

REMOVAL ACTION HEALTH AND SAFETY PLAN

Lead Remediation - Building 31
at the
Naval Submarine Base New London
Groton, CT

Contract N62472-93-C-0416

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1.0 Introduction

This section of the Removal Action Health and Safety Plan (RAHSP) document defines general applicability and general responsibilities with respect to compliance with Health and Safety programs.

The following RAHSP will be utilized and modified as necessary in order to minimize and prevent exposures to hazardous substances and conditions related to the lead contaminated soil remediation in Building 31 at the New London Naval Submarine Base, Groton, Connecticut.

In addition to this plan attention will be made to the pertinent provisions of the U.S. Corps of Engineers Safety and Health Requirements Manual EM 385-1-1 and the applicable government CFR clauses. All project personnel will be required to thoroughly review the contents of the plan and to strictly adhere to the policies and procedures listed herein.

1.1 Scope and Applicability of the Site Health and Safety Plan

The purpose of this Site Health and Safety Plan is to define the requirements and designate protocols to be followed at the Site during investigation and remediation activities. Applicability extends to all Government employees, contractors, subcontractors, and visitors.

All personnel on site, contractors and subcontractors included, shall be informed of the site emergency response procedures and any potential fire, explosion, health, or safety hazards of the operation. This HASP summarizes those hazards in table 3.1 and defines protective measures planned for the site.

This plan must be reviewed and an agreement to comply with the requirements must be signed by all personnel prior to entering the exclusion zone or contamination reduction zone.

During development of this plan consideration was given to current safety standards as defined by EPA/OSHA/NIOSH, health effects and standards for known contaminants, and procedures designed to account for the potential for exposure to unknown substances. Specifically, the following reference sources have been consulted:

- o OSHA 29 CFR 1910.120 and EPA 40 CFR 311
- o U.S. EPA, OERR ERT Standard Operating Safety Guides
- o NIOSH/OSHA/USCG/EPA Occ. Health and Safety Guidelines
- o (ACGIH) Threshold Limit Values
- o NIOSH Pocket Guide to Chemical Hazards
- o Navy/Marine Corps Installation Restoration Manual (FEB 92)

2.0 Safety Management Structure

The following safety management structure will be utilized for the implementation, administration, monitoring and conductance of the RAHSP.

2.1 Principal in Charge

The principal in charge of this project is Victoria Schopp. She is responsible for the overall completion of the contract. The principal in charge has the responsibility of securing an outside certified industrial hygienist and site health and safety officer for the development and implementation of this plan. The principal is also responsible for organizing a CQC staff to ensure the integrity and quality of the work performed. The principal in charge has the authority to stop all work at any time should the safety of the project personnel be compromised.

2.2 Certified Industrial Hygienist (CIH)

FNG Environmental, Inc., is providing Gerald Schwartz to perform the industrial hygiene on this project. Primary duties of the CIH will include:

- A. Review of all background data provided on the project
- B. Preparation and/or review and approval of the RAHSP.
- C. RAHSP implementation through the Site Safety and Health Officer.
- D. Approval of all RAHSP modifications
- E. Authority to stop all work at any time should the safety of the project personnel be compromised

2.3 Site Safety and Health Officer (SSHO)

The Site Safety and Health Officer (SSHO) for this project is Richard Groves. The alternate is Michael Fulmer. Both are from FNG Environmental, Inc., in Annapolis, MD. The SSHO will assume on-site responsibility for the RAHSP. The SSHO will monitor and maintain quality assurance of the plan until project completion. The SSHO will monitor all project operations to ensure they are being conducted in accordance with the contents of the RAHSP. Principle duties of the SSHO will include:

- A. Review of all background data provided on the project.
- B. Implementation, administration, enforcement and monitoring of the RAHSP at the site level
- C. Review of all project activity reports, inspection reports, air monitoring reports and personnel training records
- D. To notify the CIH when changes in the RAHSP are necessary.
- E. Conduct the required on-site training and safety meetings.
- F. Provide a one day site specific seminar prior to job commencement
- G. The SSHO has the authority to stop all work at any time should the safety of the project personnel be compromised.
- H. In addition to the above mentioned duties, the SSHO will perform the duties of the Site Safety and Health Supervisor when on-site.
- I. Personnel and Ambient Air Monitoring Procedures
- J. Determination of Personal Protective Equipment Levels to be used by project personnel

2.4 Quality Control Manager (QCM)

The QCM will operate independently from the health and safety organization and will report only to the Principal in Charge and the government. The QCM will also be the project superintendent. The QCM will monitor and maintain quality assurance of the plan until project completion. The QC organization will also be responsible for quality of all documentation produced with regard to this cleanup operation. Complete responsibilities of the QC staff are outlined in the QC plan.

2.5 Health & Safety Technician (HST)

The HST will be a contractor employee, who will receive additional site specific health & safety monitoring procedure training. The HST will assist the SSHO when the SSHO is unable to perform all assigned duties necessary, due to multiple tasks running concurrently. For example: monitoring personnel inside Hot Zone while having to perform perimeter monitoring.

All resumes for the safety personnel are located in Appendix A.

3.0 Project Description

The remediation of lead contaminated soil inside Building 31, New London Naval Submarine Base, Groton, Connecticut, requires the excavation and stabilization of the soil prior to placing the soil back into the excavation. This work will all be performed within Building 31. The work also includes removal, screening, and cleaning of the concrete floor prior to disposal.

Some of the ground surrounding the building has also been contaminated with lead. This soil will be excavated and disposed at a hazardous waste landfill.

The project also includes the installation of a new concrete floor, plumbing, and lightning ground system within the building. Construction outside the building includes the demolition of a small building addition and the installation of new sewer lines and manholes.

4.0 Hazard Assessment

The purpose of this section is to provide an analysis of the chemical and physical hazards associated with the activities required for the performance of this project. The hazard assessment includes an analysis of hazards for each definable feature of work and the proposed solution or safeguard for each hazard. The company Hazard Communication Program is included in Appendix B.

4.1 Chemical Hazards

The contaminants identified in the soil samples from the site include metals, polycyclic aromatic hydrocarbons (PAH), chlorinated phenolic compounds, phthalate esters, and pesticides. The concentrations of organic compounds are below 500 ug/kg except for some PAH compounds with concentrations as high as 1500 ug/kg. Mobile volatile compounds were found in concentrations less than 40 ug/kg except acetone which was found up to 130 ug/kg.

Metals with concentrations that exceed background levels in soil include antimony, lead, mercury, and zinc. Metals that exceed maximum concentration levels in groundwater include beryllium, lead, mercury, and nickel. Hazardous concentrations of lead based on TCLP analysis are known to exist. The following sections contain information about the chemicals of concern used or found as contaminants in hazardous concentrations in and around Building 31.

Material Safety Data Sheets (Appendix D) for the following list of materials will be maintained at worksite and distributed to all employees. The list includes known contaminants in the soil and all products used at the site. Employees will be required to sign an acknowledgement that they received MSDS sheets.

<u>Product or Material</u>	<u>Use of product or source of material</u>
Inorganic lead	Hazardous concentrations of contaminant in soil
Carbon monoxide	Potential for hazardous concentrations in building atmosphere
Sulfuric acid	Typical acid used in lead-acid batteries
Portland cement	Used as a construction material and for stabilization of lead contaminated soil
Automotive gasoline	Fuel for vehicles and equipment
Diesel fuel	Fuel for equipment and machinery
Ethylene glycol	Engine coolant and antifreeze for vehicles and machinery

4.1.1 Inorganic Lead

Based on the nature of the work to be performed to remediate the lead contaminated soil at Building 31, the potential exists for workers to inhale or ingest lead and other heavy metals as airborne particulate.

The exposure to airborne lead within the work area will be greatly reduced by minimizing the generation of dust within in the building. This will be done by careful handling of materials and misting dry materials with water.

The potential for ingestion of lead is greatest through the contact of contaminated hands, food and tobacco products with the mouth. This will be prevented by the proper use of personal protective equipment, proper work practices, and decontamination procedures.

The lead standard from 29 CFR, Part 1926.62 is included in Appendix C. Employees will be verbally informed of the contents of Appendices A and B of the standard. Employees will also be required to sign an acknowledgement that they received verbal communication of the lead standard.

The following table is a summary of the health and safety information about lead.

Inorganic lead

Phase of work:

- Excavation
- Stabilization
- Decontamination
- Construction

Action Level - OSHA 8 hr TWA: 30 ug/m

Routes of entry:

Inhalation, ingestion, skin and/or eye contact.

Symptoms:

Weakness, lassitude, insomnia, facial pallor, anorexia, low weight, malnutrition, abdominal pain, colic, anemia, gingival lead line, tremors, paralysis of the wrists and ankles, encephalopathy, nephropathy, eye irritation, hypotension.

Prevention:

Full-face respirators. Impervious gloves, boots and suits. Do not re-use personal protective clothing. Mist work area to keep dust to a minimum.

First Aid:

Eyes: Wash immediately, get medical attention.

Skin: Remove any clothing penetrated and wash contaminated skin promptly with soap and water.

Breath: If person breathes large amounts move the exposed to fresh air. Perform mouth-to-mouth resuscitation if necessary. Keep person warm.

Seek medical help.

Swallow: Get medical attention.

4.1.2 Carbon Monoxide

Carbon monoxide emissions from equipment are of particular concern because much of the work will be performed within Building 31. Symptoms of carbon monoxide poisoning include headache, breathlessness, irritability, confusion, fatigue, weakness, nausea, vomiting, vision impairment, and dizziness.

Carbon monoxide emissions will be continually monitored within the work area and is described in the air monitoring section of this RAHSP. To reduce or prevent the buildup of carbon monoxide emissions within the building NESC will:

- 1) Ventilate the area to the extent possible using filtered (HEPA) high volume air exchangers during remediation.
- 2) Exhaust emissions of machinery directly to the outside using flexible exhaust hose.
- 3) Cease operations until adequate ventilation reduces the carbon monoxide concentrations.
- 4) Ventilate the area after remediation is complete by opening doors and windows (weather permitting).

Carbon Monoxide

Phase of work:

Excavation
Stabilization
Decontamination
Construction

NIOSH/OSHA TWA: 35 ppm

Routes of entry: Inhalation

Symptoms:

Headache, tachypnea, nausea, weakness, dizziness, confusion, hallucinations, vision impairment, irritability, angina.

Prevention:

Adequate ventilation, supplied air respirators or self contained breathing apparatus.

First Aid:

Breath: If person breathes large amounts move the exposed to fresh air. Perform mouth-to-mouth resuscitation if necessary. Keep person warm. Seek medical help and respiratory support.

4.1.3 Corrosive Materials

In addition to lead and carbon monoxide exposure, employees may also be potentially exposed to corrosive battery wastes (pH < 2) and alkaline portland cement (pH = 12). Direct contact with these materials may cause chemical burns and damage to the skin, eyes, and mucous membranes.

Employees will wear chemically resistant suits, boots, gloves, and eye protection to prevent accidental contact with these materials.

4.1.4 Fuels and Additives

Fuels and additives for equipment and machinery will be used at the site. These materials will only be stored in proper containers. Refueling and maintenance of equipment will be performed using acceptable methods to prevent contact, ingestion, or inhalation of vapors.

4.2 Physical Hazards

4.2.1 Heavy Equipment and Truck Traffic

Heavy equipment and trucks will be equipped with backup alarms and rollover protection as necessary. Watch persons will be used as necessary during equipment movements. Hand signals between operators and watchers will be regularly reviewed. Electronic communication may be used if necessary. Machinery will be properly maintained and equipped with extra mirrors for inside use.

4.2.2 Excavations

Hazards encountered during soil and test pit excavation include both chemical and physical agents, and are as follows:

- o Exposure to airborne contaminants released during intrusive activities. Flammable atmospheres encountered in excavations.
- o Sides of excavation can cave in. Possible burying or crushing of workers due to 1) absence of shoring, 2) misjudgment of stability, 3) defective shoring, and/or 4) undercut sides.
- o Falling during access/egress or while monitoring or dismounting equipment, or stumbling into excavation.
- o An overhead hazard can result from material, tools, rock and/or soil falling into the excavation.
- o Congested work area due to too many workers in a small area.

Hazard Prevention

- o Monitor for airborne contaminants. Allow test pits to purge and/or use personal protective equipment.
- o Provide adequate shoring or sloping of sides of the excavation. Regularly inspect trenches for changing conditions.
Solid rock, cemented sand or gravel = 90 degrees
Compact angular gravel = 63 degrees 26 ft. deep
Compacted sharp sand = 33 degrees 41 ft. deep
Rounded loose sand = 26 degrees 34 ft. deep
- o Provide ramps or ladders to trenches to allow safe access and egress.
- o Provide an adequate barrier around open pits. Material from pit must be placed away from edge to prevent cave ins and instability of pit.
- o To prevent overexertion, limit manual lifting and emphasize mechanical means where practical.
- o Maintain ample work room between workers.

Other Precautions:

The sides of the excavation in which employees or property are exposed to the danger of moving earth will be sloped or shored. The minimum slope will be no less than 3/4 horizontal to 1 vertical. This may be adjusted due to the depth of the excavation, moisture content, loading, vibration, or the type of material. Shoring will be designed to adequately accommodate the forces and physical characteristics of the material to be retained. Walls will be shored, braced, or underpinned if the excavation activities have the potential of affecting the structural integrity of the load bearing walls.

Stockpiles will be placed a minimum of 2 feet from the excavation wall to prevent excessive loading on the face of the excavation.

Open excavations will be surrounded by construction fence or barricades during all periods of inactivity. Water in open excavations can affect the stability of the excavation walls, therefore water in the excavation will be pumped, containerized, and disposed as necessary to keep the excavations dry.

4.2.3 Mechanical Equipment

Workers will be trained in the proper use and operation of mechanical equipment (pugmills, vibratory screens, pumps, compressors, generators, etc.). Safety guards will be used at the appropriate locations on all equipment to prevent accidents. Electrical equipment will be protected with ground fault interrupter (GFI) type circuit breakers.

4.2.4 Other Physical Hazards

Workers will be trained in proper lifting and digging techniques to prevent physical strain. Physical injury will be prevented by the use of personal protective equipment (hard hats, steel toed shoes, eye protection, etc.). Workers will be supplied with proper tools and moving equipment.

Additional physical hazards include contact with overhead or underground utilities, noise, temperature extremes, and walking or working on uneven surfaces.

Utilities will be located and flagged prior to excavation. Operators will dig carefully in areas where suspected utilities exist. Hand digging will be used as necessary to prevent damage to utilities. Electrical utilities and pressurized lines will be shut off and locked out to protect workers. Contact with overhead utilities will be prevented by identifying the hazards in advance and using watchmen to direct the operators of equipment.

Workers will use hearing protection devices to protect them from exposure to noise above 85 dBA. Weather conditions will be continually monitored for temperature extremes. Wind chill and heat index will also be monitored. Workers will take frequent warm-up breaks when working in temperatures near or below freezing. Workers will be provided with appropriate coveralls, hard hat liners, gloves, and clothing as necessary to keep warm.

The danger of working and walking on uneven surfaces will be accommodated by providing adequate lighting to see the hazards. Running is not allowed. Surfaces will be smoothed if possible and kept free of debris to prevent tripping.

4.3 Fire Prevention

Great care will be taken during any work, such as refueling equipment, that might involve the release of flammable vapors. Combustible materials, such as waste paper and wood, will be safely packaged and stored to prevent accidental combustion.

Flammable vapors may be ignited by many ignition sources, including open flames, gasoline engines, diesel engines, lightning, electrical shorts in worn or defective extension cords and sparks. Spark sources include electrical lamps, power tools, fixtures, switches, non-explosion proof appliances, welding and static electricity. NESC will keep all the above mentioned items away from the area. In the event a tool which could cause potential ignition must be used the area will be checked thoroughly for vapors prior to use.

All sources of ignition, including automobiles, welding, or other hot work which might be a source of ignition will be eliminated from the area where the possibility of flammable vapors may be present.

Special care will be exercised to keep all sources of ignition out of the area including electrical and internal combustion engine equipment until the area has been vapor freed. Surveys of the areas using a combustible gas meter will be performed periodically to ensure that hazardous conditions do not exist in these areas.

During operations, the supervisor or safety staff will monitor the area and will stop work if a hazardous condition results. Equipment used will be suitable for hazardous locations. All portable light and extension cords will be suitable for hazardous areas.

Even after an area has been freed of vapor, flammable mixtures may still be formed later from remaining residual liquids. Heat from the sun, steam tracing, or hot work may result in increasing the vapor content. Vapors will be checked frequently even if initial measurements indicate airborne quantities are within acceptable limits.

The following safety equipment will be used:

- a. A fire extinguisher, rated not less than 20-B:C (UL approved), within 50 feet of wherever flammable or combustible liquids are being used at the work site;
- b. At least one fire extinguisher, dry chemical or CO₂, on each large piece of construction equipment such as a crawler excavator, front-end loader, or similar equipment;
- c. Combustible gas indicator (CGI)/oxygen meter;
- d. Construction fencing, flashers and signs;
- e. All hand tools used in hazardous locations will be explosion proof.
- f. Explosion-proof pumps and intrinsically safe instrumentation.

All equipment will be thoroughly inspected to ensure that it will function properly and not be a source of ignition.

4.4 General Hazard Assessment

The following table provides a general hazard assessment for each definable feature of work. The assessment includes a summary of the hazards and a solution or safeguard for each hazard.

Definable Phase of Work	Hazards Associated with the work	Method of Control or Safe Guard
Installation of Concrete floor, Plumbing, and Utilities	Personnel Safety	1) Workers will be provided with proper footwear, hard hats, safety goggles, gloves, & protective clothing 2) Train workers in correct work practices for work environment (including 40 hr OSHA if necessary) 3) Maintain site safety plan
	Equipment Hazards	1) All equipment will have back-up warning alarms, R.O.P.s and F.O.P.s 2) Watch person will be present during all operations 3) Equipment will be maintained and operated properly 4) Operators will be trained in the proper usage of all safety equipment devices 5) Laborers working near excavation will be limited 6) Hand signals to be used between operators & laborers will be reviewed regularly
	Caustic Concrete Present	Use rubber gloves and boots
	Trip Hazard	1) Remove debris from work area 2) Keep tools stored in a central location
	Exhaust Emmission (inside Bldg. 31)	1) Monitor for concentrations above action levels 2) Provide flexible hose to vent exhaust directly to outside 3) Provide adequate ventiation to maintain concentrations below action levels when possible
Stabilization of Contaminated Soil	Electrical Shock	(GFI) Circuit protection will be used on all electrical equipment
	Personnel Safety	1) Workers will wear proper footwear, hard hats, safety goggles, gloves and protective suits 2) Train workers in correct work practices for work environment
	Respiratory Protection	1) Provide proper respirators and personal protective equipment 2) Use water to control dust
	Back Strain	1) Train workers on proper lifting techniques 2) Supply workers with proper moving equipment

Definable Phase of Work	Hazards Associated with the work	Method of Control or Safe Guard
	Workers or Equipment/ Tools Falling Pugmill/Screening Equipment	<ol style="list-style-type: none"> 1) Train workers in proper use and handling of equipment 2) Provide equipment guards on machinery
	Noise	Provide proper ear protection
	Fire/Explosion	<ol style="list-style-type: none"> 1) Remove combustible debris prior to cutting operations 2) Provide proper type and number of fire extinguishers
	Public Safety	<ol style="list-style-type: none"> 1) Post proper warning signs 2) Use barricades and barrier tape 3) Deny access to work zone if person is not properly trained 4) Maintain site safety plan
	Trip Hazard	<ol style="list-style-type: none"> 1) Remove debris from work area 2) Tools will be stored in a central location when not in use
	Exhaust Emissions	<ol style="list-style-type: none"> 1) Monitor for concentrations above action levels 2) Provide flexible hose to vent exhaust directly to outside 3) Provide adequate ventilation to maintain concentrations below action levels when possible
Demolition, Sorting, Washing, and Handling of Debris	Noise	Provide proper ear protection
	Fire/Explosion	<ol style="list-style-type: none"> 1) Remove combustible debris prior to cutting operations 2) Provide watch person during all cutting operations 3) Provide proper type and number of fire extinguishers
	Public Safety	<ol style="list-style-type: none"> 1) Post proper warning signs 2) Use barricades and barrier tape 3) Deny access to work zone if person is not properly trained 4) Maintain site safety plan
	Trip Hazard	<ol style="list-style-type: none"> 1) Remove debris from work area 2) Tools will be stored in a central location when not in use
	Exhaust Emissions (Inside Bldg. 31)	<ol style="list-style-type: none"> 1) Monitor for concentrations above action levels 2) Provide flexible hose to vent exhaust directly to outside 3) Provide adequate ventilation to maintain concentrations below

Definable Phase of Work	Hazards Associated with the work	Method of Control or Safe Guard
		action levels when possible
	Electrical Shock	(GFI) Circuit protection will be used on all electrical equipment
	Personnel Safety	1) Workers will wear proper footwear, hard hats, safety goggles, gloves and protective suits 2) Train workers in correct work practices for work environment
	Respiratory Protection	1) Provide proper respirators and personal protective equipment 2) Use water to control dust
	Back Strain	1) Train workers on proper lifting techniques 2) Supply workers with proper moving equipment
	Debris Falling on Workers (Demolition)	1) Rope off area when demo begins 2) Post a watch person during demolition 3) Workers to wear hard hats at all times
	Equipment	1) All equipment will have back-up warning alarms, R.O.P.s and F.O.P.s 2) Watch person will be present during all operations 3) Equipment will be properly maintained 4) Operators will be trained in the proper use of all safety equipment devices 5) Laborers working near excavation will be limited 6) Hand signals to be used between operators & laborers will be reviewed on a regular basis
Excavation of Contaminated Soil	Equipment Hazards	1) All equipment will have back-up warning alarms, R.O.P.s and F.O.P.s 2) Watch person will be present during all operations 3) Equipment will be properly maintained 4) Operators will be trained in the proper usage of all safety equipment devices 5) Laborers working near excavation will be limited 6) Hand signals to be used between operators & laborers will be reviewed regularly

Definable Phase of Work	Hazards Associated with the work	Method of Control or Safe Guard
Personnel Safety		1) Workers will wear proper footwear, hard hats, safety goggles, gloves and protective suits 2) Train workers in correct work practices for work environment
Public Safety		1) Post proper warning signs 2) Use barricades and barrier tape as necessary 3) Maintain site safety plan
Respiratory Protection		1) Provide proper respirators and personal protective equipment 2) Use water to control dust
Fire Safety		1) Maintain work area free of debris 2) Provide proper type and number of fire extinguishers
Electrical & Other Utility Line Hazards		1) Have all underground utilities marked prior to start of excavation 2) Have all above-ground wires moved or dropped if equipment can come into contact with them
Excavation Hazards		1) Hole will be barricaded when crew is not working 2) 2:1 slope will be maintained whenever possible 3) Piling will be used if necessary
Trip Hazard		1) Remove debris from work area 2) Tools will be stored in a central location when not in use
Exhaust Emissions (inside Bldg. 31)		1) Monitor for concentrations above action levels 2) Provide flexible hose to vent exhaust directly to outside 3) Provide adequate ventiation to maintain concentrations below action levels when possible

5.0 Personnel Training

5.1 Preassignment and Annual Refresher Training

Prior to arrival on site, each employer will be responsible for certifying that his/her employees meet the requirements of preassignment training, consistent with OSHA 29 CFR 1910.120 paragraph (e)(3). The employer should be able to provide a document certifying that each general site worker has received 40 hours of instruction off the site, and 24 hours of training for any workers who are on site only occasionally for a specific task. If an individual employee has work experience and/or training that is equivalent to that provided in the initial training, an employer may waive the 40-hour training so long as that equivalent experience is documented or certified. All personnel must also receive 8 hours of refresher training annually.

5.2 Site Supervisors Training

Consistent with OSHA 29 CFR 1910.120 paragraph (e)(8), individuals designated as site supervisors require an additional 8 hours of training.

The following individuals are identified as site supervisors:

<u>Name</u>	<u>Title/Responsibility</u>
Richard Groves	SSHO
Arthur Bender	CQC

5.3 General Site Worker Training

All project personnel will received and are certified in the OSHA 40 hour hazardous materials operations and emergency response training in accordance with 29 CFR 1910.120 as required. All personnel have received the annual 8 hour refresher course as necessary. Project supervisory personnel have received the additional 8 hour hazardous materials operations and emergency response supervisory training. This training was conducted off-site in a classroom situation prior to project start-up. Certificates from course completion can be found in Appendix E along with each employees medical surveillance reports. The training included the following subject areas:

- A. A review of the standard requirements
- B. Hazard recognition and communication
- C. General toxicology
- D. Levels of protection
- E. Personal Protective Equipment
- F. Air monitoring and surveillance
- G. Medical Monitoring
- H. Security control and operational zones
- I. Personnel and equipment decontamination
- J. General first aid
- K. General site safety
- L. Qualitative respirator fit test
- M. Emergency Response Procedures

5.4 Project Specific Training

Prior to project start-up all personnel will receive an initial project specific training session conducted by the SSHO. The training session will include but not be limited to the following areas:

- A. Review of the RAHSP
- B. Review of chemical and physical hazards associated with the project
- C. Personal protection equipment levels to be used
- D. Project security control and operational work zones
- E. Emergency response and site evacuation procedures
- F. Air monitoring and medical monitoring procedures
- G. Project communications
- H. Decontamination procedures
- I. Review of contents of any applicable regulatory standards as applied to project operations
- J. Prohibited on-site activities
- K. Safe use of engineering controls, equipment, and equipment safeguards
- L. Signs and symptoms of overexposure to the site contaminants.
- M. Review of the Material Safety Data Sheets (MSDS)

5.5 General Safety Briefings

General safety meetings will be held by the SSHO each week until project completion. The purpose of these meetings will be to discuss project status, potential problem areas, general safety concerns, and to reiterate RAHSP requirements. Additional meetings will be held if conditions warrant. Meeting notes will be kept and signed by all in attendance.

5.6 Visitor Orientation

Entry into the exclusion zone will be prohibited to those who have not received the 40 hour hazardous waste training 29 CFR 1910.120. Visitors without proof of proper training will be restricted to the support zone. If a visitor has proven that he has the appropriate training, medical surveillance, and respirator, will be required to read and verify compliance with the provisions of this HASP. Visitors, other than authorized government personnel, will also be expected to provide their own protective equipment.

In the event that a visitor does not adhere to the provisions of the HASP, he/she will be requested to leave the work area. All nonconformance incidents will be recorded in the site log.

6.0 Operational Zones and Access Security Control

6.1 Site Control Measures

The following section defines measures and procedures for maintaining site control. Site control is an essential component in the implementation of the site health and safety program.

6.2 Buddy System

During all Level B activities or when some conditions present a risk to personnel, the implementation of a buddy system is mandatory. A buddy system requires at least two people who work as a team; each looking out for each other. For example, Level B operations generally require three people.

6.3 Site Communications Plan

Successful communications between field teams and contact with personnel in the support zone is essential. The following communications systems will be available during activities at the Site.

- o Two-way radio
- o Intrinsically safe radio
- o Whistle
- o Compressed Air Horn
- o Hand Signals

<u>Signal</u>	<u>Definition</u>
Hands clutching throat	Out of air/cannot breath
Hands on top of head	Need assistance
Thumbs up	OK/I am all right/I understand
Thumbs down	No/negative
Arms waving upright	Send backup support
Grip partners wrist	Exit area immediately

6.4 Work Zone Definition

The purpose of this section is to provide a method to closely supervise all personnel movements into and out of the operational areas. The operational area will be divided into three access zones. Each zone will be clearly delineated and access will be strictly supervised. Uncontrolled entrance or egress of personnel or visitors will be prohibited.

6.5 Operational Zones

The project will be divided into three access operational zones. Each zone will be delineated by a sign and barricade with uncontrolled entrance or egress by personnel or unauthorized visitors prohibited.

The access zones are identified in the map on the following page and will be as follows:

- * Zone 1 (Exclusion Zone)(Hot Zone)
- * Zone 2 (Contamination Reduction Zone)(Decon)
- * Zone 3 (Support Zone/Clean Area)

A. Zone 1 (Exclusion Zone)

The active work area is the area in and around the area where cleanup operations will be conducted. Personnel and authorized visitors will enter this area only after donning all required personal protective equipment. Entrance to and exit from this area will be accomplished through Zone 2. Signs will be posted on the perimeter of this zone reading:

WARNING
LEAD WORK AREA
POISON
NO SMOKING OR EATING

B. Zone 2 (Contamination Reduction Zone)

This area will serve as the controlled entrance to and exit from Zone 1. All Personnel and authorized visitors will be required to undergo decontamination procedures in this area prior to entering Zone 3.

C. Zone 3 (Support Zone/Clean Area)

This area will contain the Project Command Post. All personnel, authorized visitors and equipment entering this area from Zone 2 will have undergone decontamination procedures. Primary access and exit control will be handled here. Worker break areas will be cleaned using HEPA vacs or wet methods of cleaning to reduce potential of contamination migration/exposure.

6.6 Access Security Control

Access control and security measures regarding the above operational zones are imperative for loss prevention, personnel and public safety. The following includes procedures and methods that will be used to ensure proper access security control.

- A. Only personnel with assigned work tasks in the operational area will be permitted to enter.
- B. Visitors and non-essential personnel will be permitted to enter only after being authorized by the SSHO.
- C. A main controlled entry and egress point will be designated for use by all personnel and authorized visitors.
- D. Entrance to and exit from Zone 1 will only be accomplished through Zone 2.

TABLE 6.7 STANDING ORDERS FOR EXCLUSION ZONE

- o No smoking, eating, or drinking in this zone.
- o No horse play.
- o No matches or lighters in this zone.
- o Check-in on entrance to this zone.
- o Check-out on exit from this zone.
- o Implement the communications system.
- o Line of sight must be in position.
- o Wear the appropriate level of protection as defined in the Safety Plan.

TABLE 6.8 STANDING ORDERS FOR CONTAMINATION REDUCTION ZONE

- o No smoking, eating, or drinking in this zone.
- o No horse play.
- o No matches or lighters in this zone.
- o Wear the appropriate level of protection.

7.0 Site Communications and Emergency Warning

All personnel authorized to conduct operations in Zone 1 will be required to work in teams (buddy system). The project work area is small enough in size that all personnel will either be in visual or voice contact in the event of an emergency. Additionally an air horn will be available in Zone 2 for the audible sounding of an emergency.

8.0 Air Quality and Personnel Exposure Monitoring

This section explains the general concepts of an air monitoring program and specifies the surveillance activities that will take place during project completion at the Site.

The purpose of air monitoring is to identify and quantify airborne contaminants in order to verify and determine the level of worker protection needed. Initial screening for identification is often qualitative, i.e., the contaminant, or the class to which it belongs, is demonstrated to be present but the determination of its concentration (quantification) must await subsequent testing. Two principal approaches are available for identifying and/or quantifying airborne contaminants:

- o The onsite use of direct-reading instruments.
- o Laboratory analysis of air samples obtained by gas sampling bag, collection media (i.e., filter, sorbent), and/or wet-contaminant collection methods.

Monitoring of the ambient air will require several instruments because of the contaminants and the potential for the production of dust within the building.

1. For Lead, low flow pumps with proper filter cassette media will be used inside and outside of the current containment area where work is being performed. The cassettes will be analyzed by NIOSH Method 7082.
2. An direct reading carbon monoxide monitor will be used to monitor the levels of carbon monoxide near the excavators and machinery within the building. The monitor will measure concentrations between 0 ppm and 1000 ppm and has an audible alarm set to 25 ppm.
3. An MIE PDM-3 Miniram direct reading monitor will be used to monitor for dust concentrations inside and outside the building.

Because low levels of organic contaminants were detected in the soils the following equipment will be available for use to monitor conditions at the site.

1. HNU or Microtip photoionization detector (PID) with 11.7 eV lamp. Used to determine field concentrations of ionizable gasses.
2. Sensidyne Gas Detection System. Uses colorimetric tubes to determine the presence of specific compounds such as benzene, toluene, vinyl chloride, methyl chloroform, carbon disulfide etc.
3. MSA or Industrial Scientific Combustible Gas/Oxygen Meters. Used to detect combustible or flammable atmospheres and oxygen deficient atmospheres. Readings in excess of 20% of the lower explosive limit (LEL) or oxygen concentrations less than 19.5% or greater than 23% will necessitate a halt in operations so that the area can be evacuated until safe.

8.1 Direct-Reading Monitoring Instruments

Unlike air sampling devices, which are used to collect samples for subsequent analysis in a laboratory, direct-reading instruments provide information at the time of sampling, enabling rapid decision-making. Data obtained from the real-time monitors are used to assure proper selection of personnel protection equipment, engineering controls, and work practices. Overall, the instruments provide the user the capability to determine if site personnel are being exposed to concentrations which exceed exposure limits or action levels for specific hazardous materials.

Of significant importance, especially during initial entries, is the potential for IDLH conditions or oxygen deficient atmospheres. Real-time monitors can be useful in identifying any IDLH conditions, toxic levels of airborne contaminants, flammable atmospheres. Periodic monitoring of conditions is critical, especially if exposures may have increased since initial monitoring or if new site activities have commenced.

Table 8.1 excerpted from Occupational Safety and Health Guidelines for Hazardous Waste Site Activities, provides an overview of available monitoring instrumentation and their specific operating parameters.

After site mitigation activities have commenced, the selective monitoring of high-risk workers, i.e., those who are closest to the source of contaminant generation, is essential. Personal monitoring samples should be collected in the breathing zone and, if workers are wearing respiratory protective equipment, outside the facepiece.

Those employees working closest with the source have the highest likelihood of being exposed to concentrations which exceed established exposure limits. Representative sampling approaches emphasizing worst case conditions, those employees with the greatest risk of exposure, is acceptable. However, the sampling strategy may change if the operation or tasks change onsite or if exposures potentially increase.

TABLE 8.1 SOME DIRECT-READING INSTRUMENTS FOR GENERAL SURVEY

Instrument: Combustible gas indicator (CGI)

Hazard Monitored: Combustible gases and vapors.

Application: Measures the concentration of a combustible gas or vapor.

Detection Method: A filament, usually made of platinum, is heated by burning the combustible gas or vapor. The increase in heat is measured. Gases and vapors are ionized in a flame. A current is produced in proportion to the number of carbon atoms present.

General Care/Maintenance: Recharge or replace battery. Calibrate immediately before use.

Typical Operating Time: Can be used for as long as the battery lasts, or for the recommended interval between calibrations, whichever is less.

Instrument: Ultraviolet (UV) Photoionization Detector (PID)
Example: HNU.

Hazard Monitored: Many organic and some inorganic gases and vapors.

Application: Detects total concentration of many organic and some inorganic gases and vapors. Some identification of compounds are possible if more than one probe is measured.

Detection Method: Ionizes molecules using UV radiation; produces a current that is proportional to the number of ions.

General Care/Maintenance: Recharge or replace battery.

Regularly clean lamp window. Regularly clean and maintain the instrument and accessories.

Typical Operating Time: 10 hours. 5 hours with strip chart recorder.

Instrument: Direct Reading Colorimetric Indicator Tube

Hazard Measured: Specific gas and vapors.

Application: Measures concentration of specific gases and vapors.

Detection Method: The compound reacts with the indicator chemical in the tube, producing a stain whose length or color change is proportional to the compound's concentration.

General Care/Maintenance: Do not use a previously opened tube even if the indicator chemical is not stained. Check pump for leaks before and after use. Refrigerate before use to maintain a shelf life of about 2 years. Check expiration date of tubes. Calibrate pump volume at least quarterly. Avoid rough handling which may cause channeling.

Instrument: Oxygen Meter

Hazard Monitored: Oxygen (O₂)

Application: Measures the percentage of O₂ in the air.

Detection Method: Uses an electrochemical sensor to measure the partial pressure of O₂ in the air, and converts that reading to O₂ concentration.

General Care/Maintenance: Replace detector cell according to manufacturers recommendations. Recharge or replace batteries prior to expiration of the specified interval. If the ambient air is more than 0.5% CO₂, replace the detector cell frequently.

Typical Operating Time: 8-12 hours.

Instrument: Real Time Aerosol Monitor

Hazard Monitored: Particulates

Application: Measures total particulates in air.

Detection Method: Uses an internal light source. The particulates diffract the light beam and the amount of diffraction is converted into concentration (mg/m³).

General Care/Maintenance: Recharge batteries. Replace desiccant when necessary.

Typical Operating Time: 8-12 hours.

Instruments: Carbon Monoxide Meter

Hazard Monitored: Carbon Monoxide

Application: Detects levels of Carbon Monoxide

Detection Method: Electrochemical sensor relatively specific for the chemical in question.

General Care/Maintenance: Change battery when needed.

Typical Operating Time: Can be used for as long as the battery lasts, or for the recommended interval between calibrations, whichever is less.

8.2 Specific Contaminants to be monitored at the Site

The following checklist provides a summary of the contaminants to be monitored for and frequency/schedule of monitoring. The air sampling checklist will serve as a site monitoring plan.

8.2.1 Site Air Monitoring and Sampling Program

A. Air Monitoring Instruments

- * Combustible Gas Indicator (CGI)/Oxygen Meter
Frequency : Continuous monitoring for LEL/O2
Locations :
 - Soil Solidification Area
 - Excavation area
 - Hot zone area

- * Ultraviolet (UV) Photoionization Detector (PID)
Frequency : Continuous monitoring for VOC's
Locations :
 - Soil Solidification Area
 - Excavation area
 - Hot zone area

- * Real Time Aerosol Monitor
Frequency : Continuous monitoring for Lead
Locations :
 - Soil Solidification Area
 - Upwind and downwind of site activities
 - Decon area
 - Excavation area
 - Hot zone area

- * Carbon Monoxide Monitor
Frequency : Continuous monitoring for CO
Locations :
 - Basement while using Heavy Equipment
 - Excavation area
 - Hot zone area

B. Action Levels

Explosive atmosphere:

<u>Action Level</u>	<u>Action</u>
<10% LEL	Continue investigation.
10%-20% LEL	Continue on-site monitoring with extreme caution as higher levels are encountered.
(Permit Space) >10% LEL	Explosion hazard. Withdraw from area immediately.
>20% LEL	Explosion hazard. Withdraw from area immediately.

Oxygen:

<u>Action Level</u>	<u>Action</u>
<19.5%	Monitor wearing self-contained breathing apparatus or supplied air respirator. NOTE: Combustible gas readings are not valid in atmospheres with <19.5% oxygen.
19.5%-25%	Continue investigation with caution. Deviation from normal level may be due to presence of other substances.
>25%	Fire hazard potential.
(Permit Space) >23.5%	Discontinue investigation. Consult a fire safety specialist.

Organic gases and vapors:

Action Level Action

If VOC's are detected during site operations with the PID then air samples will be taken and sent to a laboratory for VOC analysis. After determining what VOC's are present and at what levels the CIH will develop and implement a more detailed air monitoring plan in regard to VOC's.

Particulates/Lead:

<u>Action Level</u>	<u>Action</u>
0.00 - 0.03 mg/m3	Continue work.
0.03 - 2.5 mg/m3	Upgrade to Level "C" PPE
2.5 - 50 mg/m3	Upgrade to Level "B" PPE
>50 mg/m3	Upgrade to Level "A" PPE

A sustained reading for 2 minutes will constitute an Upgrade/Downgrade in PPE.

Carbon Monoxide:

<u>Action Level</u>	<u>Action</u>
0.0 - 12.5 ppm	Continue work and monitoring
12.5 - 25 ppm	Continue work and observe for symptoms of overexposure. Ventilate area to extent possible.
Over 25 ppm	Cease work until ventilation adequately reduces levels.
Any indication of CO poisoning	Cease work and obtain further direction.

8.3 Personnel Exposure Monitoring

Personal Air Monitoring - every day at least 10% of personnel will be required to wear a personal air pump with a proper filter cassette media. The SSHO will select individuals whose work functions would be expected to yield the highest exposure levels for monitoring. The pumps will be calibrated at 2.0 liters/min and a full shift sample will be obtained. The cassette from the pump will be analyzed for lead.

Employees will be notified of the results of monitoring in writing. The notification may be posted in the field office or mailed to the individual employee. Additional copies will be available in the corporate office.

All air samples will be recorded on daily air sample logs. These forms will be retained for a minimum of 30 (thirty) years.

When working in an open area, such as in the outside excavation, monitoring will be performed downwind of the work.

8.4 Perimeter Monitoring

Four fixed sampling stations will be set up around the work area, and one fixed station will be set up in the decon area. Low flow personnel sampling pumps will be used at these stations and samples taken and analyzed for lead using NIOSH Method 7082. These samples will help determine any off-site migration of contaminants.

8.5 Calibration and Maintenance of Equipment

Prior to the start of this project, all monitoring equipment will be calibrated and certified by the manufacturer. The monitoring equipment also will be cleaned and calibrated on site every work day and all calibrations will be recorded in a calibration log book by the SSHO. The results of daily calibrations and responses of the air monitoring instruments will be recorded on the SSHO Daily Reports and submitted to the CO. All instruments will be calibrated and maintained in accordance with the manufacturers specifications. The contractor will have back up instruments available to be on site within 24 hours of any instrument malfunction.

Organic gases and vapors:

Action Level Action

If VOC's are detected during site operations with the PID then air samples will be taken and sent to a laboratory for VOC analysis. After determining what VOC's are present and at what levels the CIH will develop and implement a more detailed air monitoring plan in regard to VOC's.

Particulates/Lead:

Action Level Action

0.00 - 0.03 mg/m3	Continue work.
0.03 - 2.5 mg/m3	Upgrade to Level "C" PPE
2.5 - 50 mg/m3	Upgrade to Level "B" PPE
>50 mg/m3	Upgrade to Level "A" PPE

A sustained reading for 2 minutes will constitute an Upgrade/Downgrade in PPE.

Carbon Monoxide:

Action Level Action

0.0 - 12.5 ppm	Continue work and monitoring
12.5 - 25 ppm	Continue work and observe for symptoms of overexposure. Ventilate area to extent possible.
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8.6 Air Monitoring Reports

Monitoring records will be kept in accordance with 29 CFR 1910.120 and standard National Environmental Services practices. SSHO Daily Reports, which record ambient air monitoring results, times of sampling, daily site activities, work areas, background air levels, daily instrument calibration results, wind direction and weather conditions, for carbon monoxide, particulate, lead concentrations from personal and perimeter air monitors, will be submitted to the Contracting Officer on a daily basis. Personnel and environmental monitoring will be made part of the permanent project records. All reports will be reviewed by the CIH, SSHO, and the CQC organization. A copy of the SSHO Daily Report and all air monitoring sampling results will be posted for employee review. All air monitoring sampling results which exceed exposure limits will be made known to all employees during the daily tailgate safety meetings.

9.0 Confined Space Entry

Confined space entry is not anticipated for any of the work required for this project. However, if confined space entry becomes necessary, then workers will follow the procedures outlined in the Confined Space Entry Program in Appendix F.

10.0 Personal Protective Equipment Program

This section describes the general requirements of the EPA designated Levels of Protection (A-D), and the specific levels of protection required for each task at the Site.

Personnel wear protective equipment when response activities involve known or suspected atmospheric contamination vapors, gases, or particulates may be generated by site activities, or when direct contact with skin-affecting substances may occur. Full facepiece respirators protect lungs gastrointestinal tract, and eyes against airborne toxicants. Chemical-resistant clothing protects the skin from contact with skin-destructive and absorbable chemicals.

Modifications of these levels are permitted, and routinely employed during site work activities to maximize efficiency. For example, Level C respiratory protection and Level D skin protection may be required for a given task. Likewise the type of chemical protective ensemble (i.e., material, format) will depend upon contaminants and degrees of contact.

Level of Protection selected is based upon the following:

- o Type and measured concentration of the chemical substance in the ambient atmosphere and its toxicity.
- o Potential for exposure to substances in air liquids, or other direct contact with material due to work being done.
- o Knowledge of chemicals on-site along with properties such as toxicity, route of exposure, and contaminant matrix.

In situations where the type of chemical, concentration, and possibilities of contact are not known, the appropriate Level of Protection must be selected based on professional experience and judgment until the hazards can be better identified.

The purpose of this program is to establish guidelines for the selection and use of personal protective equipment for the protection of eyes, face, head, extremities, and body.

10.1 Program Responsibilities

- A. Use all personal protective equipment provided in accordance with instructions and training received
- B. To routinely inspect personal protective equipment for defects which would negate their usefulness
- C. Immediately report any defect or damage of personal protective equipment to the SSHO or his/her designated person

10.2 Program Administration

- A. The SSHO shall direct, evaluate and provide guidance on all aspects of the project personal protective equipment program.
- B. Immediate program administration will be accomplished by the SSHO.

10.3 Equipment Selection

- A. Only approved personal protective equipment will be purchased and supplied to project personnel. All purchasing of equipment will be under the guidance of the SSHO.
- B. Selective use of personal protective equipment will be administered by the SSHO under the guidance and direction of the SSHO. Personal protective equipment will be selected on the basis of the following criteria:
 - 1. Nature of the hazard
 - 2. Physical properties of the contaminant involved
 - 3. Location of the hazard
 - 4. Time frame for which the equipment will be worn
 - 5. Operational activities of personnel required to wear the equipment
 - 6. Functional capabilities and limitations of the equipment
 - 7. Toxicity of the contaminant with emphasis on the primary routes of entry
 - 8. Irritant properties of the contaminant
 - 9. Body absorption and synergistic properties of the contaminant

10.4 Personnel Training

- A. The SSHO will administer periodic training pertaining to all personal protective equipment. The training will include, but not be limited to, the following:

1. Proper use of all available personal protective equipment
2. Reasons for the selection of various types of personal protective equipment
3. Functional capabilities and limitations of all personal protective equipment
4. Proper methods of donning and wearing personal protective equipment
5. Proper care and maintenance of equipment
6. Training in the recognition and handling of emergency situations

10.5 Issuance of Equipment

- A. Only the SSHO shall be permitted to issue personal protective equipment to project personnel, outside contractors and visitors.
- B. All outside contractors and visitors will be required to adhere to the same personal protective equipment procedures as regular project personnel.
- C. For unusual operation instances or special projects, personal protective equipment will be issued under the guidance of the SSHO.
- D. The SSHO will ensure that the proper protective equipment is being used and will be responsible for maintaining an adequate supply of equipment on site for personal use.

10.6 Equipment Inspection

- A. All site personnel required to wear personal protective equipment will routinely inspect issued equipment to ensure its integrity and operational readiness. Any equipment found to be defective or damaged will be returned to the Ssho for a suitable replacement.

- B. The SSHO will daily inspect all personal protective equipment for defects or damage which would negate the effectiveness of the equipment in providing optimum protection to the wearer. Defective or damaged equipment will be taken out of service and replaced. Unsanitary equipment will be cleaned prior to reissuance and all storage of equipment will be accomplished in a manner as to prevent contamination and damage.

10.7 Program and Medical Surveillance

- A. The SSHO will approve the purchase of all personal protective equipment.
- B. The project personal protective equipment program will be continually evaluated as part of the RAHSP Quality Assurance Program.
- C. The SSHO will direct a continuing Industrial Hygiene program designed to protect the safety and health of project personnel.
- D. All project personnel will receive a comprehensive medical health evaluation related to operations performed.

10.8 Personnel Safety and Health

The SSHO will direct and provide guidance for the ongoing Industrial Hygiene and Safety Program designed to minimize the potential for occupational safety and health hazards. These programs will incorporate project safety and health program evaluations and will include periodic personnel and environmental monitoring procedures. The SSHO will implement all project health and safety programs and will monitor and enforce all safety and health policies and practices to ensure a safe working environment.

10.9 Personnel Protective Equipment Assignment Levels

The specific levels of protection and necessary components for each have been divided into four categories according to the degrees of protection afforded:

10.9.1 Assignment Level A

Level A protection equipment will be assigned when the highest available level of respiratory, skin and eye protection is deemed necessary by the SSHO.

A. Equipment List

1. Pressure demand SCBA or air supplied units with escape bottles. (NIOSH/MSHA approved).
2. Full encapsulated chemical suit.
3. Chemical resistant gloves.
4. Chemical resistant steel toed, steel shanked boots worn over or under suit boot depending on construction.
5. FM two-way radio for team leader.
6. Chemical resistant disposal coveralls to be worn under suit.

B. Criteria for Use - The following is a list of conditions that would require the highest level of respiratory and eye protection.

1. Immediately dangerous to life and health (IDLH) conditions.
2. Known conditions or potential condition that would cause severe illness or injury from exposure to the skin, eyes or respiratory tract.
3. If the extent of the conditions are unknown.
4. Oxygen deficient atmospheres with the presence or potential presence of the above.

10.9.2 Assignment Level B

Level B will be assigned when the highest level of respiratory protection is needed, but skin exposure is only moderate hazard.

A. Equipment List

1. Pressure demand SCBA or air supplied units with escape bottles. (NIOSH/MSHA approved)
2. Chemical resistant suit (with hood and booties).
3. Chemical resistant steel toed, steel shanked boots or shoes with over-boot.
4. Two-way radio for team leader.

B. Criteria for Use

The following is a list of conditions that would require Level B protection assignment:

1. When known conditions exist that would require the highest level of respiratory protection but a lower level of skin and eye protection.
2. Oxygen deficient atmosphere with the above known conditions.
3. When potential body exposure is such that a full encapsulation suit is not warranted.
4. Types and concentrations of gases or vapors in the atmosphere do not prevent a hazard to small unprotected area of the body (i.e., neck).
5. No hazard exists from splashes of corrosive or toxic liquids to unprotected areas of the body.

10.9.3 Assignment Level C

Level C will be assigned when the required level of respiratory protection is known or reasonably assumed to be not greater than the level of protection afforded by air purifying respirators and exposure to the few unprotected areas of the body (i.e., neck) is unlikely to cause harm.

Equipment List:

1. Full-face or half-face air purifying respirator (NIOSH/MSHA approved) with suitable respirator cartridges.
2. Chemical resistant suit.
3. Chemical resistant gloves.
4. Chemical resistant steel toed, steel shanked boots or safety shoes with chemical resistant over-boot.
5. Hard hat.

10.9.4 Assignment Level D

Level D protection will be assigned as the basic work uniform.

A. Equipment List

1. Coveralls or normal work clothes
2. Safety shoes or boots
3. Safety glasses or goggles.
4. Hard hat
5. Air purifying respirator (readily available).
6. Chemical resistant gloves and/or cotton work gloves where needed.

B. Criteria for Use

Areas where a reasonable determination has been made that hazards due to exposure to hazardous materials is unlikely or that such exposures would be minimal and not present a health hazard.

10.10 Personal Protective Equipment Inspection

Proper inspection of PPE features several sequences of inspection depending upon specific articles of PPE and it's frequency of use. The different levels of inspection are as follows:

- Inspection and operational testing of equipment received from the factory or distributor.
- Inspection of equipment as it is issued to workers.
- Inspection after use or training and prior to maintenance.
- Periodic inspection of stored equipment.
- Periodic inspection when a question arises concerning the appropriateness of the selected equipment, or when problems with similar equipment arise.

The primary inspection of PPE in use for activities at the Site will occur prior to immediate use and will be conducted by the user. This ensures that the specific device or article has been checked-out by the user that the user is familiar with its use.

Table 10.10.1 Sample PPE Inspection Checklists

CLOTHING

Before use:

- o Determine that the clothing material is correct for the specified task at hand.
- o Visually inspect for:
 - imperfect seams
 - non-uniform coatings
 - tears
 - malfunctioning closures
- o Hold up to light and check for pinholes.
- o Flex product:
 - observe for cracks
 - observe for other signs of shelf deterioration
- o If the product has been used previously, inspect inside and out for signs of chemical attack:
 - discoloration
 - swelling
 - stiffness

During the work task

- o Evidence of chemical attack such as discoloration, swelling, stiffening, and softening. Keep in mind, however, that chemical permeation can occur without any visible effects.
- o Closure failure.
- o Tears.
- o Punctures.
- o Seam Discontinuities.

GLOVES

Before use:

- o Visually inspect for:
 - imperfect seams
 - tears
 - non-uniform coating
 - pressurize glove with air; listen for pin-hole leaks.

10.11 Specific Levels of Protection Planned for the Site

The following levels of protection will be utilized during activities at the Site:

- o Level C:
 - Inner Gloves: Cotton or Surgical
 - Outer Gloves: Nitrile
 - Boot/Boot Covers: Disposable Neoprene or Reusable Rubber overboots
 - Outer Garment: Poly laminated Tyvek or Saranex
 - Respirator: Full Face PPAR or Full Face APR with HEPA Filters and HEPA/OV when needed

o Level D

Regular duty work clothes to include: steel toe/steel shank work boots, work gloves, hard hat, hearing protection as needed and side shield safety glasses.

Table 10.11.1 presents the level of protection planned for the completion of individual task assignments and the specific components of each protective ensemble.

TABLE 10.11.1

SPECIFIC LEVELS OF PROTECTION PLANNED FOR THE TASK ASSIGNMENTS AT THE SITE

LEVEL C Tasks

- o Site walk through
- o Site survey
- o Air sampling/monitoring
- o Stabilization of contaminated soil
- o Demolition, sorting, washing and handling of contaminated debris
- o Contaminated soil excavations

LEVEL D Tasks

- o Installation of concrete floor, plumbing, and utilities
- o Perimeter monitoring

All project personnel entering the operational areas must be properly equipped with the required personal protective equipment for the operations they are to perform.

10.11.1 Initial Protective Level Assignments

The initial protection level assignments will be enforced until sufficient air monitoring data can be collected and evaluated. Evaluation of data will be based on airborne concentrations detected, dust control effectiveness, and meteorological information. If a determination is made that airborne concentrations are within acceptable ranges then and only then will a down grading of protection levels be allowed.

10.11.2 Upgrading or Downgrading Protection Levels

The SSHO will conduct an air monitoring survey of the site and will inspect operational areas to ensure proper safety equipment is being used.

If air monitoring and inspections by the SSHO do not indicate a need for a change in safety equipment, then all operations will continue under initial guidelines.

If air monitoring results indicate a need for a higher level of protection, the SSHO will immediately direct all project personnel to change to the increased level required.

If air monitoring indicates that a lower level of protection would be satisfactory, the SSHO will then inform personnel of their choice of downgrading of protective equipment if desired. Downgrading of protection levels can only be approved by the SSHO.

If project personnel encounter conditions which would require a higher level of protection they will immediately notify the SSHO and request a protection level increase. The SSHO will then monitor the conditions and will alter the requirements if necessary.

10.11.3 Reassessment of Protection Program

The Level of Protection provided by PPE selection shall be upgraded or downgraded based upon a change in site conditions or findings of investigations.

When a significant change occurs, the hazards should be reassessed. Some indicators of the need for reassessment are:

- o Commencement of a new work phase, such as the start of drum sampling or work that begins on a different portion of the site.
- o Change in job tasks during a work phase.
- o Change of season/weather.
- o When temperature extremes or individual medical considerations limit the effectiveness of PPE.
- o Contaminants other than those previously identified are encountered.
- o Change in ambient levels of contaminants.
- o Change in work scope which effects the degree of contact with contaminants.

10.11.4 Work Mission Duration

Before the workers actually begin work in their PPE ensembles the anticipated duration of the work mission should be established. Several factors limit mission length, including:

- o Air supply consumption (SCBA use).
- o Suit/Ensemble permeation and penetration rates for chemicals (section 5.8).
- o Ambient temperature and weather conditions (heat stress cold stress).
- o Capacity of personnel to work in PPE.

10.12 Available PPE

The following personal protective equipment and general safety equipment will be supplied in sufficient quantities to meet operation requirements.

10.12.1 Respiratory Protection

- A. Full-face air purifying respirators
- B. Half-face purifying respirators
- C. Combination cartridges (organic vapor, acid gas, dust, fume, mist)
- D. SCBA for emergency use
- E. Powered Air Purifying Respirator (PAPR)

10.12.2 Protective Clothing

- A. Regular Tyvek chemical suits
- B. Poly laminated Tyvek chemical suits
- C. Saranex chemical suits

10.12.3 Foot Protection

- A. Steel toed, steel shanked safety shoes
- B. Chemical resistant over-boots with 10" to 14" cuffs

10.12.4 Hand Protection

- A. Puncture, tear and chemical resistant floc lined Nitrile gloves
- B. Cotton inner-gloves

10.12.5 Head Protection

Hard hats will be worn by all project personnel, including site visitors unless otherwise stipulated by the SSHO .

10.12.6 Hearing Protection

In areas where noise problems are determined to exist, personnel will wear hearing protection.

10.12.7 Eye Protection

- A. For most work situations in Zone 1, eye protection will be accomplished by the wearing of side shield safety glasses.
- B. If full-face respiratory protection is required, the lens of the respirator will serve as eye protection.

10.12.8 Heat Stress

- A. Adequate water supplies will be maintained at all times.
- B. Work breaks will be taken by all operational personnel as needed as well as on a scheduled work/rest basis.

10.12.9 General Equipment

- A. Visqueen plastic
- B. DOT approved 55-gallon drums
- C. First-Aid supplies
- D. Air diaphragm pump and hose
- E. 20 lb. ABC dry chemical fire extinguisher
- F. HNU Photoionization Meter
- G. Combustible Gas/Oxygen Meter
- H. Sensidyne detector tubes
- I. Bonding/grounding cables
- J. Pressure washer

11.0 Respiratory Protection Program

The purpose of this program is to establish written standardized operational guidelines governing the selection, maintenance and use of respiratory protection.

11.1 Program Responsibilities

- A. Certified Industrial Hygienist (CIH) Responsibilities
 - 1. Review and approve this RAHSP.
 - 2. Review, approve, and sign certification letters for OSHA compliance, 40 hour OSHA hazardous materials training, and medical surveillance.

3. Approval of modifications to the HASP.
 4. Approval of air monitoring methods, instrumentation, and calculations.
 5. General oversight and support for the health and safety aspects of this project.
- B. Site Safety and Health Officer (SSHO) Responsibilities
1. Present and document the site specific health and safety training for this project.
 2. Maintain on-site compliance with all OSHA 29 CFR 1910/1926 requirements.
 3. Ensure the provisions of this program are carried out.
 4. Conduct air monitoring and maintain instrumentation and documentation.
 5. Provide respirator training and fit testing to National Environmental Services Corporation (NESC) employees.
 6. Conduct frequent safety inspections and inspections of respiratory protective equipment.
 7. Conduct weekly refresher training including the proper use of respirators and their limitations.
 8. Display in the clean room a poster of the required respirator, its method of donning, seal testing procedures, and cleaning procedures.
 9. Ensure that all employees and visitors in the controlled area have the proper clearance, medical surveillance, and use the correct respirator and PPE at all times.
 10. Ensure that all employees clean and store their respirator in accordance with the provisions of this program.

11. Provide each employee with the required respirator, cleaning and disinfecting supplies, storage space and repair parts.
12. Ensure the Employee Daily Respirator Report (RP1) is completed and turned in to the Company Safety Officer.
13. Approve upgrades or downgrades of PPE requirements.

C. Individual Employees

1. Inspect their respirator each day before and after each use.
2. Wear the designated type of respirator at all times when in the regulated area. It will be worn from the time employees exit the clean room into the exclusion zone until the employees decontaminate.
3. Clean and store their respirator in accordance with these guidelines.
4. Make minor repairs to their respirators using the manufacturers recommendations.
5. Immediately report any malfunctions to the Company Safety Officer.

D. Company President

1. Designate and approve the CIH and SSO who will provide respirator training.
2. Provide the OSHA compliance letter signed by the CIH and an officer of the company.
3. Provide a letter signed by the CIH and an Officer of the company certifying that 40 hour OSHA hazardous materials training has been completed by all site personnel.
4. Provide letter signed by the CIH and an officer of the company identifying site personnel and certifying that medical surveillance has been maintained.

5. Maintain copies at corporate headquarters of all signed Respirator Training Questionnaires (Form NESC RP1) and all physician's written opinions regarding employees ability to wear respirators.

11.2 Selection and Use of Respiratory Protective Equipment

The Safety/Training Director will be responsible for regular inspection and evaluation to determine the continued effectiveness of this program. Duties will include conducting frequent inspections of all work sites to ensure safety compliance, and to review and evaluate all office procedures and inspections and to make recommendations where necessary toward to continued effectiveness of this program.

It is the responsibility of all NESC employees to carry out the provisions of this program in their various job functions as quickly as practical.

The following table represents guidelines to be used by the safety personnel in choosing an appropriate respirator:

- A. Only approved respiratory protection will be purchased and supplied to personnel. All respiratory equipment will be purchased by the SSHO under the guidance of the Certified Industrial Hygienist.
- B. Selective use of respiratory protection shall be administrated by the SSHO under the guidance and direction of the CIH. Respirator selection is generally based on the following criteria:
 1. Nature of hazard
 2. Physical properties of the contaminants involved
 3. Location of the hazard
 4. Time frame for which respiratory protection will be required
 5. Operational activities of personnel required to wear respiratory equipment
 6. Functional capabilities and limitations of respiratory equipment

7. Potential for the presence of conditions Immediately Dangerous to Life and Health (IDLH)
8. Potential for the presence of oxygen deficient atmospheres

Based on the number and types of contaminants involved on this project, National Environmental Services Corp. has chosen to use full face powered air purifying respirators (PAPR) on initial phase of this project. The respirators will be able to filter metals and organic vapors. After sufficient data has been collected the SSHO will evaluate data to determine if a downgrade of respiratory protection is warranted. Continuous monitoring would be done to ensure that adequate protection is being provided.

Guidelines for respiratory protection are included in section 8.0.

C. Equipment Fit Testing

Qualitative (1/2 face masks only) or quantitative fit tests are required by CFR 1926.62 and CFR 1910.1025, initially and every 6 months (negative pressure respirators only). To ensure proper protection, the wearer of a respirator equipped with a tight fitting facepiece using the following procedures.

1. Negative Pressure test for air purification respirators and air supplied respirators.
 - A. Cover the inlet openings of the respirator's cartridge or filter with the palm of the hand to prevent the passage of air on the air purification. Cover the breathing tube on the air supplied respirator.
 - B. Inhale gently and hold the breath for at least ten (10) seconds.
 - C. If the facepiece collapses slightly and no inward leakage of air into the facepiece is detected, it can be assumed that the respirator has been properly donned and that the exhalation valve and facepiece are not leaking.

2. Positive Pressure test

- A. Cover the exhalation valve of the respirator with the palm of the hand to prevent the passage of air. Note: The exhalation valve cover must first be removed from the respirator.
- B. Exhale gently and slowly.
- C. If a slight positive pressure builds up inside the facepiece without the detection of any outward leakage of air between the facepiece and the skin it can be reasonably assumed that the respirator has been properly donned and that the inhalation valves and the facepiece are not leaking.
- D. Replace exhalation valve cover.

3. Special Considerations

A. Facial Hair

Facial hair including beards, sideburns, and stubble are not permitted. Facial hair between the wearer's skin and the sealing surface of the respirator will prevent a good seal, which will allow contaminants into the respirator.

B. Eye Glasses

Ordinary eye glasses shall not be used with full face respirators. Eye glasses with temple bars or straps that pass between the sealing surface of a full face respirator and the employee's face will allow contaminants to enter the respirator. To ensure good vision and proper sealing for the facepiece, special corrective lenses can be permanently mounted inside a full facepiece respirator. Eye glasses and goggles may be worn with half facepiece respirators, but must not be allowed to interfere with seal of the facepiece.

C. Contact Lenses

Workers shall not, under any circumstances, wear contact lenses when wearing any type respirator.

D. Facial Deformities

Facial deformities, such as scars, deep skin creases, prominent cheekbones, severe acne, and the lack of teeth or dentures can prevent a respirator from sealing properly. Employees with such conditions may not be assigned tasks requiring the use of respirators.

E. Communications

Talking while wearing a respirator can break the seal for the facepiece. Employees who must talk should keep jaw movement to a minimum. When communications are necessary within the restricted area, it should be done with sign language and gestures as much as possible.

11.3 SOP for Respiratory Protection

The following subsections define standard operating procedures for air purifying respirators and self-contained breathing apparatus.

11.3.1 Cleaning and Disinfecting Air Purifying

Respirators APRs in routine use should be cleaned and disinfected at least daily. Where respirators are used only occasionally or when they are in storage, the cleaning interval is weekly or monthly, as appropriate.

11.3.1.1 Daily Cleaning Procedure

The steps to be followed for cleaning and disinfecting daily are as follows:

- o Respirator Disassembly. Respirators are taken to a clean location where the filters, cartridges or canisters are removed, damaged to prevent accidental reuse, and discarded. For thorough cleaning, the inhalation and exhalation valves, speaking diaphragm, and any hoses are removed.
- o Cleaning. In most instances, the cleaning and disinfecting solution provided by the manufacturer is used, and is dissolved in warm water in an appropriate tub. Using gloves, the respirator is placed in the tub and swirled for a few moments. A soft brush may be used to facilitate cleaning.
- o Rinsing. The cleaned and disinfected respirators are rinsed thoroughly in water to remove all traces of detergent and disinfectant. This is very important for preventing dermatitis.
- o Drying. The respirators may be allowed to dry in room air on a clean surface. They may also be hung upside down like drying clothes, but care must be taken not to damage or distort the facepieces.
- o Reassembly and Inspection. The clean, dry respirator facepieces should be reassembled and inspected in an area separate from the disassembly area to avoid contamination. Special emphasis should be given to inspecting the respirators for detergent or soap residue left by inadequate rinsing. This appears most often under the seat of the exhalation valve, and can cause valve leakage or sticking.

11.3.1.2 After Routine Use in Exclusion Zone

The steps to be followed for cleaning and disinfecting in the field are as follows:

- o The mask may be washed/rinsed with soap and water.
- o At a minimum, the mask should be wiped with disinfectant wipes (benzoalkaloid or isopropyl alcohol), and allowed to air dry in a clean area.

11.3.2 APR Inspection and Checkout

1. Visually inspect the entire unit for any obvious damages, defects, or deteriorated rubber.
2. Make sure that the facepiece harness is not damaged. The serrated portion of the harness can fragment which will prevent proper face seal adjustment.
3. Inspect lens for damage and proper seal in facepiece.
4. Exhalation Valve - pull off plastic cover and check valve for debris or for tears in the neoprene valve(which could cause leakage).
5. Inhalation Valves (two) - screw off cartridges/canisters and visually inspect neoprene valves for tears. Make sure that the inhalation valves and cartridge receptacle gaskets are in place.
6. Make sure a protective cover lens is attached to the lens.
7. Make sure the speaking diaphragm retainer ring is hand tight.
8. Make sure that you have the correct cartridge.
9. Don and perform negative pressure test.

If, at any time, a respirator is found to be deficient, the employee should return it to the SSHO for a suitable replacement.

Emergency use respirators such as self-contained breathing apparatus (S.C.B.A.) equipment (where available) will be inspected by the SSHO at a minimum of once per month to ensure proper working condition in the event of an emergency. A record of this inspection will be maintained listing the respirator, date of inspection, and any defects found.

11.3.3 Storage of Air Purifying Respirators

OSHA requires that respirators be stored to protect against:

- Dust
- Sunlight
- Heat
- Extreme cold
- Excessive moisture
- Damaging chemicals
- Mechanical damage

Storage of respirators should be in a clean which minimizes the chance for contamination or unsanitary conditions.

11.4 Employee Exposure Monitoring

A. Initial Monitoring Requirements

At the start of each project, personal air samples will be taken to determine the level of contaminants within the regulated area. This data will be used to determine the type of respiratory protection required.

B. Periodic Monitoring Requirements

1. Daily air samples will be taken which are representative of the exposure of each employee with the regulated area.
2. If all employees are using supplied air respirators, operated in the positive pressure mode, daily periodic monitoring is not required.

- A. All air samples taken for initial and periodic monitoring will be 8 hour time weighted average (TWA) personal samples taken in the breathing zone of employees.
- B. Employees shall be notified of the results of monitoring. This notice will be in writing and may be given to the individual employee or posted in the job site clean room. Additional copies may be posted in the company office.
- C. All air samples will be recorded on NESC daily air sample logs. These forms will be retained for at least thirty (30) years.

11.5 Program and Medical Surveillance

- A. The SSHO will approve the purchase of all respiratory protection equipment.
- B. The project respiratory protection program will be continually evaluated as part of the RAHSP quality assurance program.
- C. The SSHO will direct air monitoring operations as part of a continuing Industrial Hygiene Program designed to protect the safety and health of project personnel.
- D. All project personnel will receive a medical health evaluation to include an evaluation of their ability to perform required work tasks while wearing respiratory protection.

12.0 Personnel and Equipment Decontamination

12.1 Purpose

To ensure that proper and safe decontamination procedures are utilized by project personnel to prevent exposure and the spread of contamination outside to the project area.

Decontamination involves the orderly controlled removal of contaminants. Standard decontamination sequences are presented in the decontamination figure. All site personnel should minimize contact with contaminants in order to minimize the need for extensive decon.

12.1.1 Levels of Decontamination Protection Required for Personnel

The levels of protection required for personnel assisting with decontamination will be Level C.

12.2 Procedure

The SSHO will survey all decontamination activities. Project personnel will be instructed in proper decontamination procedures and will familiarize themselves with the Zone 2 area including locations of all decontamination equipment. The following decontamination procedures will be used and modified as conditions require:

- A. An area will be prepared with a plastic drop sheet and a 55-gallon drum. When leaving Zone 1, all personnel will remove all disposable clothing and place in 55-gallon drum for disposal.
- B. If deemed necessary, a station will be prepared for more thorough decontaminating in which personal protective equipment is cleaned in buckets of clean water and mild detergent to where all visible contamination is removed. All contaminated rinsate would be collected and tested to determine the proper method of disposal.

- C. Workers will wash their hands and face with potable water each time they leave the exclusion zone, before performing any hand to mouth activity. Exposure to lead is greatest during excavation operations and anytime contaminated hands, food, or tobacco products are brought into contact with the mouth. Food and tobacco products are strictly forbidden in the exclusion zone and contamination reduction zone.

*Project personnel assigned will be thoroughly familiar with the decontamination procedures. No personnel will be allowed to exit Zone 2 until all decontamination phases have been properly completed.

12.3 Equipment Decontamination

All equipment utilized in the operational zone will be decontaminated prior to removal from the site. Decontamination will take place in Zone 2. The following procedures will be used:

- A. All contaminated surfaces will be washed with high pressure water and with sponges or brushes being used as required, and when necessary.
- B. All decon water will be collected and tested to determine the proper method of disposal.
- C. The decon procedure will be repeated, as necessary, to ensure thorough decontamination.

12.4 Disposition of Decontamination Wastes

All equipment and solvents used for decontamination shall be decontaminated or disposed of properly. Commercial laundries or cleaning establishments that decontaminate protective clothing or equipment shall be informed of the potentially harmful effects of exposures.

12.5 Decontamination Plan

Table 10.11.1 lists the tasks and specific levels of protection required for each task. Consistent with the levels of protection required, the decontamination figure provides a step by step representation of the personnel decontamination process for either level A, B, or C. These procedures should be modified to suit site conditions and protective ensembles in use.

FIGURE 12.5.1

LEVEL A DECONTAMINATION STEPS

- Step 1 Segregated equipment drop
- Step 2 Boot cover and glove wash
- Step 3 Boot cover and glove rinse
- Step 4 Tape removal - boot and glove
- Step 5 Boot cover removal
- Step 6 Outer glove removal
- Step 7 Suit/safety boot wash
- Step 8 Suit/safety boot rinse
- Step 9 Safety boot removal
- Step 10 Fully encapsulating suit and hard hat removal
- Step 11 SCBA backpack removal
- Step 12 Inner glove wash
- Step 13 Inner glove rinse
- Step 14 Face piece removal
- Step 15 Inner glove removal
- Step 16 Inner clothing removal
- Step 17 Field wash
- Step 18 Redress

FIGURE 12.5.2
LEVEL B DECONTAMINATION STEPS

- Step 1 Segregated equipment drop
- Step 2 Boot cover and glove wash
- Step 3 Boot cover and glove rinse
- Step 4 Tape removal - outer glove and boot
- Step 5 Boot cover removal
- Step 6 Outer glove removal
- Step 7 Suit/safety boot wash
- Step 8 Suit/SCBA/boot/glove rinse
- Step 9 Safety boot removal
- Step 10 SCBA backpack removal
- Step 11 Splash suit removal
- Step 12 Inner glove wash
- Step 13 Inner glove rinse
- Step 14 Face piece removal
- Step 15 Inner glove removal
- Step 16 Inner clothing removal
- Step 17 Field wash
- Step 18 Redress

FIGURE 12.5.3
LEVEL C DECONTAMINATION STEPS

- Step 1 Segregated equipment drop
- Step 2 Boot cover and glove wash
- Step 3 Boot cover and glove rinse
- Step 4 Tape removal
- Step 5 Boot cover removal
- Step 6 Outer glove removal
- Step 7 Suit/safety boot wash
- Step 8 Suit/safety boot rinse
- Step 9 Safety boot removal
- Step 10 Splash suit removal
- Step 11 Inner glove wash
- Step 12 Inner glove rinse
- Step 13 Face piece removal
- Step 14 Inner glove removal
- Step 15 Inner clothing removal
- Step 16 Field wash
- Step 17 Redress

FIGURE 12.5.4
LEVEL D DECONTAMINATION STEPS

- Step 1 Remove outer garments (i.e., coveralls)
- Step 2 Remove gloves
- Step 3 Wash hands and face

13.0 Potable/Nonpotable Water Supply

13.1 Potable Water

- A. An adequate supply of potable drinking water will be maintained on site at all times. Drinking water will meet all federal, state and local health requirements.
- B. Drinking water will be supplied to protect personnel via approved dispensing sources.
- C. Only paper cups will be permitted for the drinking of potable water supplies.
- D. Drinking water dispensers will be clearly marked and will, in no way, have the potential for cross contamination from non-potable supplies.

14.0 Sanitary Facilities

14.1 Toilet Facilities

- A. Adequate toilet facilities will be provided at the site.
- B. Unless prohibited by local codes, these facilities will be in the form of chemical porta-toilets.
- C. Routine servicing and cleaning of the toilet will be established with the selected contractor and will be in accordance with federal, state, and local health regulations.

14.2 Washing Facilities

- A. Adequate washing facilities will be provided for personal use.
- B. Facilities will be located in the transition area between Zone 2 and Zone 3.
- C. Washing facilities will be maintained in a sanitary condition and will be provided with adequate supplies of soap, towels for drying and covered plastic waste receptacles.
- D. Washing facilities will be maintained in a clean, sanitary condition.

- E. Eating, drinking and smoking will be confined to Zone 3 or predesignated areas at all times. This policy will be strictly enforced by the SSHO .

15.0 Fire Control Equipment

15.1 Local Fire Protection

The closest fire station will be posted at each site along with the location of the closest pull station.

15.2 Portable Fire Extinguisher

An adequate number of approved fire extinguisher class rated A,B and C will be located at the site. Criteria for use is as follows:

- A. All personnel will be trained in the use of the extinguisher.
- B. Extinguisher will only be used on outbreak stage fires of minor nature.
- C. For involved fires, the local fire department will be summoned.
- D. Extinguisher should be readily accessible by team members.
- E. If fire cannot be immediately extinguished, then an emergency should be relayed and evacuation procedures immediately initiated.

16.0 Emergency Preparedness and Evaluation Contingency Plan

This section outlines what actions are to be taken in the event of an emergency. National Environmental Services personnel will respond to emergency situations on site and will comply with 1910.120 (l) and emergency response personnel will have additional site specific emergency response training in accordance to 1910.120 (e)(7), not 1910.120 (q) as per 1910.120 (a)(ii). At all times National Environmental Services Corp. will maintain at least two people on the project who are certified in first aid and CPR by the American Red Cross or an equivalent agency. All personnel performing first aid will take all necessary precautions in accordance to 1910.130 Bloodborne Pathogens and the Bloodborne Pathogen Exposure Control Program, Appendix K. At least one person will be present on-site at all times during emergency operations. This person shall be appointed by the SSHO and will report directly to him. Copies of first aid and CPR certificates can be found in Appendix G.

16.1 Pre-Emergency Planning

During the site briefings held periodically/daily, all employees will be trained in and reminded of provisions of the emergency response plan, communication systems, and evacuation routes. The site map identifies the hazardous conditions associated with specific site activities. The plan will be reviewed and revised if necessary, on a regular basis by the SSHO. This will ensure that the plan is adequate and consistent with prevailing site conditions.

16.2 Personnel Roles and Lines of Authority

The SSHO has primary responsibility for responding to and correcting emergency situations. This includes taking appropriate measure to ensure the safety of site personnel and the public. Possible actions may involve evacuation of personnel from the site area, and evacuation of adjacent residents. He/she is additionally responsible for ensuring that corrective measures have been implemented, appropriate authorities notified, and follow-up reports completed. The SSHO may be called upon to act on the behalf of the site supervisor, and will direct responses to any medical emergency. The individual contractor organizations are responsible for assisting the project manager in his/her mission within the parameters of their scope of work.

16.3 Emergency Recognition/Prevention

Table 4.1 provides a listing of chemical and physical hazards onsite. Additional hazards as a direct result of site activities are listed in Table 10.1 as are prevention and control techniques/mechanisms. Personnel will be familiar with techniques of hazard recognition from preassignment training and site specific briefings. The HSO is responsible for ensuring that prevention devices or equipment is available to personnel.

16.4 Evacuation Routes/Procedures

In the event of an emergency which necessitates an evacuation of the site, the following alarm procedures will be implemented:

Evacuation alarm notification should be made using three short blasts on the air horn, supplemented using the hand held radios. All personnel should evacuate upwind of any activities. Insure that a predetermined location is identified off-site in case of an emergency, so that all personnel can be accounted for.

Personnel will be expected to proceed to the closest exit with your buddy, and mobilize to the safe distance area associated with the evacuation route. Personnel will remain at that area until the re-entry alarm is sounded or an authorized individual provides further instructions.

16.5 Initiation of the Plan

Project personnel should immediately notify the SSHO upon identifying the following or the potential for the following:

- A. Fire
- B. Explosion
- C. Unplanned release of hazardous materials into the air, soil, surface or groundwater
- D. Injured or ill personnel requiring immediate medical assistance
- E. Any event not listed which presents an imminent hazard to project personnel or the environment

16.5.2 Notification Information

The following information will be conveyed to the SSHO:

- A. Type of casualty or event
- B. Location of casualty or event
- C. Subsequent to notification, all personnel will function under the direction of the SSHO

16.5.3 Emergency Coordinator

The SSHO will be the primary emergency coordinator. The SSHO will initiate emergency notification of all authorities and emergency response agencies if necessary.

16.5.4 Authority and Agency Agreements

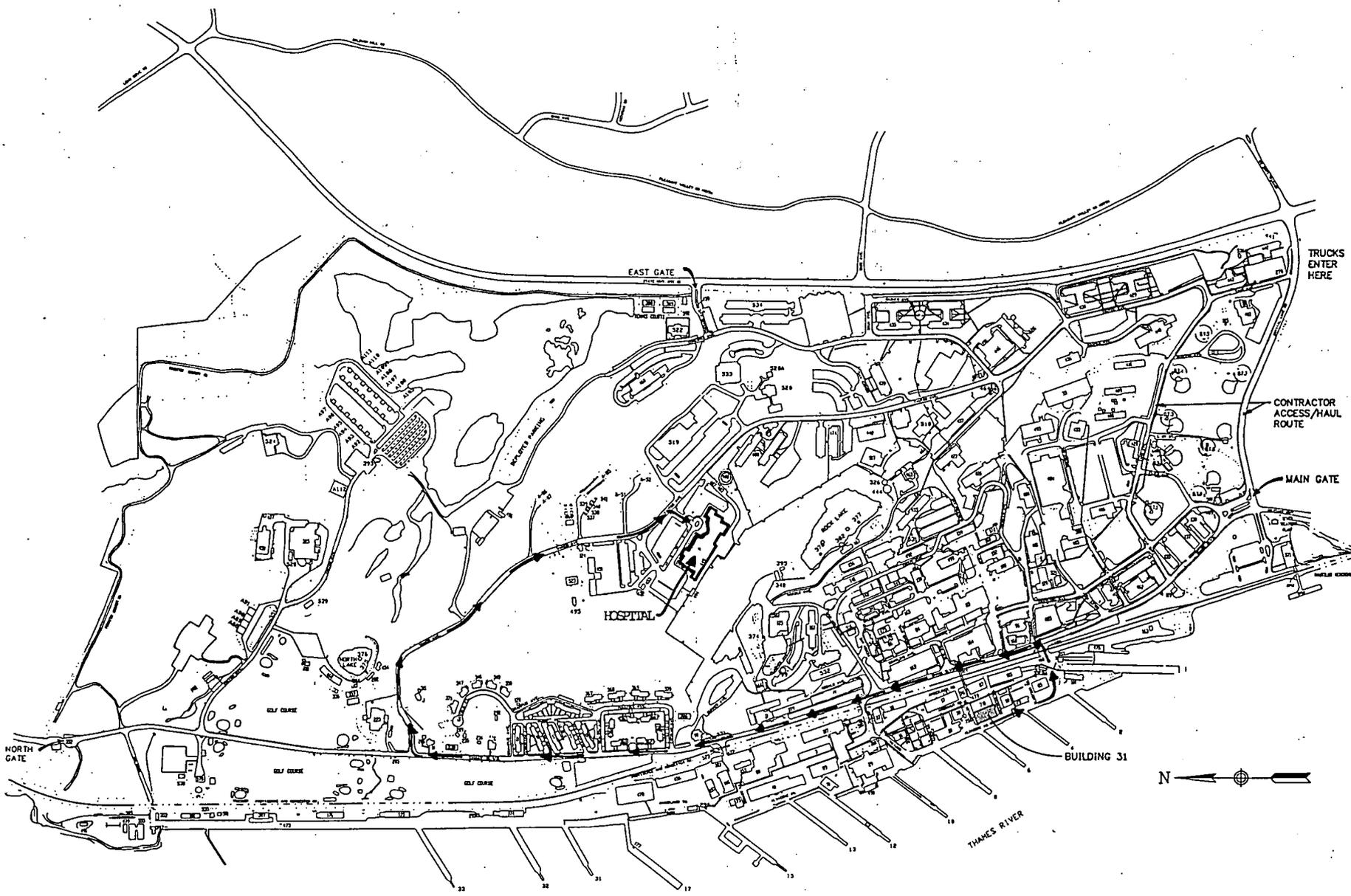
Prior to beginning operations the SSHO will contact the appropriate personnel at the Naval Submarine Base - New London and will notify them of the commencement of the project and the associated hazards.

The following emergency notification telephone list with a map that shows the route to the nearest hospital will be posted in the National Environmental Services Corporation field office.

The directions to the base hospital are :

1. Proceed south on Albacore road from Building 31
2. Bear left and exit Lower Subbase at checkpoint
3. Cross tracks and turn left on Shark Boulevard
4. Pass Building 338 and turn right on Wahoo Avenue
5. Wahoo Avenue becomes Tautog Avenue, base hospital is on the right at Building 449

Directions to the base hospital from Building 31: south on Albacore Road, follow road left and exit Lower Subase at check point. Cross railroad tracks and turn left on Shark Boulevard. Pass Building 338 and turn right onto Wahoo Avenue. Wahoo Avenue becomes Tautog Avenue and base hospital is Building 449 on the right.



PREP BY: DATE: APPROV:	
REV. DESCRIPTION	
NORTHERN DIVISION	
LEAD REMEDIATION - BUILDING 31	
TRAFFIC PLAN	
CODE 18 40	SCALE 7 1/2" = 1"
SPEC. NO. 8-13-84-11	COUNTY: CAYUGA, NY
PROJECT NO. 887472-93-C-041	SHEET NO. 2162154
SHEET 2 OF 7	DATE: 12/1/93
D	T-2

EMERGENCY TELEPHONE NUMBERS

NSB-NLON

Fire/Ambulance (203) 449-3333
or (203) 449-3666
Security..... (203) 449-3444
Utility Emergency (water, gas,
electric, sewer) public works..... (203) 449-4711
Lt. Pat Rios..... (203) 449-3644

Groton, CT

Fire Department..... 911 or (203) 445-2456
Police..... 911 or (203) 445-2451
Lawrence Memorial Hospital 911 or (203) 442-0711
Pequot Health Center (203) 446-8265

Nationwide

Poison Control Center (800) 343-2722
Chemtrec..... (800) 424-9300
National Spill Response Center..... (800) 424-8802
EPA Emergency Response Team..... (908) 321-6660

Industrial Hygiene

Gerald Swartz (CIH)..... (410) 741-9825
Michael Fulmer (SSHO) (410) 741-9825
Richard Groves (alternate SSHO) (410) 741-9825

National Environmental Services Corp.

Victoria Schopp (president)..... (812) 339-9000
Christopher Kohler
(environmental specialist)..... (812) 339-9000
CHEMTREC..... (800) 424-9555

16.5.5 Plan Modification

The Plan may be modified or changed only with current approval of the certified industrial hygienist. The SSHO may modify the plan in emergency situations if modification will more adequately protect human health or the environment.

16.6 Fire Explosion or Unplanned Release Involving Hazardous Materials

A. Upon notification of an event involving hazardous materials the Emergency Coordinator will take the following action:

1. Alert all project personnel to evacuate the area
2. Muster all personnel in the Decontamination/Transition area (Zone 2)
3. Determine the character, source, amount and aerial extent of any released material
4. Concurrently, assess possible hazards to human health and the environment. This assessment must consider both short and long term effects of fire.

B. If the Emergency Coordinator determines that the event threatens human health and the environment outside of the site boundaries or that additional assistance is necessary to control the event or evacuate the local areas he/she will immediately establish communications with responsible parties at the Naval Submarine Base - New London. The following information will be transmitted:

1. Name and telephone number of the reporter
2. Location of incident
3. Time and type of incident
4. Materials involved in incident
5. Wind direction

6. Extent of injuries, if any
 7. Instructions for assistance
 8. Potential hazards to human health and/or the environment
- C. The Emergency Coordinator will coordinate on-scene response efforts. The following coordination efforts will be made:
1. Ensure all personnel not required for response efforts are evacuated to a safe area (Zone 3)
 2. Establish lines of communication
 3. Provide necessary personal protective equipment
 4. Evaluate the nature and extent of the event and establish proper extinguishing media if fire involved
 5. Monitor the affected area as necessary
 6. Where possible control all discharges from the site
- D. Supplementary Actions

Immediately after the event, the Emergency Coordinator must begin to provide for the treating, storing, or disposing of recovered waste, contaminated soil or surface water or any other material that results from the event.

All emergency equipment will be decontaminated and fit for its intended use before operations are resumed.

16.7 Spill Containment

The procedures defined in this section comprise the spill containment program in place for activities at the Site.

With any spill the primary concern is with personnel safety. Once the safety of all people has been ensured the following general rules will be maintained with regard to the spill.

1. When approaching or leaving the spill, the upwind route will always be taken. Being downwind of a spill represents the greatest risk in exposure to personnel as they are placed in the path of airborne contamination.
2. If anyone was injured that person will never be moved unless the person is in danger because of the spill.
3. The first and most important step in handling a spill is to contain the spill as soon as it occurs or is noticed. Where possible and when safe, the spill will be prevented from reaching a public waterway i.e. sewer, creek, river, pond, etc. Once the spill is contained it is easier and safer to handle and presents a far less risk to the community and environment. Absorbent booms will be maintained on site that will be able to isolate and soak up any spill. Absorbent materials such as oil-dry and absorbent booms will be maintained on-site. In the event of a large spill, excavating equipment on site can be used to create an earthen containment barrier if necessary.
4. Once the spill has been contained and all proper people notified, the spill would then be cleaned up. All spills will be handled at the expense of the contractor.
5. All drums and containers used during the clean-up shall meet the appropriate DOT, OSHA, and EPA regulators for the waste that they will contain.
6. Drums and containers shall be inspected and their integrity assured prior to being moved. Drums or containers that cannot be inspected before being moved because of storage conditions, shall be positioned in an accessible location and inspected prior to further handling.
7. Operations on site will be organized so as to minimize the amount of drum or container movement.

8. Employees involved in the drum or container operations shall be warned of the hazards associated with the containers.
9. Drums or containers that cannot be moved without failure, shall be emptied into a sound container.
10. Fire extinguishing equipment meeting 29 CFR part 1910. subpart 1 shall be on hand and ready for use to control fires.

16.8 Injured Person

- A. An on-scene evaluation will be made by a person trained in first aid to determine if outside medical assistance is needed.
- B. Seriously injured person should not be moved until professional medical assistance is available or an imminent hazard exists if the injured person remains in the area.
- C. Specific Casualty Response
 1. Unconscious person
 - a. Do not move the person unless he or she is located in an area which presents an imminent hazard.
 - b. Observe the person and check for breathing, pulse, cuts and massive bleeding, shock, eyes for unequal pupil dilation, and broken bones (by observation only).
 - c. Evaluate possible causes of consciousness.
 - d. A qualified person should administer what first aid is possible and necessary.
 - e. If heat prostration is evident, effort should be made to immediately reduce body temperature.
 - f. Transport to hospital immediately.

2. Respiratory Arrest

- a. Commence artificial respiration immediately.
- b. Treat for shock.
- c. Keep person quiet.
- d. Observe for other complications and control in accordance with other sections of this article or proper emergency medical practices.
- e. Transport to a hospital immediately.

3. Weak or Slow Pulse

- a. Treat for shock.
- b. Keep person quiet.
- c. Transport to a hospital immediately.

4. Cuts and Massive Bleeding

- a. Control bleeding.
- b. Treat for shock.
- c. Keep person quiet.

5. Shock

- a. Cover person with heavy blankets to prevent body heat loss.
- b. Elevate lower extremities just to head level.
- c. Make person comfortable.
- d. Keep person quiet.
- e. Transport to a hospital immediately.

*Note: Never give beverages to a person in shock.

6. Fracture

- a. Control bleeding if present.
- b. Cover wound to prevent infection.
- c. Splint fracture—do not attempt to set fracture.
- d. Transport to hospital.

7. Chemically Contaminated Wounds

In the event that an injury occurs in a chemically contaminated area, or while working with chemically contaminated material the action to be taken will be governed by the type and extent of the injury.

- a. For superficial puncture wounds or cuts, move the individual to a safe, chemically uncontaminated area and flush the wound if practicable.
- b. Check the wound, clothing and person for chemical contamination.
- c. Remove all contaminated clothing and flush all contaminated areas with water if practicable.
- d. If chemical contamination is evident, allow the wound to bleed freely for a short period (not constituting excessive blood loss), then flush with copious amounts of clean, fresh water.
- e. Transport the person to a medical doctor or hospital for check-up and/or treatment.

8. Snake Bite

Normally the noise created by a person approaching a snake habitat is sufficient to frighten the snakes off. However, extreme caution is necessary when exploring areas where snakes might be found, such as: behind rocks, under brushes, or in holes, crevices and abandoned pipes. If a snake bite occurs these rules will be followed.

- a. Hold the affected area lower than the body while waiting for medical assistance
- b. Do not cut the bite area as it will intensify the effect of the venom.
- c. Do not apply suction to the wound as it is minimally effective in removing venom.

- d. Do not apply a tourniquet since venom is most dangerous when concentrated in a small area.
 - e. Do not allow the victim to run for help as this quickens circulation.
 - f. Keep victim calm and immobile
 - g. Seek immediate medical attention
- D. If the injured person is transported to a hospital, the Emergency Coordinator or designated person will travel in the ambulance with the injured person offering assistance as required. The Emergency Coordinator or designated person will notify hospital of the transportation of any injured person to their facility, identifying the following:
- 1. Individual's name
 - 2. Employer
 - 3. Nature of injury
 - 4. Estimated time of arrival
 - 5. Any other information requested by the hospital

16.9 Severe Weather Plan

Meteorological conditions shall be closely watched, especially in the spring when severe thunderstorms and tornadoes are most likely to occur. Thunderstorms and tornadoes often occur late in the afternoon on hot spring days, but can occur at any time of the day, in any season of the year. Tornadoes are usually preceded by severe thunderstorms with frequent lightening, heavy rains, and strong winds.

A severe thunderstorm watch or a tornado watch announcement on radio or television indicates that a severe thunderstorm or tornado is possible. Work will continue at the work site during severe thunderstorms watches or tornado watches. A severe thunderstorm warning or a tornado warning signifies that a severe thunderstorm or a tornado has been sighted or detected by radar and may be approaching. All work on site shall cease during a thunderstorm, a severe thunderstorm warning, or a tornado warning.

Personnel on site during a tornado shall take the following steps:

1. Evacuate office trailers or vehicles.
2. If outdoors, lie flat in a nearby ditch.
3. Stay away from power poles, electrical appliances, and metal objects.
4. Do not try to outrun a tornado.

16.10 Evacuation Plan

All project personnel will evacuate the facility under the direction of the Emergency Coordinator.

Evacuation Routes:

1. A Coordinated evacuation will be conducted with all project personnel using the most direct upwind route, to Zone 2, avoiding the point of emergency.
2. All project personnel involved in the evacuation will immediately move to the Decontamination/Transition area (Zone 2) and will remain there awaiting further instruction from the Emergency Coordinator.

Because Zone 2 will be inside Building 31, dangerous carbon monoxide conditions may exist in Zone 2 also. Therefore, a designated area of safe refuge will be determined and communicated at the site specific training meeting.

3. Personal protective equipment will be used at all times by the project personnel during the evacuation procedures.

17.0 Medical Evaluation and Surveillance Program

A comprehensive medical evaluation program designed to meet requirements and recommendations set forth by the Occupations Safety and Health Administration will be implemented. All project personnel will receive a medical evaluation. The medical evaluation will be designed to ensure that personnel can wear respiratory protection and work in a hazardous materials environment.

The medical surveillance program includes biological monitoring for lead in accordance with the standards set in the Code of Federal Regulations, 29 CFR Part 1926.62. A board certified physician has examined the medical surveillance program and conducted examinations of the project employees. A letter from the attending physician is included in Appendix E.

17.1 Medical Examinations

The following is a breakdown of the evaluation to be performed on project personnel to determine fitness to conduct operations:

- A. Medical History and Ancillary History
 - 1. Social history
 - 2. Family medical history
 - 3. Personal medical history
 - 4. Review of body systems
- B. Occupational History
 - 1. Respiratory
 - 2. Noise
 - 3. Skin
 - 4. Vision
- C. Cardiology
 - 1. Electrocardiogram
 - 2. Blood pressure
 - 3. Pulse rate
- D. Pulmonary Lung Function - FVC, FEV-1
- E. Audiology
 - 1. Hearing threshold 500-8000 hertz
 - 2. Ear canal examination
- F. Vision
 - 1. Visual acuity
 - 2. Color perception
 - 3. Depth perception

G. Physical Measurements

1. Height
2. Weight
3. Abdominal girth

H. Blood

1. Chemistry
2. Hemoglobin, Hematocrit, RBC, WBC, and examination of peripheral smear morphology
3. Blood lead level
4. Zinc protoporphyrin (ZZP)
5. Blood urea nitrogen
6. Serum creatinine

I. Urinalysis with microscopic evaluation

The above evaluation will be subject to modification with concurrence from the medical consultant in order to meet any additional regulatory requirements. Additional tests may be performed if they are relevant to lead exposure which the examining physician deems necessary by sound medical practice.

17.2 Employee Notification

All personnel who receive a medical evaluation will be notified within five working days of the outcome of their evaluation. This will be in the form of a confidential report addressed to the individual and will contain a breakdown of the clinical findings and blood lead levels. If the blood lead level exceeds 40 ug/dl the person will be notified that the standard requires temporary medical removal with Medical Removal Protection benefits if the blood lead level exceeds 50 ug/dl.

The report will also indicate any areas of concern which would justify further medical consultation by the individual's personal physician. In the event that the areas of concern are of a severe nature, a follow-up notification will be made to the individual by the medical consultant to answer any questions the employee may have.

17.3 Frequency of Medical Evaluations

Medical exams will be conducted at the following frequencies:

- A. Prior to initial job assignment where medical exams would be required.
- B. Annually
- C. Termination of employment (if last medical exam was greater than six months)
- D. Injury/illness due to hazardous materials exposure

Biological monitoring for blood lead and ZPP levels will be determined at the following frequency:

- A. Prior to working on the project
- B. Every 2 months for the first 6 months and every 6 months thereafter.
- C. If a test indicates a level greater than or equal to 40 ug/dl, the person will be tested within two weeks and every 2 months until two consecutive tests indicate a level less than 40 ug/dl.
- D. Anyone removed from the project because of elevated lead levels will be re-tested within two weeks and every month during the removal period.

18.0 Hauling, Disposal, and Vehicle Operation

18.1 General Operation

All operators of motor vehicles and equipment have valid operators licenses for the vehicle or equipment being operated. The number of personnel in each vehicle will not exceed the number which can be seated. All tools and equipment will be guarded, stowed, and secured while being transported.

No vehicles will be used unless they are in safe operating condition and regularly inspected and maintained. Vehicles will be inspected weekly to ensure that the following equipment is in safe operating condition:

- 1) Service brakes
- 2) Emergency and parking brakes
- 3) Tires
- 4) Horns
- 5) Steering
- 6) Coupling devices and hitches
- 7) Seat belts
- 8) Operating controls
- 9) Safety devices
- 10) Accessories (mirrors, lights, reflectors, wipers, glass, defrosters, fire extinguisher, etc.)

Records of tests, inspections, and maintenance will be maintained on each vehicle. Vehicles not meeting safe conditions will be repaired immediately or they will not be used until they have been repaired.

18.2 Dump Trucks

All dump trucks will comply with all federal, state, and local DOT standards. Drivers will have current Commercial Drivers Licenses (CDL).

Dump trucks and equipment will be equipped with back up alarms. Dump trucks will be equipped with a device to prevent accidental lowering while maintenance is being performed. Hoist levers will be secured to prevent accidental tripping. All off-highway end-dump trucks will have a clearly visible device to determine if the dump box has been lowered. Trip handles for tailgates will be arranged such that the operator will be clear.

Trucks will be equipped with one red flag and three emergency reflectors. They will have two wheel chocks for each unit of the vehicle. They will have one 2A:10B:C fire extinguisher.

Vehicle exhaust will be controlled and maintained such that emissions will not present a hazard to operators, attendants, or other personnel.

Rubber tires on vehicles will not extend out beyond fenders. Mud flaps will be used on vehicles not equipped with fenders. Safety cages will be used when performing maintenance on tires on split rim wheels.

18.3 Operating Rules

Operators will obey all traffic regulations and practice defensive driving at all times. Vehicles approaching railroad crossings will be driven such that the vehicle will be able to stop prior to crossing the first rail of the track. Vehicles carrying personnel, explosives, flammables, or toxic substances will stop at all railroad crossings and will not proceed until the way is clear.

Vehicles will not be left unattended until the engine has been turned off, the parking brake set, and the gear engaged. Vehicles will not be stopped or parked in any way that may endanger the vehicle, other vehicles, equipment, or personnel.

Drivers will leave the cab while loading if there is any danger from suspended loads or overhead equipment. The vehicle will not be loaded in any way that interferes with the safe operation of the vehicle. Each load will be distributed, chocked, tied down, or secured.

Loads will be tarped when there is danger of flying debris, rock, or dirt. Any hazardous or toxic materials will be tarped and secured as necessary. The loads will be manifested and the trucks will display any applicable placards when in route.

19.0 Severe and Inclement Weather

19.1 Severe Weather

When there are warnings of impending severe weather, conditions will be monitored and precautions taken to ensure the safety of personnel and property. The National Oceanic and Atmospheric Administration's Natural Hazard Watch and Warning poster will be displayed on the jobsite poster board to provide instructions and safety rules for tornadoes, hurricanes, floods, thunderstorms, lightning, and winter storms.

19.2 Hot Weather

19.2.1 Heat Stress Prevention

Of particular importance is heat stress resulting when protective clothing decreases natural body ventilation. One or more may help reduce heat stress:

1. Provide plenty of liquids. To replace body fluids (water and electrolytes) lost because of sweating, use a water or commercial sport drink mixes, drinks with excess sugar should be avoided. Alcohol should be avoided by workers during off-hours, because of its effects on the body's natural cooling system.
2. Provide cooling devices to aid natural body ventilation. These devices, however, add weight, their use should be balanced against worker efficiency.
3. Install mobile showers and/or hose-down facilities to reduce body temperature and cool PPE.
4. In extremely hot weather consider performing work at night or early morning/late afternoon hours.
5. Provide shielding for shade to reduce temperature in work area.

19.2.2 Heat Stress Monitoring

For monitoring the effects of heat on the body, techniques will be used as a screening mechanism. Monitoring of personnel using PPE should be monitored at temperatures above 70°F or above. Frequency of monitoring should increase as the ambient temperature increases or as slow recovery rates are indicated. Heat stress will be avoided by establishing appropriate work/rest periods suggested by the American Conference of Governmental Industrial Hygienists (ACGIH) 1992-1993 TLV guide (Appendix I).

19.2.3 Effects of Heat Stress

If the body's physiological process fail to maintain a normal body temperature because of excess heat, a number of physical reactions can occur, ranging from mild (such as fatigue or irritability) to fatal. Heat related problems include:

1. Heat Rash-caused by continuous exposure to heat and humid air and aggravated by chaffing clothes. Decreases ability to tolerate heat as well as being a nuisance.
2. Heat Cramps-caused by profused perspiration with inadequate fluid intake and vitamin/mineral replacement. Signs: muscle spasms and pain in the extremities and abdomen.
3. Heat exhaustion-caused by increased stress on various organs to meet increased demands to cool the body. Signs: shallow breathing, pale, cool moist skin; profuse sweating, and dizziness.
4. Heat Stroke-Life Threatening-the most severe form of heat stress. Body must be cooled immediately to prevent severe injury or death, seek medical attention immediately. Signs: red, hot, dry skin, no perspiration, nausea, dizziness, confusion, strong rapid pulse and/or coma.

19.3 Cold Weather

19.3.1 Effects of Cold Exposure

Persons working outdoors in temperatures at or below freezing may experience injuries ranging from frost nip to hypothermia. Extreme cold for a short time may cause severe injury to the surface of the body. Areas of the body that have a high surface area to volume ratio, such as fingers, toes and ears are the most susceptible.

Two factors influence the development of a cold injury: ambient temperature and the velocity of the wind. Wind chill is used to describe the chilling effect of moving air in combination with low temperature. For instance, 10°F with a wind of 15 mph is equivalent in chilling effect to still air at -18°F.

As a general rule, the greatest incremental change in wind chill occurs when a wind of 5 mph increases to 10 mph. Additionally, water conducts heat 240 times faster than air. Thus, the body cools suddenly when PPE is removed if the clothing underneath is soaked with perspiration.

Local injury resulting from cold is included in the generic term frostbite. There are several degrees of damage. Frostbite in the extremities can be categorized into:

1. Frost Nip or Incident Frostbite-condition is characterized by sudden blanching or whitening of the skin.
2. Superficial Frostbite-the skin has a waxy or white appearance and is firm to the touch, but tissue beneath is resilient.
3. Deep Frostbite-tissue is cold, pale and solid, extreme serious injury.

Systemic hypothermia is caused by the exposure to the freezing or rapidly dropping temperature. Its symptoms are usually exhibited in five stages:

1. Shivering
2. Apathy, listlessness, sleepiness, and sometimes rapid cooling of the body to less than 95°F.
3. Unconsciousness, glassy stare, slow pulse and slow respiratory rate.
4. Freezing of the extremities
5. Finally-Death

Table 19.3.2 Temperature and Corresponding Actions

<u>Temperature</u>	<u>Actions to be taken</u>
60.8°F	Work place monitoring shall be initiated. If bare hand fine work or sedentary work is being performed, provisions to keep workers hands warm should be made with gloves, heaters, etc.
40°F	Dry insulated clothing shall be provided to workers to maintain worker body core temperature above 96.8°F.
39.2°F	Workers performing light work will be provided with gloves. Workers handling evaporative liquids(i.e. gasoline, solvents, etc.) will be provided with protective gloves and take precautions to prevent spillage on workers.
35.6°F	Wet clothing will be changed immediately.
30.2°F	Dry bulb temperature readings will be taken at least every four hours. Metal handles on tools or equipment shall be covered with thermal insulating material to prevent worker contact. If outside work is being performed, wind speed will be measured along with temperature to determine wind chill factor. Workers with disease(s) or taking medication that will effect body temperature regulation will be excluded from cold work.
19.4°F	If moderate work and fine manual dexterity is not required is being performed then gloves will be provided. Workers will be notified to prevent inadvertent bare skin contact with cold surfaces. If workers are continuously exposed to

cold, heated warming shelters will be made available and work/rest(warm) schedule will be developed and implemented.

0°F

Use of protective mittens and machine controls and tools will be designed for use with mittens.

0°F & >5 MPH Wind
or
-11.2°F & <5 MPH Wind

Workers should be medically certified as suitable for such exposures.

-25.6°F

Skin should not be continuously exposed.

19.3.3 Work/Rest(Warm) Schedule

The air temperature and wind speed will be used to determine the wind chill. Workers shall be rotated/rested (warmed) in accordance to the AGCIH TLV warm up schedule (Appendix J).

Appendix A

GERALD A. SCHWARTZ
 Certified Safety Professional
 Certified Industrial Hygienist

**AREAS OF
 SPECIAL SERVICE:**

Industrial Hygiene
 Occupational Safety
 Safety & Health Audits
 Asbestos Projects
 Asbestos and Safety Training

**PROFESSIONAL
 EXPERIENCE:**

1984-1988,
 1988-Present

Consultant
 Yardley, Pennsylvania

Principal Clients:

Atlantic Environmental Inc.
 Dover, New Jersey

Develop Specifications for Asbestos Projects
 Manage Asbestos Abatement Projects
 Environmental and Industrial Hygiene Audits
 Right to Know Training and Audits
 Indoor Air Quality

National Asbestos and Environmental Training
 Institute

Ocean, New Jersey

Asbestos Worker/Supervisor, Inspector,
 Management Planner, Project Designer
 Training
 Asbestos Training Course Development
 Asbestos Surveys

Industrial Construction Environmental
 Phoenixville, Pennsylvania

Hazardous Waste Training
 Review and Update of Health and Safety Plan

Galson Technical Services

Plymouth Meeting, Pennsylvania
 Asbestos Project Oversight

Princeton Testing Laboratory

Princeton, New Jersey
 Safety Audits
 Asbestos Projects

Asbestos Training Institute

New York, New York

Asbestos Worker/Supervisor Training
 Asbestos Inspector/Investigator Training

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Tri-Tech Laboratories, Inc.
Gap, Pennsylvania
Review of Asbestos Project Specifications

Apex Environmental Inc.
Rockville, Maryland
Development and Management of Landfill
Gas Monitoring Project
Right to Know Training

ATC Environmental, Inc.
New York, New York
Asbestos Worker/Supervisor Training
Air Sampling Technician Training
Asbestos Inspector/Investigator Training

Hudson Asbestos Training Institute
Richmond Hill, New York
Hazardous Waste Operations Training

A & S Environmental Safety, Inc.
Harrisburg, Pennsylvania
Asbestos Worker/Supervisor Training

Hillmann Environmental Services, Inc.
Union, New Jersey
Air Sampling Technician Training
Hazardous Waste Operations Training
Review of Specifications for Asbestos,
Hazardous Waste, Tank Removal and Lead
Abatement Projects

Abatement Safety Training Institute
New York, New York
Asbestos Worker/Supervisor Training
Asbestos Inspector/Investigator Training

Woodbridge/Cartex Inc.
Fairless Hills, Pennsylvania
Industrial Hygiene Surveys

Environmental Resource Associates
Philadelphia, Pennsylvania
Review of Asbestos Project Specifications

B & M Construction & Restoration, Inc.
Totowa, New Jersey
Review of Asbestos Project Specifications
Development of Respirator Protection Program

Khemsafe Environmental, Inc.
Bronx, New York
Review of Asbestos Abatement Project
Specifications and Final R ports

GERALD A. SCHWARTZ

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Executive Abatement Industries
Jersey City, New Jersey
Preparation and Review of Asbestos
Project Specifications
Review of Asbestos Management Plans
Review of Asbestos Project Final Reports

Paragon Environmental Group
Coatsville, Pennsylvania
Quality Control and Monitoring of
Lead Abatement Projects

1988

Biospherics, Inc.
Mt. Laurel, New Jersey
Branch Manager

Responsible for all aspects of operation of New Jersey branch office including marketing, project oversight, and technical supervision of environmental and training services.

1979-1984

FMC Corporation
Princeton, New Jersey
Safety Specialist

Developed and implemented safety and industrial hygiene monitoring programs. Audited facilities to ensure Company compliance with OSHA and other safety standards. Conducted safety training sessions. Consulted with management to help them meet safety standards and goals. Provided safety engineering analysis and review for new processes and facilities. Investigated accidents and serious incidents.

1976-1979

Ionac Chemical Company
Birmingham, New Jersey
Staff Engineer

Had responsibility for maintaining Company compliance with OSHA, EPA and DOT requirements. Implemented plant safety programs. Provided consultant services and technical knowledge to all levels of management in the areas of safety, hazardous materials transportation, industrial hygiene and fire protection. Conducted training. Investigated accidents.

Prior to 1976

DIVA Corporation
Eatontown, New Jersey
Chemical Process Engineer

Western Electric Company
Princeton, New Jersey
Engineering Associate

EDUCATION:

City College of New York
B.E. (Chemical Engineering)

New Jersey Institute of Technology
M.S. (Management Engineering)

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**PROFESSIONAL
MEMBERSHIPS/
HONORS:**

American Industrial Hygiene Association
American Academy of Industrial Hygiene
American Society of Safety Engineers
AIHA Communication and Training Methods
Committee

Appear in Who's Who in the Safety Profession

Appear in 24th ed. Who's Who in the East

CERTIFICATIONS:

Certified Industrial Hygienist Cert No. 3489
Certified Safety Professional Cert No. 7890
New York City Asbestos Investigator No. 42099
New Jersey Asbestos Safety Technician No. 0069
EPA AHERA Supervisor No. RAPA-01369
EPA AHERA Building Inspector No. 001637
EPA AHERA Management Planner No. 001637
Philadelphia Asbestos Proj. Insp. No. H-15185
NYS Air Sampling Technician No. AH 89-11365
NYS Inspector No. AH 89-11365
NYS Project Designer No. AH 89-11365
NYS Project Monitor No. AH 89-11365
NIOSH 582 (Equiv.) Cert. No. 1049
Supv. of Haz. Waste Oper. No. Ref 0201-92-01

MICHAEL FULMER
Industrial Hygienist

EDUCATION/SPECIALIZED TRAINING:

40-hour Health and Safety Training in accordance with 29 CFR 1910.120
 8-hour Health and Safety Training Supervisory Training
 Health and Safety Certification - Montgomery County Community College, Pennsylvania

GENERAL EXPERIENCE:

- 1992 To Present** Industrial Hygienist and Environmental Remediations, Apex Environmental, Inc., Rockville, Maryland. Responsible for health and safety during remediation of hazardous waste sites and underground storage tank (UST) closures.
- 1987 To 1992** Industrial Hygienist and Environmental Remediations, Phoenix Safety, Ltd. Worked as Health & Safety Supervisor for environmental remediations and asbestos abatements. Performed safety and industrial hygiene monitoring for City of New York. Health & Safety Supervisor on numerous environmental remediation sites including BROS Superfund site, Bridge Port, New Jersey; Strassburg Landfill, Strassburg, Pennsylvania; and soil solidification, Amoco Oil Co., Whiting, Indiana; basin and ditch sludge removal, Dupont Co., Chambers Works Plant, New Jersey; and Right to Know, City of Philadelphia, Pennsylvania.
- 1973 To 1986** Quality Assurance, B.F. Goodrich Co., Oaks, Pennsylvania. Performed calibration and overall quality assurance for raw and finished products.

PROJECT EXPERIENCE:

- Health & Safety Audits - cities of Philadelphia and New York.
- Air Monitoring - School District of Lancaster, Pennsylvania and Veterans Administration, New Haven, Connecticut.
- Air Monitoring - City of New York, various locations, during pre- and post abatement of asbestos: duties included health and safety of five to ten workers and surrounding buildings.
- Air Monitoring - City of Philadelphia, Right to Know: inventory for hazardous materials at Philadelphia International Airports. Set up material safety data sheets (MSDS) program, determine hazardous and non-hazardous materials.
- Environmental Remediation - various sites in Pennsylvania, New York, Delaware and New Jersey.
- BROS Superfund Site, Bridgeport, New Jersey: oversight of health and safety for 75 to 100 workers during removal and remediation of oil storage facility. All work performed in Level B personal protective equipment (PPE).
- Strassburg Landfill, Strassburg, Pennsylvania - Health and safety officer for enforcement of Safety, Health, and Emergency Response Plan (SHERP) during collection and shipping of leachate.
- Amoco Oil Co. Refinery, Whiting, Indiana - health and safety supervisor for 30 to 50 workers and nearby communities during soil solidification of oil waste lagoon. Work performed in Level B PPE.
- Dupont Co., Chambers Works Plant, New Jersey - Supervisor for culvert and lagoon hazardous waste removal operations. Responsible for health and safety of 20 to 30 workers in nearby community and plant personnel. Level D, C, and B PPE.
- Cecos, B.f., Niagara Falls, New York - Supervised closure of 18 foot leachate pipeline, scope of work included confined space entries in excavations as vault for hazardous waste. Level B PPE.
- Phase I site assessments at various locations in Maryland, PA, N. C.
- Health and safety during apron addition at Dover Air Force Base.
- Health and safety during environmental remediation at Andrews Air Force Base Resource Conservation and Recovery Act (RCRA) site. Duties included air monitoring, confined space entries, air and soil sampling.
- Air sampling at various locations in Washington, D.C.
- Health and safety for UST removal in Eddystone, Pennsylvania. Also, the removal of transformers containing polychlorinated biphenyls (PCBs).
- Health and safety for UST removals at various locations in Maryland. Duties included air and soil sampling, overall health and safety for tank removal.

RICHARD A. GROVES
220 LYONS CREEK
LOTHIAN, MD 20711
410-741-1648

EMPLOYMENT HISTORY:

FNG ENVIRONMENTAL, INC. Phone# 410-741-9825
1410 Forest Dr. #8, Suite 235 Annapolis, MD 21403
Vice President of FNG Environmental From: 4/93 To: Present Director of marketing, management of field personnel, and responsible for general business operations.

APEX ENVIRONMENTAL, INC. Phone# 301-417-0200
15850 Crabbs Branch Way Rockville, MD 20850
Supervisor: Steve Simmons From: 2/91 To: 3/93
Position: Health and Safety Officer/Industrial Hygienist
Responsibilities include OSHA monitoring, site supervision, and asbestos air monitoring. Developed and enforced HASP's and SHERPS, monitored UST removals, installed pump and treat and vapor extraction systems. Developed corporate health and safety SOP's, cross trained workers from industrial hygiene and geology, and expanded marketing for Hazmat contracts.

PHOENIX SAFETY ASSOCIATES, LTD. Phone# 212-268-0600
35 West 31 Street 6th Floor New York, New York 10001
Supervisor: Barbara Raskob From: 8/89 To: 11/90
Position: Health and Safety Officer/Industrial Hygienist
Responsibilities included health and risk assessments of industrial facilities and hazardous waste remediation sites. Development, evaluation and enforcement of HASP's. Asbestos project air and OSHA monitoring, survey bulk sampling, site safety supervisor and client/contractor interface.

SHORELINE, INC. Phone# 203-877-7665
255 Cherry Street Milford, Connecticut 06460
Supervisor: Steve Bard From: 12/88 To: 7/89
Position: Sales Representative
Responsibility was a direct salesman.

UNITED STATES ARMY From: 12/84 To: 12/88
Position: Infantry/Nuclear, Biological and Chemical (NBC)
Warfare Specialist
Responsibilities included planning, conducting and evaluating NBC training, maintenance and readiness. Performed fit tests, protective clothing drills, first aid exercises and reviewed and updated NBC warfare procedures. Supervised respiratory protection confidence station. Instructed and performed decontamination operations from individual personnel to large scale multi-hazard projects. Performed site surveys and hazard assessments of contaminated zones.

RICHARD A. GROVES**KEY PROJECTS:****APEX ENVIRONMENTAL, INC.**

U. S. Army Corps of Engineers, Various Former Nike Missile Battery Sites, MD Developed and enforced SHERP, took soil, air and water samples during the removal of 28 UST's and subsequent remediation of petroleum contaminated soil.

Head, Inc., Dover AFB, Dover, DE

Directed health and safety monitoring and coordinated geology support during the construction of parking aprons in areas extremely contaminated with JP-4 jet fuel. Performed air monitoring, field screened soil, and took soil and water samples.

Triborough Bridge and Tunnel Authority (TBTA), New York, NY

Carbon Monoxide Pilot Study of Bridge and Tunnel Officers

Conducted placement of personal and area samples, retrieved data from samples, evaluated procedures and interacted between TBTA, BTO's (and their union) and general contractor on discrepancies.

Department of Corrections (DOC), Rikers Island Correctional Facility, Queens, New York

Methane Monitoring and Methane Safety Plan Enforcement

Monitored facility for presence of methane and hydrogen sulfide, supervised technicians, generated weekly safety reports, enforced safe work procedures on construction workers and updated DOC Commissioner on weekly status of potential hazards to inmates, workers and officers.

PHOENIX SAFETY ASSOCIATES, LTD.

Du Pont Environmental Resources, Deep Water, New Jersey

Site Remediation and Waste Processing

Site Safety Supervisor of health and safety technicians, review of daily logs, maintained monitoring and protective equipment, updated medical records and inventory sheets.

Assisted in the conditioning and disposal of the waste.

Scientific Ecology Group, Bloomfield, New Jersey

Site Decommission and Decontamination

Assessment of multiple hazard and cross contaminated areas, developed and implemented sampling and monitoring procedures. Reviewed and updated health and safety plan and aided in the processing of waste materials.

RICHARD A. GROVES**EDUCATION:****UNIVERSITY OF MARYLAND 1987**

Studies in Korean culture, language and customs.

U.S. ARMY NBC DEFENSE SCHOOL 1986

Trained in all defensive and offensive capabilities of Nuclear Biological and Chemical (NBC) warfare. Instructed for effects on mission completion, heat stress, detection, evaluation, decontamination, first aid and contamination hazard plotting. Development of equipment maintenance schedules.

BRIDGEPORT ENGINEERING INSTITUTE 1984

Certified in computer aided drafting and design (CAD).

SPECIAL TRAINING/CERTIFICATES:

OSHA 40 Hour Health and Safety Training for Hazardous Waste Site Operations.

OSHA 8 Hour Supervisors Health and Safety Training for Hazardous Waste Site Operation.

American Red Cross standard First Aid certificate.

American Red Cross adult/infant CPR certificate.

Appendix B

Appendix B

HAZARD COMMUNICATION

In order to comply with 29 CFR 1910.1200, Hazard Communication, the following written Hazard Communication Program has been established. All employees will be briefed on this program, and have a written copy for review.

A. CONTAINER LABELING

All containers received on site will be inspected to ensure the following: (1) all containers will be clearly labeled as to the contents; (2) the appropriate hazard warnings will be noted; and (3) the name and address of the manufacturer will be listed.

All secondary containers will be labeled with either an extra copy of the original manufacturer's label or with generic labels which have a block for identify and blocks for the hazard warning.

B. MATERIAL SAFETY DATA SHEETS (MSDSs)

Copies of MSDSs for all hazardous chemicals known or suspected on site will be maintained in the work area. MSDSs will be available to all employees for review during each work shift.

C. EMPLOYEE TRAINING AND INFORMATION

Prior to starting work, each employee will attend a health and safety orientation and will receive information and training on the following: (1) an overview of the requirements contained in the Hazard Communication Standard, 29 CFR 1910.1200; (2) chemicals present in their workplace operations; (3) location and availability of a written hazard program; (4) physical and health effects of the hazardous chemicals; (5) methods and observation techniques used to determine the presence or release of hazardous chemicals; (6) how to lessen or prevent exposure to these hazardous chemicals through usage of control/work practices and personal protective equipment; (7) emergency procedures to follow if they are exposed to these chemicals; (8) how to read labels and review MSDSs to obtain appropriate hazard information; (9) location of MSDS file and location of hazardous chemical list.

Appendix C



SECTION 1. MATERIAL IDENTIFICATION 19

MATERIAL NAME: SULFURIC ACID, CONCENTRATED

OTHER DESIGNATIONS: Oil of Vitriol, Hydrogen Sulfate; H₂SO₄; CAS #7664-93-9

MANUFACTURER/SUPPLIER: Available from many suppliers, including:
 Allied Corporation, PO Box 2064R, Morristown, NJ 07960; Telephone: 800 631-8050



HMS
 H: 3
 F: 0 R 1
 R: 2 I 3
 PPE: * S 4
 *See Sect. 8 K 0

SECTION 2. INGREDIENTS AND HAZARDS HAZARD DATA

	%	HAZARD DATA
Hydrogen Sulfate (H ₂ SO ₄)	93-98	8-hr TWA: 1 mg/m ³
Water	Balance*	Human, Mist Inhalation, TCLo: 3 mg/m ³ , 24 wk. (Toxic Mouth Effects)
* Material is obtained by the reaction of SO ₃ and water. Can contain low impurity levels, such as 0.02% max of iron as Fe. Properties vary with H ₂ SO ₄ content.		Rat, Oral, LD ₅₀ : 2140 mg/kg
Current OSHA standard and ACGIH (1985-86) TLV. NIOSH has a 10-hr TWA, 40-hr. work week, of 1 mg/m ³ .		

SECTION 3. PHYSICAL DATA

	93.19% H ₂ SO ₄	98.33% H ₂ SO ₄	100% H ₂ SO ₄
Boiling Point, 1 atm, deg C	ca 281	ca 338	ca 330 (dc)
Specific Gravity (60/60°F)	1.8354	1.84	1.84
Volatiles, % @ 340°C	ca 100	ca 100	ca 100
Melting Point, deg C	ca -34	ca 3	10.4
Water Solubility ...	Complete Miscible		
Vapor Pressure, mm Hg @ 100°F ...	<1 (93.19% H ₂ SO ₄); Deg. Baume ... 66 (93.19% H ₂ SO ₄) - Density of H ₂ SO ₄ is often reported in degrees Baume Be). Formula is Be=145 [145/sp gr for liquids heavier than water].		
Appearance and odor: Clear, colorless, hygroscopic, oily liquid with no odor. Mists greater than 1 mg/m ³ are easily recognizable. Those at 5 mg/m ³ are distinctly objectionable.			

SECTION 4. FIRE AND EXPLOSION DATA LOWER UPPER

Flash Point and Method	Autoignition Temp.	Flammability Limits In Air	LOWER	UPPER
None - Nonflammable	NA	NA	NA	NA

Sulfuric acid is nonflammable; however, it is a strong oxidizing agent and may cause ignition by contact with combustible materials. Small fires may be smothered with suitable dry chemical. Cool exterior of storage tanks of H₂SO₄ with water to avoid rupture if exposed to fire. **Do not add water or other liquid to the acid!** The acid, especially when diluted with water, can react with metals to liberate flammable hydrogen gas.
 Sulfuric acid mists and vapors from a fire area are corrosive (see sect. 5).
 Fire fighters must wear self-contained breathing equipment and fully protective clothing.

SECTION 5. REACTIVITY DATA

Sulfuric acid is stable under normal conditions of use and storage. It does not undergo hazardous polymerization. It is a strong mineral acid reacting with bases and metals. The concentrated acid is also a dehydrating agent, picking up moisture readily from the air or other materials. Hydrogen gas may be generated within a H₂SO₄ container. Vent drums cautiously.

This material reacts exothermically with water. (Acid should always be added slowly to water. Water added to acid can cause boiling and uncontrolled splashing of the acid.) Sulfur oxides can result from decomposition and from oxidizing reactions of sulfuric acid.

SECTION 6. HEALTH HAZARD INFORMATION TLV

Concentrated sulfuric acid is a strong mineral acid, an oxidizing agent, and a dehydrating agent that is rapidly damaging to all human tissue with which it comes in contact. Ingestion may cause severe injury or death. Eye contact produces severe or permanent injury. Inhalation of mists can damage both the upper respiratory tract and the lungs. Sulfuric acid is not listed as a carcinogen by the NTP, IARC, or OSHA.

FIRST AID: EYE CONTACT: Immediately flush eyes (including under eyelids) with plenty of running water for at least 15 minutes. Speed in diluting and rinsing out acid with water is extremely important if permanent eye damage is to be avoided. Obtain medical help as soon as possible.*

SKIN CONTACT: Immediately flush affected areas with water, removing contaminated clothing while under the safety shower. Continue washing with water and get medical attention.*

INHALATION: Remove to fresh air. Restore breathing. Call a physician immediately. **INGESTION:** Dilute acid immediately with large amounts of milk or water, then give milk of magnesia to neutralize. Never give anything by mouth to an unconscious person. Do not induce vomiting; if it occurs spontaneously, continue to administer fluid. Obtain medical attention as soon as possible.*

Maintain observation of patient for possible delayed onset of pulmonary edema.

* GET MEDICAL HELP = In plant, paramedic, community.

SECTION 7. SPILL, LEAK, AND DISPOSAL PROCEDURES

Handle major spills by a predetermined plan. Contact supplier for assistance in this planning, in meeting local regulations, and for disposing of large amounts. Notify safety personnel. Provide optimum ventilation; vapors are extremely irritating. Stop leak if you can do so without risk.

Cleanup personnel need protection against inhalation or contact. Keep upwind. Contain spill. Minor leaks or spills can be diluted with much water and neutralized with soda ash or lime. If water is not available, cover contaminated area with sand, ashes, or gravel and neutralize cautiously with soda ash or lime.

DISPOSAL: Follow Federal, state, and local regulations. Runoff to sewer may create hydrogen gas, which is a fire or explosion hazard. EPA (CWA) RQ 1000 lbs. (40 CFR 117).

SECTION 8. SPECIAL PROTECTION INFORMATION

Provide general ventilation to meet current TLV requirements in the workplace. Where mists are up to 50 mg/m³, a high-efficiency particulate respirator with full facepiece is warranted; a type-C supplier-air respirator with full facepiece operated in pressure-demand mode is used to 100 mg/m³.

Avoid eye contact by use of chemical safety goggles or face shield where splashing may occur. Acid-resistant protective clothing, such as rubber gloves, aprons, boots, and suits, is recommended to avoid body contact.

Eyewash fountain and safety showers with deluge type of heads should be readily available where this material is handled or stored.

Contact lenses pose a special hazard; soft lenses may absorb and all lenses concentrate irritants.

Comprehensive preplacement and annual medical examinations with emphasis on dental erosion, cardiopulmonary system, and mucous membrane irritation and cough are indicated.

SECTION 9. SPECIAL PRECAUTIONS AND COMMENTS

Sulfuric acid in carboys or drums should be stored in clean, ventilated storage areas having acid-resistant floors with good drainage. Keep out of direct sunlight, do not store above 89.6°F (32°C). Storage facilities are to be separate from organic materials, metallic powders, chromates, chlorates, nitrates, carbides, oxidizables, etc. Soda ash, sand, or lime should be kept in general storage or work areas for emergency use. Protect containers against physical damage. Glass bottles need extra protection. Sulfuric acid is highly corrosive to most metals, especially below 77% H₂SO₄. Avoid breathing mist or vapors. Avoid contact with skin or eyes. Do not ingest. Do not add water to concentrated acid. Drums may contain hydrogen gas, so open cautiously. Use nonsparking tools free of oil, dirt, and grit and vapor-proof electrical fixtures

DOT Classification: Corrosive Material. ID No.: UN1830 Label: Corrosive

Data Source(s) Code: 1-12, 19, 20, 24, 26, 31, 37-39, 42, 82. CK

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Approvals	<i>J.D. DeMarco</i>
Indust. Hygiene/Safety	<i>JW</i>
Medical Review	<i>[Signature]</i>



Section 1. Material Identification

32

Lead (Inorganic) (Pb) Description: Exists widely throughout the world in a number of ores. Its main commercial source is galena (lead sulphide). Lead mineral is separated from crude ores by blast-furnace smelting, dressing, or electrolytic refining. Lead is used mostly in manufacturing storage batteries. Other uses are in manufacturing tetraethyllead and both organic and inorganic lead compounds in ceramics, plastics, and electronic devices; in producing ammunition, solder, cable covering, sheet lead, and other metal products (brass, pipes, caulking); in metallurgy; in weights and as ballast; as a chemical intermediate for lead alkyls and pigments; as a construction material for the tank linings, piping, and equipment used to handle the corrosive gases and liquids used in sulfuric acid manufacturing, petroleum refining, halogenation, sulfonation, extraction, and condensation; and for x-ray and atomic radiation protection.

R 0
I 4
S -
K 0



Genium
HMIS
H 3
F 1
R 0
PPG*

Other Designations: CAS No. 7439-92-1, lead oxide; lead salts, inorganic; metallic lead; plumbum.

Manufacturer: Contact your supplier or distributor. Consult the latest *Chemicalweek Buyers' Guide*⁽⁷³⁾ for a suppliers list.

Cautions: *Inorganic lead is a potent systemic poison.* Organic lead (for example, tetraethyl lead) has severe, but different, health effects. Occupational lead poisoning is due to inhalation of dust and fumes. Major affected organ systems are the nervous, blood, and reproductive systems, and kidneys. Health impairment or disease may result from a severe acute short- or long-term exposure. * Sec. 8

Section 2. Ingredients and Occupational Exposure Limits

Lead (inorganic) fumes and dusts, as Pb, ca 100%

1989 OSHA PELs (Lead, inorganic compounds)
8-hr TWA: 50 µg/m³
Action Level TWA*: 30 µg/m³

1989-90 ACGIH TLV (Lead, inorganic, fumes and dusts)
TLV-TWA: 150 µg/m³

1985-86 Toxicity Data†

Human, inhalation, TC_{Lo}: 10 µg/m³ affects gastrointestinal tract and liver

Human, oral, TD_{Lo}: 450 mg/kg ingested over 6 yr affects peripheral and central nervous systems

Rat, oral, TD_{Lo}: 790 mg/kg affects multigeneration reproduction

29 CFR 1910.1025 Lead Standard
Blood Lead Level: 40 µg/100 g

1988 NIOSH REL
10-hr TWA: <100 µg/m³

* Action level applies to employee exposure without regard to respirator use.

† See NIOSH, *RTECS* (OF7525000), for additional mutative, reproductive, and toxicity data.

Section 3. Physical Data

Boiling Point: 3164 °F (1740 °C)
Melting Point: 621.3 °F (327.4 °C)
Vapor Pressure: 1.77 mm Hg at 1832 °F (1000 °C)
Viscosity: 3.2 cp at 621.3 °F (327.4 °C)

Molecular Weight: 207.20

Specific Gravity (20 °C/4 °C): 11.34

Water Solubility: Relatively insoluble in hot or cold water*

Appearance and Odor: Bluish-white, silvery, gray, very soft metal.

* Lead dissolves more easily at a low pH.

Section 4. Fire and Explosion Data

Flash Point: None reported

Autoignition Temperature: None reported

LEL: None reported

UEL: None reported

Extinguishing Media: Use dry chemical, carbon dioxide, water spray, or foam to extinguish fire.

Unusual Fire or Explosion Hazards: Flammable and moderately explosive in the form of dust when exposed to heat or flame.

Special Fire-fighting Procedures: Isolate hazard area and deny entry. Since fire may produce toxic fumes, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in the pressure-demand or positive-pressure mode and full protective equipment. Be aware of runoff from fire control methods. Do not release to sewers or waterways.

Section 5. Reactivity Data

Stability/Polymerization: Lead is stable at room temperature in closed containers under normal storage and handling conditions. It tarnishes on exposure to air. Hazardous polymerization cannot occur.

Chemical Incompatibilities: Mixtures of hydrogen peroxide + trioxane explode on contact with lead. Lead is incompatible with sodium azide, zirconium, disodium acetylide, and oxidants. A violent reaction on ignition may occur with concentrated hydrogen peroxide, chlorine trifluoride, sodium acetylide (with powdered lead), ammonium nitrate (below 200 °C with powdered lead). Lead is attacked by pure water and weak organic acids in the presence of oxygen. Lead is resistant to tap water, hydrofluoric acid, brine, and solvents.

Conditions to Avoid: Rubber gloves containing lead may ignite in nitric acid.

Hazardous Products of Decomposition: Thermal oxidative decomposition of lead can produce highly toxic fumes of lead.

Section 6. Health Hazard Data

Carcinogenicity: Although the NTP and OSHA do not list lead as a carcinogen, the IARC lists it as probably carcinogenic to humans, but having (usually) no human evidence. However, the literature reports instances of lead-induced neoplasms, both benign and malignant, of the kidney and other organs in laboratory rodents. Excessive exposure to lead has resulted in neurologic disorders in infants. Experimental studies show lead has reproductive and teratogenic effects in laboratory animals. Human male and female reproductive effects are also documented.

Summary of Risks: Lead is a potent, systemic poison that affect a variety of organ systems, including the nervous system, kidneys, reproductive system, blood formation, and gastrointestinal (GI) system. The most important way lead enters the body is through inhalation, but it can also be ingested when lead dust or unwashed hands contaminate food, drink, or cigarettes. Much of ingested lead passes through feces without absorption into the body. Adults may absorb only 5 to 15% of ingested lead; children may absorb a much larger fraction. Once in the body, lead enters the bloodstream and circulates to various organs. Lead concentrates and remains in bone for many years. The amount of lead the body stores increases as exposure continues, with possibly cumulative effects. Depending on the dose entering the body, lead can be deadly within several days or affect health after many years. Very high doses can cause brain damage (encephalopathy).

Medical Conditions Aggravated by Exposure: Lead may aggravate nervous system disorders (e.g., epilepsy, neuropathies), kidney diseases, high blood pressure (hypertension), infertility, and anemia. Lead-induced anemia and its effect on blood pressure can aggravate cardiovascular disease.

Continue on next page

Section 6. Health Hazard Data, continued

Target Organs: Blood, central and peripheral nervous systems, kidneys, and gastrointestinal (GI) tract.

Primary Entry Routes: Inhalation, ingestion.

Acute Effects: An acute, short-term dose of lead could cause acute encephalopathy with seizures, coma, and death. However, short-term exposures of this magnitude are rare. Reversible kidney damage can occur from acute exposure, as well as anemia.

Chronic Effects: Symptoms of chronic long-term overexposure include appetite loss, nausea, metallic taste in the mouth, lead line on gingival (gum) tissue, constipation, anxiety, anemia, pallor of the face and the eye grounds, excessive tiredness, weakness, insomnia, headache, nervous irritability, fine tremors, numbness, muscle and joint pain, and colic accompanied by severe abdominal pain. Paralysis of wrist and, less often, ankle extensor muscles may occur after years of increased lead absorption. Kidney disease may also result from chronic overexposure, but few, if any, symptoms appear until severe kidney damage has occurred. Reproductive damage is characterized by decreased sex drive, impotence, and sterility in men; and decreased fertility, abnormal menstrual cycles, and miscarriages in women. Unborn children may suffer neurologic damage or developmental problems due to excessive lead exposure in pregnant women. Lead poisoning's severest result is encephalopathy manifested by severe headache, convulsions, coma, delirium, and possibly death.

FIRST AID

Eyes: Gently lift the eyelids and flush immediately and continuously with flooding amounts of water until transported to an emergency medical facility. Consult a physician immediately.

Skin: Quickly remove contaminated clothing. Rinse with flooding amounts of water for at least 15 min. Consult a physician if any health complaints develop.

Inhalation: Remove exposed person to fresh air and support breathing as needed. Consult a physician.

Ingestion: Never give anything by mouth to an unconscious or convulsing person. If large amounts of lead were ingested, induce vomiting with Ipecac syrup. Consult a physician immediately.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Physician's Note: For diagnosis, obtain blood pressure, blood lead level (PbB), zinc protoporphyrin (ZPP), complete blood count for microcytic anemia and basophilic stippling, urinalysis, and blood urea nitrogen (BUN) of creatinine. Examine peripheral motor neuropathy, pallor, and gingival lead line. Use Ca-EDTA to treat poison, but *never* chelate prophylactically. Consult an occupational physician or toxicologist.

Section 7. Spill, Leak, and Disposal Procedures

Spill/Leak: Notify safety personnel and evacuate all unnecessary personnel immediately. Cleanup personnel should protect against inhalation of dusts or fume and contact with skin or eyes. Avoid creating dusty conditions. Water sprays may be used in large quantities to prevent the formation of dust. Cleanup methods such as vacuuming (with an appropriate filter) or wet mopping minimizes dust dispersion. Scoop the spilled material into closed containers for disposal or reclamation. Follow applicable OSHA regulations (29 CFR 1910.120).

Disposal: Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.

EPA Designations

Listed as a RCRA Hazardous Waste (40 CFR 261.33, Appendix II—EP Toxicity Test Procedures)

Listed as a CERCLA Hazardous Substance* (40 CFR 302.4), Reportable Quantity (RQ): 1 lb (0.454 kg) [* per Clean Water Act, Sec. 307(a)]

SARA Extremely Hazardous Substance (40 CFR 355): Not listed

Listed as a SARA Toxic Chemical (40 CFR 372.65)

OSHA Designations

Listed as an Air Contaminant (29 CFR 1910.1000, Table Z-1-A)

Section 8. Special Protection Data

Goggles: Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133).

Respirator: Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a NIOSH-approved respirator. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.*

Other: Wear impervious gloves, boots, aprons, and gauntlets to prevent skin contact. Protective clothing made of man-made fibers and lacking turn-ups, pleats, or pockets retain less dust from lead.

Ventilation: Provide general and local ventilation systems to maintain airborne concentrations below the OSHA PELs (Sec. 2). Local exhaust ventilation is preferred since it prevents contaminant dispersion into the work area by controlling it at its source.⁽¹⁰³⁾

Safety Stations: Make available in the work area emergency eyewash stations, safety/quick-drench showers, and washing facilities.

Contaminated Equipment: Never wear contact lenses in the work area: soft lenses may absorb, and all lenses concentrate, irritants. Remove this material from your shoes and equipment. Launder contaminated clothing before wearing.

Comments: Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially washing hands before eating, drinking, smoking, using the toilet, or applying cosmetics.

Section 9. Special Precautions and Comments

Storage Requirements: Store in tightly closed containers in a cool, dry, well-ventilated area away from all incompatible materials, direct sunlight, and heat and ignition sources.

Engineering Controls: Educate worker about lead's hazards. Follow and inform employees of the lead standard (29 CFR 1910.1025). Avoid inhalation of lead dust and fumes and ingestion of lead. Use only with appropriate personal protective gear and adequate ventilation. Institute a respiratory protection program that includes regular training, maintenance, inspection, and evaluation. Avoid creating dusty conditions. Segregate and launder contaminated clothing. Take precautions to protect laundry personnel. Practice good personal hygiene and housekeeping procedures. For a variety of reasons, the lead concentration in workroom air may not correlate with the blood lead levels in individuals.

Other Precautions: Provide preplacement and periodic medical examinations which emphasize blood, nervous system, gastrointestinal tract, and kidneys, including a complete blood count and urinalysis. Receive a complete history including previous surgeries and hospitalization, allergies, smoking history, alcohol consumption, proprietary drug intake, and occupational and nonoccupational lead exposure. Maintain records for medical surveillance, airborne exposure monitoring, employee complaints, and physician's written opinions for at least 40 years or duration of employment plus 20 years. Measurement of blood lead level (PbB) and zinc protoporphyrin (ZPP) are useful indicators of your body's lead absorption level. Maintain worker PbBs at or below 40 µg/100 g of whole blood. To minimize adverse reproductive health effects to parents and developing fetus, maintain the PbBs of workers intending to have children below 30 µg/100 g. Elevated PbBs increase your risk of disease, and the longer you have elevated PbBs, the greater your chance of substantial permanent damage.

Transportation Data (49 CFR 172.102)

IMO Shipping Name: Lead compounds, soluble, n.o.s.

IMO Hazard Class: 6.1

ID No.: UN2291

IMO Label: St. Andrews Cross (X, Stow away from foodstuffs)

IMDG Packaging Group: III

MSDS Collection References: 26, 38, 73, 84, 85, 88, 89, 90, 100, 101, 103, 109, 124, 126, 132, 133, 134, 136, 138, 139, 142, 143

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Sheet No. 35
Carbon Monoxide

Issued: 8/78 Revision: B, 7/91

Section 1. Material Identification

Carbon Monoxide (CO) Description: Produced when organic materials (coal, wood, paper, oil, gasoline, explosives, or other carbonaceous material) burn in limited air or oxygen; when flame contacts a surface colder than ignition temperature of its gaseous part. The main source of man-made global carbon monoxide is exhaust gas of gasoline-fuelled combustion engines containing 1 to 10% CO, depending on the engine's operation mode. Used in manufacturing metal carbonyls and zinc white pigments; as a reducing agent in metallurgy, especially in the Mond-Nickel process; and an ingredient in many industrial gases used for heating boilers and furnace.

Other Designations: CAS No. 630-08-0, carbonic oxide, exhaust gas, flue gas, monoxide.

Manufacturer: Contact your supplier or distributor. Consult latest *Chemical Week Buyers' Guide*⁽⁷³⁾ for a suppliers list.

R 1
I 3
S -
K 4



HMS
H 3
F 4
R 0
PPG*
* Sec. 8

Cautions: A combustible, flammable gas, carbon monoxide is considered the single most common cause of industrial and home poisoning. Excessive exposure may cause symptoms ranging from headache and dizziness to unconsciousness, coma, neurologic damage, heart attack, or death.

Section 2. Ingredients and Occupational Exposure Limits

Carbon monoxide, ca 100%

1990 OSHA PELs
8-hr TWA: 35 ppm, 40 mg/m³
Ceiling: 200 ppm, 229 mg/m³

1990-91 ACGIH TLVs
TWA: 50 ppm, 57 mg/m³
STEL: 400 ppm, 458 mg/m³

1985-86 Toxicity Data*
Human, inhalation, TC₅₀: 5000 ppm/5 min
Man, inhalation, LC₅₀: 4000 ppm/30 min
Man, inhalation, TC₁₀: 650 ppm/45 min. Toxic effects include blood (carboxy-hemoglobinemia), cardiovascular, and central nervous system (CNS)

1990 IDLH Level
1500 ppm

1990 NIOSH RELS
TWA: 35 ppm/10 hr
Ceiling: 200 ppm, 229 mg/m³

* See NIOSH, RTECS (FG3500000), for additional toxicity data.

Section 3. Physical Data

Boiling Point: -313 °F (-191.5 °C)

Molecular Weight: 28.01

Melting Point: -337 °F (-205.1 °C)

Specific Gravity: 1.25 g/l at 0 °F (gas); 0.793 (liquid)

Vapor Pressure: >760 mm Hg at 68 °F (20 °C)

Water Solubility: Insoluble; 3.5 ml/100 ml water at 32 °F (0 °C), 2.3 ml/100 ml water at

Vapor Density (air = 1): 0.97

68 °F (20 °C), 1.5 ml/100 ml water at 140 °F (60 °C)

Condensation Point: -310 °F (-190 °C)

Appearance and Odor: A colorless, odorless, tasteless gas that is lighter than air and burns with a deep blue flame.

Section 4. Fire and Explosion Data

Flash Point: Not applicable (gas)

Autoignition Temperature: 1292 °F (700 °C)

LEL: 12.5% v/v

UEL: 74% v/v

Extinguishing Media: Carbon monoxide is very flammable. Let a small fire burn unless leak can be stopped immediately. For a large fire, use water spray, fog, or regular foam.

Unusual Fire or Explosion Hazards: Carbon monoxide is a severe explosion hazard when exposed to heat or flame.

Special Fire-fighting Procedures: Since fire may produce toxic fumes, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode, and full protective clothing. *Caution!* Structural fire-fighters' protective clothing is ineffective for fires involving CO. If possible without risk, move container from area. Apply water to fire-exposed containers sides until fire is well out. Stay away from ends of tanks. For massive fire in cargo area, use monitor nozzles or unmanned hose holder; if impossible, withdraw from area and let fire burn. Withdraw from area immediately in case of rising sound from venting safety device or if there is any discoloration of tank due to fire. Isolate area for 1/2 mile in all directions if fire involves tank, railcar, or tank truck.

Section 5. Reactivity Data

Stability/Polymerization: Carbon monoxide is stable under pressure in cylinders at room temperature. Hazardous polymerization cannot occur.

Chemical Incompatibilities: Strong oxidizers, bromine trifluoride, chlorine trifluoride, lithium, iodine heptafluoride, nitrogen trifluoride, silver oxide, cesium oxide, sodium + ammonia. Liquid CO is explosive with copper perchlorate. Since CO combined with liquid dinitrogen oxide is a rocket propellant, avoid that combination under any other conditions.

Conditions to Avoid: Avoid contact with oxidizers, halogen compounds, heat, and ignition sources.

Hazardous Products of Decomposition: Thermal oxidative decomposition of carbon monoxide can produce carbon and carbon dioxide (CO₂).

Section 6. Health Hazard Data

Carcinogenicity: In 1990 reports, the IARC and NTP do not list carbon monoxide as a carcinogen.

Summary of Risks: Inhalation, the primary route of exposure, can cause chemical asphyxia with symptoms ranging from headache, nausea, and dizziness to unconsciousness, convulsions, coma, myocardial infarction (heart attack), and death. Upon entering the bloodstream, CO combines with hemoglobin over 200 times more tightly than oxygen. Hemoglobin, then, is unable to carry oxygen in the blood [hemoglobin becomes carboxyhemoglobin (COHb)]. CO may also combine with myoglobin (forming carboxymyoglobin), which may cause muscle metabolism disturbances, especially in the heart. The degree of toxicity depends primarily on CO concentration, exposure time, individual susceptibility, and exertion level. CO crosses the placenta and could cause harmful exposure to a fetus.

Medical Conditions Aggravated by Exposure: Anemia, hemoglobinopathies, coronary artery disease, other cardiovascular or cerebrovascular disorders, chronic respiratory conditions. Pregnant females and children may also be at increased risk of exposure to CO.

Target Organs: Blood, central nervous system (CNS; including brain), and cardiovascular system (including heart).

Primary Entry Routes: Inhalation.

Acute Effects: Inhalation can cause chemical asphyxia, characterized by rapid, irregular breathing, need for fresh air (air hunger), headache, fatigue, mental confusion, nausea and vomiting, giddiness and poor judgement, exhaustion, collapse, unconsciousness, coma, convulsions, and death. If high-level exposure is not fatal, there may be potential for severe central nervous system (CNS) damage, including cerebral edema. Persons with pre-existing coronary artery disease can develop angina pectoris (chest pain) or myocardial infarction (heart attack) at even lower levels of exposure to CO. Carboxyhemoglobin blood levels of less than 1% are normally seen in nonsmokers; levels of approximately 5 to 10% are normal in smokers. Levels of 10 to 30% may cause headache, nausea, and drowsiness; above 40%, confusion, weakness, and collapse; and above 50 to 60%, coma, convulsions, and death.

Chronic Effects: While there may be delayed chronic neurologic effects of high-level acute exposure, it is not well-established whether or not chronic exposure to lower levels of CO may cause health effects.

FIRST AID

Inhalation: Protect rescue personnel with proper respiratory protective devices. Remove exposed person to fresh air and support breathing. Provide oxygen as soon as possible.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: Treat aggressively with 100% oxygen. Use non-rebreather mask. Consider hyperbaric oxygen (HBO) in consultation with a medical toxicologist for those with severe intoxication or with significant underlying medical risk factors. Monitor COHb (or breath CO levels) serially and obtain CBC, ABGs, and electrolytes. Treat acidosis with sodium bicarbonate and cerebral edema with steroids and diuresis. The classically described cherry-red discoloration is rarely seen. Follow severe exposure cases to detect post-hypoxic encephalopathy.

Section 7. Spill, Leak, and Disposal Procedures

Spill/Leak: Immediately notify safety personnel. Shut off all ignition sources—no flares, smoking, or flames in hazard area. Provide maximum explosion-proof ventilation to keep CO concentration below explosion limits. Isolate area and deny entry. Use self-contained or air-supplied breathing apparatus when detecting for leaks. Apply soap solution to suspected sites; bubbling indicates leaks. If possible without risk, stop leak. Use water spray to disperse vapors. Follow applicable OSHA regulations (29 CFR 1910.120).

Disposal: Remove leaky cylinders to isolated area outdoors or place in hood with adequate forced ventilation. Defective cylinders should be tagged to indicate defect. Close valve and return to supplier. Follow applicable Federal, state, and local regulations.

EPA Designations

RCRA Hazardous Waste (40 CFR 261.33): Not listed

CERCLA Hazardous Substance (40 CFR 302.4): Not listed

SARA Extremely Hazardous Substance (40 CFR 355): Not listed

SARA Toxic Chemical (40 CFR 372.65): Not listed

OSHA Designations

Listed as an Air Contaminant (29 CFR 1910.1000, Table Z-1-A)

Section 8. Special Protection Data

Respirator: Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a NIOSH-approved respirator. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. **Warning!** Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Ventilation: Enclose all CO sources and provide general and local ventilation systems to maintain airborne concentrations below OSHA PEL and IDLH values (Sec. 2). Local exhaust ventilation is preferred since it prevents contaminant dispersion into the work area by controlling it at its source.⁽¹⁰³⁾ Regularly check exhaust ducts and pipes.

Comments: Pay special attention to metering equipment, piping, and burners to prevent leaks. Ensure proper ventilation when using internal combustion engines indoors (e.g., fork-lift trucks).

Section 9. Special Precautions and Comments

Storage Requirements: Avoid physical damage to containers. Store in a cool, dry, well-ventilated area away from heat, ignition sources, oxidizers, and halogen compounds. Install automated alarms where carbon monoxide is kept. These alarms and automatic recorders can provide indications of leaks or problems in a system before a gassing accident occurs. Check CO containers for leaks upon arrival, filling, and at least every three months.

Engineering Controls: Provide monitoring for CO in the workplace where it is used or generated to ensure proper control of exposures. Make arrangements to minimize CO production and to destroy the gas as soon as it forms. Install Class I, Group C, electrical equipment.

Other Precautions: Institute preplacement and periodic exams for exposed workers that emphasize cardiovascular diseases, anemia, respiratory insufficiencies, or any other medical condition that hypoxic (oxygen-depleting) carbon monoxide can worsen. Provide warning signs in all areas where CO is stored or used. Instruct workers about carbon monoxide's hazardous properties, poison symptoms, mask locations, and appropriate emergency procedures. Institute a respiratory protection program that includes regular training, maintenance, inspection, and evaluation. Adhere to strict, safe-working codes to prevent accidents.

Transportation Data (49 CFR 172.101, .102)

DOT Shipping Name: Carbon monoxide

DOT Hazard Class: Flammable gas

ID No.: UN1016

DOT Label: Flammable gas

DOT Packaging Exceptions: 173.306

DOT Packaging Requirements: 173.302

IMO Shipping Name: Carbon monoxide

IMO Hazard Class: 2.1

ID No.: UN1016

IMO Label: Flammable gas, poisonous gas

IMDG Packaging Group: None, stow "away from" living quarters.

MSDS Collection References: 26, 38, 73, 85, 89, 100, 101, 103, 126, 127, 132, 133, 136, 138, 139, 140, 143, 145, 146, 148, 159

Prepared by: M Gannon, BA; Industrial Hygiene Review: DJ Wilson, CIH; Medical Review: MJ Upfal, MD, MPH; Edited by: JR Stuart, MS



SECTION 1. MATERIAL IDENTIFICATION 19

MATERIAL NAME: SULFURIC ACID, CONCENTRATED

OTHER DESIGNATIONS: Oil of Vitriol, Hydrogen Sulfate; H₂SO₄; CAS #7664-93-9

MANUFACTURER/SUPPLIER: Available from many suppliers, including:
 Allied Corporation, PO Box 2064R, Morristown, NJ 07960; Telephone: 800 631-8050

HMIS
 H: 3
 F: 0
 R: 2
 PPE: *
 *See Sect. 8

R 1
 I 3
 S 4
 K 0



SECTION 2. INGREDIENTS AND HAZARDS % HAZARD DATA

	%	HAZARD DATA
Hydrogen Sulfate (H ₂ SO ₄)	93-98	8-hr TWA: 1 mg/m ³
Water	Balance*	Human, Mist Inhalation, TCLo: 3 mg/m ³ , 24 wk. (Toxic Mouth Effects)
* Material is obtained by the reaction of SO ₃ and water. Can contain low impurity levels, such as 0.02% max of iron as Fe. Properties vary with H ₂ SO ₄ content.		Rat, Oral, LD ₅₀ : 2140 mg/kg
Current OSHA standard and ACGIH (1985-86) TLV. NIOSH has a 10-hr TWA, 40-hr. work week, of 1 mg/m ³ .		

SECTION 3. PHYSICAL DATA

	93.19% H ₂ SO ₄	98.33% H ₂ SO ₄	100% H ₂ SO ₄
Boiling Point, 1 atm, deg C	ca 281	ca 338	ca 330 (dc)
Specific Gravity (60/60°F)	1.8354	1.84	1.84
Volatiles, % @ 340°C	ca 100	ca 100	ca 100
Melting Point, deg C	ca -34	ca 3	10.4
Water Solubility ...	Complete Miscible		
Vapor Pressure, mm Hg @ 100°F ...	<1 (93.19% H ₂ SO ₄); Deg. Baume ... 66 (93.19% H ₂ SO ₄) - Density of H ₂ SO ₄ is often reported in degrees Baume Be). Formula is Be=145 [145/sp gr for liquids heavier than water].		
Appearance and odor: Clear, colorless, hygroscopic, oily liquid with no odor. Mists greater than 1 mg/m ³ are easily recognizable. Those at 5 mg/m ³ are distinctly objectionable.			

SECTION 4. FIRE AND EXPLOSION DATA LOWER UPPER

Flash Point and Method	Autoignition Temp.	Flammability Limits In Air	LOWER	UPPER
None - Nonflammable	NA	NA	NA	NA

Sulfuric acid is nonflammable; however, it is a strong oxidizing agent and may cause ignition by contact with combustible materials. Small fires may be smothered with suitable dry chemical. Cool exterior of storage tanks of H₂SO₄ with water to avoid rupture if exposed to fire. **Do not add water or other liquid to the acid!** The acid, especially when diluted with water, can react with metals to liberate flammable hydrogen gas.

Sulfuric acid mists and vapors from a fire area are corrosive (see sect. 5).
 Fire fighters must wear self-contained breathing equipment and fully protective clothing.

SECTION 5. REACTIVITY DATA

Sulfuric acid is stable under normal conditions of use and storage. It does not undergo hazardous polymerization. It is a strong mineral acid reacting with bases and metals. The concentrated acid is also a dehydrating agent, picking up moisture readily from the air or other materials. Hydrogen gas may be generated within a H₂SO₄ container. Vent drums cautiously.

This material reacts exothermically with water. (Acid should always be added slowly to water. Water added to acid can cause boiling and uncontrolled splashing of the acid.) Sulfur oxides can result from decomposition and from oxidizing reactions of sulfuric acid.

SECTION 6. HEALTH HAZARD INFORMATION TLV

Concentrated sulfuric acid is a strong mineral acid, an oxidizing agent, and a dehydrating agent that is rapidly damaging to all human tissue with which it comes in contact. Ingestion may cause severe injury or death. Eye contact produces severe or permanent injury. Inhalation of mists can damage both the upper respiratory tract and the lungs. Sulfuric acid is not listed as a carcinogen by the NTP, IARC, or OSHA.

FIRST AID: EYE CONTACT: Immediately flush eyes (including under eyelids) with plenty of running water for at least 15 minutes. Speed in diluting and rinsing out acid with water is extremely important if permanent eye damage is to be avoided.

Obtain medical help as soon as possible.* **SKIN CONTACT:** Immediately flush affected areas with water, removing contaminated clothing while under the safety shower. Continue washing with water and get medical attention.*

INHALATION: Remove to fresh air. Restore breathing. Call a physician immediately. **INGESTION:** Dilute acid immediately with large amounts of milk or water, then give milk of magnesia to neutralize. Never give anything by mouth to an unconscious person. Do not induce vomiting; if it occurs spontaneously, continue to administer fluid. Obtain medical attention as soon as possible.*

Maintain observation of patient for possible delayed onset of pulmonary edema.

* GET MEDICAL HELP = In plant, paramedic, community.

SECTION 7. SPILL, LEAK, AND DISPOSAL PROCEDURES

Handle major spills by a predetermined plan. Contact supplier for assistance in this planning, in meeting local regulations, and for disposing of large amounts. Notify safety personnel. Provide optimum ventilation; vapors are extremely irritating. Stop leak if you can do so without risk.

Cleanup personnel need protection against inhalation or contact. Keep upwind. Contain spill. Minor leaks or spills can be diluted with much water and neutralized with soda ash or lime. If water is not available, cover contaminated area with sand, ashes, or gravel and neutralize cautiously with soda ash or lime.

DISPOSAL: Follow Federal, state, and local regulations. Runoff to sewer may create hydrogen gas, which is a fire or explosion hazard. EPA (CWA) RQ 1000 lbs. (40 CFR 117).

SECTION 8. SPECIAL PROTECTION INFORMATION

Provide general ventilation to meet current TLV requirements in the workplace. Where mists are up to 50 mg/m³, a high-efficiency particulate respirator with full facepiece is warranted; a type-C supplier-air respirator with full facepiece operated in pressure-demand mode is used to 100 mg/m³.

Avoid eye contact by use of chemical safety goggles or face shield where splashing may occur. Acid-resistant protective clothing, such as rubber gloves, aprons, boots, and suits, is recommended to avoid body contact.

Eyewash fountain and safety showers with deluge type of heads should be readily available where this material is handled or stored.

Contact lenses pose a special hazard; soft lenses may absorb and all lenses concentrate irritants. Comprehensive preplacement and annual medical examinations with emphasis on dental erosion, cardiopulmonary system, and mucous membrane irritation and cough are indicated.

SECTION 9. SPECIAL PRECAUTIONS AND COMMENTS

Sulfuric acid in carboys or drums should be stored in clean, ventilated storage areas having acid-resistant floors with good drainage. Keep out of direct sunlight, do not store above 89.6°F (32°C). Storage facilities are to be separate from organic materials, metallic powders, chromates, chlorates, nitrates, carbides, oxidizables, etc. Soda ash, sand, or lime should be kept in general storage or work areas for emergency use. Protect containers against physical damage. Glass bottles need extra protection. Sulfuric acid is highly corrosive to most metals, especially below 77% H₂SO₄. Avoid breathing mist or vapors. Avoid contact with skin or eyes. Do not ingest. Do not add water to concentrated acid. Drums may contain hydrogen gas, so open cautiously. Use nonsparking tools free of oil, dirt, and grit and vapor-proof electrical fixtures

DOT Classification: Corrosive Material. ID No.: UN1830 Label: Corrosive

Data Source(s) Code: 1-12, 19, 20, 24, 26, 31, 37-39, 42, 82. CK

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Approvals JO-DeCenzo

Indust. Hygiene/Safety JW

Medical Review [Signature]



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(518) 377-8854

Sheet No. 718
Portland Cement

Issued: 8/90

Section 1. Material Identification

32

Portland Cement (<1% quartz) Description: Tricalcium silicate (3CaO-SiO₂) and dicalcium silicate (2CaO-SiO₂) are portland cement's essential constituents, along with varying amounts of alumina, tricalcium aluminate, and iron oxide as tetracalcium aluminoferrate. Small amounts of magnesia, sodium, potassium, and sulfur are also present. Chromium may be present in the finished cement since the kiln's refractory lining and the steel balls used in the finish-milling operations are possible sources. To improve adhesion, strength, and flexibility, cement may be modified with various plastic latexes. Portland cement is used as a binding agent in concrete (a mixture of cement, gravel, and sand) and mortar. Concrete is cement diluted with 15% sand or other coarse particles, and approximately 3.75% calcium oxide.
Other Designations: CAS No. 65997-15-1, hydraulic cement, portland cement silicate.
Manufacturer: Contact your supplier or distributor. Consult the latest *Chemicalweek Buyers' Guide*^(TM) for a suppliers list.

R 0
I 2
S 3
K 0



HMS
H 2
F 0
R 1
PPG*
* Sec. 8

Cautions: *Portland cement's primary danger is its alkalinity.* Calcium hydroxide, an alkaline, abrasive, and hygroscopic (moisture-absorbing) material, forms when water is added to dry cement. *Acute contact with wet cement may cause extensive burns; chronic exposure may lead to dermatitis.* Severe tissue damage may result if the cement hardens.

Section 2. Ingredients and Occupational Exposure Limits

Portland cement, ca 100%

Average Composition of Portland Cement:

	%
CaO (calcium oxide)	64.0
SiO ₂ (silicon dioxide)	21.0
Al ₂ O ₃ (aluminum oxide)	5.8
Fe ₂ O ₃ [iron (III) oxide]	2.9
MgO (magnesium oxide)	2.5
Alkali Oxides	1.4
SO ₃ (sulfur trioxide)	1.7

1989 OSHA PELs

8-hr TWA: 10 mg/m³ (total dust)

8-hr TWA: 5 mg/m³ (respirable fraction)

1989-90 ACGIH TLV

TLV-TWA: 10 mg/m³ nuisance dust

1988 NIOSH REL

None established

1985-86 Toxicity Data*

None listed

* Monitor NIOSH, RTECS (VV8770000), for future data.

Section 3. Physical Data

Vapor Pressure: Approximately 0 mm

pH: 12 (wet cement)*

Water Solubility: Insoluble

Appearance and Odor: Odorless, gray powder with <1% crystalline silica.

* Cement's alkalinity varies from batch to batch, depending on the excessive calcium oxides the manufacturer uses.

Section 4. Fire and Explosion Data

Flash Point: None reported

Autolgnition Temperature: None reported

LEL: None reported

UEL: None reported

Extinguishing Media: This material is noncombustible. Use extinguishing media appropriate to the surrounding fire.

Special Fire-fighting Procedures: Since fire may produce toxic fumes, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in the pressure-demand or positive-pressure mode. Calcium hydroxide forms when water is added to portland cement. Do not expose skin to wet cement. Be aware of runoff from fire control methods. Do not release to sewers or waterways.

Section 5. Reactivity Data

Stability/Polymerization: Portland cement is stable at room temperature in closed containers under normal storage and handling conditions. Hazardous polymerization cannot occur.

Chemical Incompatibilities: No hazardous incompatibilities are reported.

Hazardous Products of Decomposition: None reported.

Section 6. Health Hazard Data

Carcinogenicity: The NTP, IARC, and OSHA do not list portland cement as a carcinogen.

Summary of Risks: Portland cement is a nuisance dust and skin, eyes, and mucous membrane irritant. Its principle health hazard—with the addition of water—occurs when it forms alkaline, abrasive, hygroscopic (moisture-absorbing) calcium hydroxide (slaked lime). Dry cement alone does not cause an alkaline burn. Some individuals appear to tolerate brief skin contact with wet cement, but others develop extensive skin burns. Repeated and prolonged skin contact can cause dermatitis including skin dryness, fissures, eczematous rashes, and dystrophy of nails. Allergic dermatitis may result from the presence of heavy metals such as chromium in the mixture. In one study, 15 of 95 cement workers reported dermatitis of the hands.

Medical Conditions Aggravated by Long-Term Exposure: Individuals with chronic respiratory disorders or skin diseases should minimize inhalation and skin contact.

Target Organs: Respiratory system, skin, eyes.

Primary Entry Routes: Inhalation, ingestion, skin contact.

Acute Effects: Inhalation symptoms include eye, nose, and upper respiratory tract irritation, cough, expectoration, shortness of breath, and wheezing. Eye contact (splashes) cause burning and possible corneal edema. Direct contact with wet cement may result in extensive skin burns with dermal necrosis. Within 12 to 48 hr after 1- to 6-hr exposures, first, second, and third degree burns may occur. There may be no obvious pain at the time of exposure. Ingestion of the powder or liquid form causes esophagus and stomach burns.

Chronic Effects: Chronic bronchitis and chronic dermatitis may result from chronic exposure. There are reports of x-ray changes without symptoms in cement workers exposed to portland cement. Other studies showing x-ray changes with pulmonary symptoms are noted in workers exposed primarily to the silica-containing products in portland cement. The contact dermatitis it causes may clear up only after a prolonged time after the exposures end.

FIRST AID

Eyes: Gently lift the eyelids and flush immediately and continuously with flooding amounts of water until transported to an emergency medical facility. Consult a physician immediately.

Skin: Quickly remove contaminated clothing. Rinse with flooding amounts of water for at least 15 min. Rinsing the exposed area with dextrose water may slow the hardening process. For reddened or blistered skin, consult a physician. Wash affected area with soap and water. Treat acute dermal reactions to wet cement as you would lye burns. Consult a physician immediately.

Inhalation: Remove exposed person to fresh air and support breathing as needed.

Ingestion: Never give anything by mouth to an unconscious or convulsing person. If ingested, have that conscious person drink 4 to 8 oz. of milk or water. Consult a physician immediately.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Physician's Note: Ingestion of large amounts of cement is unlikely. However, to prevent re-exposing the esophagus and stomach, do not induce emesis or perform gastric lavage. Immediate dilution may prevent esophageal burns. For severe esophageal burns, consider esophagoscopy within the first 24 hr. Neutralization with acidic agents is not advised because of increased risks of exothermic burns. Water-mineral oil soaks may aid in removing hardened cement from the skin. Dried on cement is extremely difficult to remove; surgical debridement and even skin grafting may be necessary. Consult an ophthalmologist for ocular burns. Consider topical mydriatic-cycloplegics to guard against development of posterior synechiae and ciliary spasm.

Section 7. Spill, Leak, and Disposal Procedures

Spill/Leak: Notify safety personnel of spill and provide adequate ventilation. Cleanup personnel should protect against dust inhalation and direct contact with wet cement. Avoid creating airborne dust conditions. Cleanup methods such as vacuuming (with an appropriate filter) or wet mopping minimizes dust dispersion. Carefully scoop spilled dry material into a suitable container (with a secure lid) for disposal or reclamation. Follow applicable OSHA regulations (29 CFR 1910.120).

Disposal: Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.

EPA Designations

RCRA Hazardous Waste (40 CFR 261.33): Not listed

CERCLA Hazardous Substance (40 CFR 302.4): Not listed

SARA Extremely Hazardous Substance (40 CFR 355): Not listed

SARA Toxic Chemical (40 CFR 372.65): Not listed

OSHA Designations

Listed as an Air Contaminant (29 CFR 1910.1000, Table Z-1-A)

Section 8. Special Protection Data

Goggles: Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133).

Respirator: Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a NIOSH-approved respirator. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.*

Other: Wear impervious gloves, boots, aprons, and gauntlets to prevent skin contact.

Ventilation: Provide general and local ventilation systems to maintain airborne concentrations below the OSHA PELs and ACGIH TLV (Sec. 2).

Local exhaust ventilation is preferred since it prevents contaminant dispersion into the work area by controlling it at its source.⁽¹⁰³⁾

Safety Stations: Make available in the work area emergency eyewash stations, safety/quick-drench showers, and washing facilities.

Contaminated Equipment: Never wear contact lenses in the work area: soft lenses may absorb, and all lenses concentrate, irritants. Remove this material from your shoes and equipment. Launder contaminated clothing before wearing.

Comments: Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

Section 9. Special Precautions and Comments

Storage Requirements: Store in tightly closed containers in a cool, dry, well-ventilated area. Protect containers from physical damage.

Engineering Controls: Avoid dust inhalation and direct contact with skin and eyes. Wear gloves, impervious boots, and other protective gear when pouring cement. Institute a respiratory protection program that includes regular training, maintenance, inspection, and evaluation. Differentiate between cement and concrete usage and the degree of hazard. Practice good personal hygiene and housekeeping procedures.

Other Precautions: Provide preplacement and annual physical examinations with emphasis on the respiratory tract, eyes, and skin. Avoid exposing individuals sensitive to hexachromium salts. Adding iron to cements reduces chromium levels.

Transportation Data (49 CFR 172.101, .102): Not listed

MSDS Collection References: 26, 38, 73, 88, 89, 100, 101, 103, 126, 127, 132, 133, 134, 136, 138, 143

Prepared by: MJ Allison, BS; Industrial Hygiene Review: DJ Wilson, CIH; Medical Review: W Silverman, MD; Edited by: JR Stuart, MS

MATERIAL SAFETY DATA SHEET

GENIUM PUBLISHING CORPORATION
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No. 467

AUTOMOTIVE
GASOLINE, LEAD-FREE

Date October 1981

SECTION I. MATERIAL IDENTIFICATION					
<p>MATERIAL NAME: AUTOMOTIVE GASOLINE, LEAD-FREE DESCRIPTION: A volatile blend of hydrocarbons for automotive fuel OTHER DESIGNATIONS: Petrol, CAS #008 006 619, ASTM D439 MANUFACTURER: Available from several suppliers.</p>					
SECTION II. INGREDIENTS AND HAZARDS		%	HAZARD DATA		
<p>Gasoline A hydrocarbon blend that can include normal and branched chain alkanes, cycloalkanes, alkenes, aromatics and other additives.** (Lead max 0.013 g/L, phosphorus max 0.0013 g/L, sulfur max 0.10 wt%. May contain benzene, <5%; see ASTM D3606). *ACGIH 1981 TLV (Intended Changes List). See also Am. Ind. Hyg. A. 39 110-117 (1978) **The composition of fuel is varied with altitude and seasonal requirements for a locality. The blend must meet antiknock requirements. (Antiknock Index min 85, ASTM D439.)</p>		100	<p>8-hr TWA 300 ppm or 900 mg/m³* Man Eye: 500 ppm/1H Moderate irritation Inhalation: TCLo 900 ppm/1H TFX:CNS</p>		
SECTION III. PHYSICAL DATA					
<p>Distillation at 1 atm, Initial, deg C >39 Specific gravity, 60/60 F - 0.72-0.76 50% distilled -- 77-121 Melting point, deg C ----- -90.5-95.4 End point ----- <240 Evaporation rate ----- N/A Vapor density (Air=1) ----- 3.0-4.0 Solubility in water ----- Insoluble</p> <p>Appearance and Odor: A clear, mobile liquid with a characteristic odor which can be recognized at about 10 ppm in air. (Gasoline may be colored with dye.)</p>					
SECTION IV. FIRE AND EXPLOSION DATA				LOWER	UPPER
Flash Point and Method	Autoignition Temp.	Flammability Limits In Air			
-45 F	536-853 F	% by volume		1.4	7.6
<p>Extinguishing Media: Dry chemical, carbon dioxide, alcohol foam. Use of water may be ineffective to extinguish fire, but use water spray for cooling fire-exposed drums and tanks to prevent pressure rupture. It is a dangerous fire and explosion hazard when exposed to heat and flames. Vapors can flow along surfaces, reach distant ignition sources and flash back. Can react violently with oxidizing agents. Firefighters should wear self-contained breathing apparatus and full protective clothing.</p>					
SECTION V. REACTIVITY DATA					
<p>This is a stable material in closed containers at room temperature under normal storage and handling conditions. It does not undergo hazardous polymerization. This is an OSHA Class IA flammable liquid. A mixture of gasoline vapors and air can be explosive. It is incompatible with oxidizing agents. Thermal-oxidative degradation can yield carbon monoxide and partially oxidized hydrocarbons.</p>					

SECTION VI. HEALTH HAZARD INFORMATION

TLV 300 ppm (See Sect. II)

Inhalation causes intense burning of the mucous membranes, throat and respiratory tract; overexposure to vapors can lead to bronchopneumonia. Inhalation of high conc. can cause fatal pulmonary edema. Repeated or prolonged skin exposure causes dermatitis. Can cause blistering of skin due to its defatting properties. Exposure to eyes can cause hyperemia of the conjunctiva.

Ingestion or excessive vapors can cause inebriation, drowsiness, blurred vision, vertigo, confusion, vomiting and cyanosis (2000 ppm produces mild anesthesia in 30 min, higher conc. are intoxicating in less time.) Aspiration after ingestion causes bronchitis, pneumonia, or edema which can be fatal.

FIRST AID:

Eye Contact: Flush thoroughly with running water for 15 min. including under eyelids.

Skin Contact: Remove contaminated clothing. Wash affected area with soap and water.

Inhalation: Remove to fresh air. Restore breathing and administer oxygen if needed.

Ingestion: Do not induce vomiting. Aspiration hazard. Contact physician.

Seek prompt medical assistance for further treatment, observation and support.

SECTION VII. SPILL, LEAK, AND DISPOSAL PROCEDURES

Notify safety personnel of leaks or spills. Remove sources of heat or ignition. Provide adequate ventilation. Clean-up personnel require protection against liquid contact and vapor inhalation. If a leak or spill has not ignited, use water spray to disperse vapors and to protect men attempting to stop the leakage. Contain spill. Do not allow to enter sewer or surface water. Add absorbent solid to small spills or residues and pick up for disposal.

DISPOSAL: Burn scrap material in an approved incinerator. Burn contaminated liquid by spraying into an incinerator. Follow Federal, State, and Local regulations.

SECTION VIII. SPECIAL PROTECTION INFORMATION

Use general and local exhaust ventilation (explosion-proof) to keep vapors below the TLV requirements in the workplace. Respirators should be available for nonroutine or emergency use above the TLV.

Avoid eye contact by use of chemical safety goggles and/or full faceshield where splashing is possible. Wear protective clothing appropriate for the work situation to minimize skin contact such as rubber gloves and boots. Clothing to be changed daily and laundered.

Eyewash fountains, showers and washing facilities should be readily accessible. Provide suitable training to those handling and working with this material.

SECTION IX. SPECIAL PRECAUTIONS AND COMMENTS

Store in closed containers in a cool, dry, well-ventilated area away from sources of heat, ignition and strong oxidizing agents. Protect containers from physical damage.

Avoid direct sunlight. Storage must meet requirements of OSHA Class IA liquid. Outdoor or detached storage preferred. No smoking in areas of use. Prevent static electric sparks and use explosion-proof electrical services. (Must meet code.)

Avoid skin and eye contact. Avoid inhalation of vapors. Wear clean work clothing daily. Indoor use of this material requires exhaust ventilation to remove vapors.

ICC Flammable Liquid, Red Label. LABEL: Flammable Liquid DOT I.D. No. UN 1203.

DOT Classification: FLAMMABLE LIQUID

DATA SOURCE(S) CODE: 2,4-9,34,37

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APPROVALS: MIS
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Industrial Hygiene
and Safety

MEDICAL REVIEW: 14 November 1981



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Material Safety Data Sheets Collection:

Sheet No. 470
Diesel Fuel Oil No. 2-D

Issued: 10/81 Revision: A, 11/90

Section 1. Material Identification

33

Diesel Fuel Oil No. 2-D Description: Diesel fuel is obtained from the middle distillate in petroleum separation; a distillate oil of low sulfur content. It is composed chiefly of unbranched paraffins. Diesel fuel is available in various grades, one of which is synonymous with fuel oil No. 2-D. This diesel fuel oil requires a minimum Cetane No. (efficiency rating for diesel fuel comparable to octane number ratings for gasoline) of 40 (ASTM D613). Used as a fuel for trucks, ships, and other automotive engines; as mosquito control (coating on breeding waters); and for drilling muds.
Other Designations: CAS No. 68334-30-5, diesel fuel.
Manufacturer: Contact your supplier or distributor. Consult the latest *Chemicalweek Buyers' Guide*⁽⁷³⁾ for a suppliers list.

R	1	NFPA
I	-	
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K	2	
HMIS		
H	0	
F	2	
R	0	
PPG*		
		* Sec. 8

Cautions: Diesel fuel oil No. 2-D is a skin irritant and central nervous depressant with high mist concentrations. It is an environmental hazard and moderate fire risk.

Section 2. Ingredients and Occupational Exposure Limits

Diesel fuel oil No. 2-D*

1989 OSHA PEL	1990-91 ACGIH TLV	1988 NIOSH REL	1985-86 Toxicity Data†
None established	Mineral Oil Mist TWA: 5 mg/m ³ † STEL: 10 mg/m ³	None established	Rat, oral, LD ₅₀ : 9 g/kg produces gastrointestinal (hypermotility, diarrhea) effects

* Diesel fuel No. 2-D tends to be low in aromatics and high in paraffinics. This fuel oil is complex mixture of: 1) >95% paraffinic, olefinic, naphthenic, and aromatic hydrocarbons, 2) sulfur (<0.5%), and 3) benzene (<100 ppm). [A low benzene level reduces carcinogenic risk. Fuel oils can be exempted under the benzene standard (29 CFR 1910.1028)]. Although low in the fuel itself, benzene concentrations are likely to be much higher in processing areas.

† As sampled by nonvapor-collecting method.

‡ Monitor NIOSH, RTECS (HZ1800000), for future toxicity data.

Section 3. Physical Data

Boiling Point Range: 340 to 675 °F (171 to 358 °C)	Specific Gravity: <0.86
Viscosity: 1.9 to 4.1 centistoke at 104 °F (40 °C)	Water Solubility: Insoluble
Appearance and Odor: Brown, slightly viscous liquid.	

Section 4. Fire and Explosion Data

Flash Point: 125 °F (52 °C) min.	Autoignition Temperature: >500 °F (932 °C)	LEL: 0.6% v/v	UEL: 7.5% v/v
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Extinguishing Media: Use dry chemical, carbon dioxide, or foam to fight fire. Use a water spray to cool fire exposed containers. Do not use a forced water spray directly on burning oil since this will scatter the fire. Use a smothering technique for extinguishing fire.

Unusual Fire or Explosion Hazards: Diesel fuel oil No. 2-D is a OSHA Class II combustible liquid. Its volatility is similar to that of gas oil. Vapors may travel to a source of ignition and flash back.

Special Fire-fighting Procedures: Isolate hazard area and deny entry. Since fire may produce toxic fumes, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in the pressure-demand or positive-pressure mode and full protective clothing. If feasible, remove containers from fire. Be aware of runoff from fire control methods. Do not release to sewers or waterways due to pollution and fire or explosion hazard.

Section 5. Reactivity Data

Stability/Polymerization: Diesel fuel oil No. 2-D is stable at room temperature in closed containers under normal storage and handling conditions. Hazardous polymerization cannot occur.

Chemical Incompatibilities: It is incompatible with strong oxidizing agents; heating greatly increases the fire hazard.

Conditions to Avoid: Avoid heat and ignition sources.

Hazardous Products of Decomposition: Thermal oxidative decomposition of diesel fuel oil No. 2-D can produce various hydrocarbons and hydrocarbon derivatives, and other partial oxidation products such as carbon dioxide, carbon monoxide, and sulfur dioxide.

Section 6. Health Hazard Data

Carcinogenicity: Although the IARC has not assigned an overall evaluation to diesel fuels as a group, it has evaluated occupational exposures in petroleum refining as an IARC probable human carcinogen (Group 2A). It has evaluated distillate (light) diesel oils as not classifiable as human carcinogens (Group 3).

Summary of Risks: Although diesel fuel's toxicologic effects should resemble kerosine's, they are somewhat more pronounced due to additives such as sulfurized esters. Excessive inhalation of aerosol or mist can cause respiratory tract irritation, headache, dizziness, nausea, vomiting, and loss of coordination, depending on concentration and exposure time. When removed from exposure area, affected persons usually recover completely. If vomiting occurs after ingestion and if oil is aspirated into the lungs, hemorrhaging and pulmonary edema, progressing to renal involvement and chemical pneumonitis, may result. A comparative ratio of oral to aspirated lethal doses may be 1 pt vs. 5 ml. Aspiration may also result in transient CNS depression or excitement. Secondary effects may include hypoxia (insufficient oxygen in body cells), infection, pneumatocele formation, and chronic lung dysfunction. Inhalation may result in euphoria, cardiac dysrhythmias, respiratory arrest, and CNS toxicity. Prolonged or repeated skin contact may irritate hair follicles and block sebaceous glands, producing a rash of acne pimples and spots, usually on arms and legs.

Medical Conditions Aggravated by Long-Term Exposure: None reported.

Target Organs: Central nervous system, skin, and mucous membranes.

Primary Entry Routes: Inhalation, ingestion.

Acute Effects: Systemic effects from ingestion include gastrointestinal irritation, vomiting, diarrhea, and in severe cases central nervous system depression, progressing to coma or death. Inhalation of aerosols or mists may result in increased rate of respiration, tachycardia (excessively rapid heart beat), and cyanosis (dark purplish discoloration of the skin and mucous membranes caused by deficient blood oxygenation).

Chronic Effects: Repeated contact with the skin causes dermatitis.

FIRST AID

Eyes: Gently lift the eyelids and flush immediately and continuously with flooding amounts of water until transported to an emergency medical facility. Consult a physician immediately.

Skin: *Quickly* remove contaminated clothing. Rinse with flooding amounts of water for at least 15 min. If large areas of the body have been exposed or if irritation persists, get medical help immediately. Wash affected area with soap and water.

Inhalation: Remove exposed person to fresh air and support breathing as needed.

Ingestion: Never give anything by mouth to an unconscious or convulsing person. If ingested, *do not induce vomiting* due to aspiration hazard. Contact a physician immediately. Position to avoid aspiration.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: Gastric lavage is contraindicated due to aspiration hazard. Preferred antidotes are charcoal and milk. In cases of severe aspiration pneumonitis, consider monitoring arterial blood gases to ensure adequate ventilation. Observe the patient for 6 hr. If vital signs become abnormal or symptoms develop, obtain a chest x-ray.

Section 7. Spill, Leak, and Disposal Procedures

Spill/Leak: Notify safety personnel, evacuate area for large spills, remove all heat and ignition sources, and provide maximum explosion-proof ventilation. Cleanup personnel should protect against vapor inhalation and liquid contact. Clean up spills promptly to reduce fire or vapor hazards. Use a noncombustible absorbent material to pick up small spills or residues. For large spills, dike far ahead to contain. Pick up liquid for reclamation or disposal. Do not release to sewers or waterways due to health and fire and/or explosion hazard. Follow applicable OSHA regulations (29 CFR 1910.120). Diesel fuel oil No. 2-D spills may be environmental hazards. Report large spills.

Disposal: Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.

EPA Designations

RCRA Hazardous Waste (40 CFR 261.21): Ignitable waste

CERCLA Hazardous Substance (40 CFR 302.4): Not listed

SARA Extremely Hazardous Substance (40 CFR 355): Not listed

SARA Toxic Chemical (40 CFR 372.65): Not listed

OSHA Designations

Air Contaminant (29 CFR 1910.1000, Subpart Z): Not listed

Section 8. Special Protection Data

Goggles: Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133).

Respirator: Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, use a NIOSH-approved respirator with a mist filter and organic vapor cartridge. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.*

Other: Wear impervious gloves, boots, aprons, and gauntlets to prevent skin contact.

Ventilation: Provide general and local explosion-proof ventilation systems to maintain airborne concentrations that promote worker safety and productivity. Local exhaust ventilation is preferred since it prevents contaminant dispersion into the work area by controlling it at its source.⁽¹⁰⁾

Safety Stations: Make available in the work area emergency eyewash stations, safety/quick-drench showers, and washing facilities.

Contaminated Equipment: Never wear contact lenses in the work area: soft lenses may absorb, and all lenses concentrate, irritants. Remove this material from your shoes and equipment. Launder contaminated clothing before wearing.

Comments: Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

Section 9. Special Precautions and Comments

Storage Requirements: Use and storage conditions should be suitable for a OSHA Class II combustible liquid. Store in closed containers in a well-ventilated area away from heat and ignition sources and strong oxidizing agents. Protect containers from physical damage. To prevent static and explosion-proof electrical equipment. No smoking in storage or use areas.

Engineering Controls: Avoid vapor or mist inhalation and prolonged skin contact. Wear protective rubber gloves and chemical safety glasses where contact with liquid or high mist concentration may occur. Additional suitable protective clothing may be required depending on working conditions. Institute a respiratory protection program that includes regular training, maintenance, inspection, and evaluation. Practice good personal hygiene and housekeeping procedures. Do not wear oil contaminated clothing. At least weekly laundering of work clothes is recommended. Do not put oily rags in pockets. When working with this material, wear gloves or use barrier cream.

Transportation Data (49 CFR 172.101)

DOT Shipping Name: Fuel oil

DOT Hazard Class: Combustible liquid

ID No.: NA1993

DOT Label: None

DOT Packaging Exceptions: 173.118a

DOT Packaging Requirements: None

MSDS Collection References: 1, 6, 7, 12, 73, 84, 101, 103, 126, 127, 132, 133, 136, 143, 146

Prepared by: MJ Allison, BS; **Industrial Hygiene Review:** DJ Wilson, CIH; **Medical Review:** AC Darlington, MD; **Edited by:** JR Stuart, MS

Material Safety Data Sheet

From Genium's Reference Collection
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No. 323

ETHYLENE GLYCOL
(Revision C)
Issued: November 1980
Revised: August 1988

SECTION 1. MATERIAL IDENTIFICATION

26

Material Name: ETHYLENEGLYCOL

Description (Origin/Uses): Used as an antifreeze in heating and cooling systems; as an industrial humectant (a substance that promotes retention of moisture); as a solvent in the paint and plastics industries; in the formulation of inks; in the synthesis of safety explosives, plasticizers, elastomers, synthetic fibers (Dacron), and in synthetic waxes.



NFPA

Other Designations: 1,2-Ethandiol; C₂H₆O₂; CAS No. 0107-21-1

HMS

H 2

F 1

R 0

PPG*

*See sect. 8

R 1

I 3

S 2

K 1

Manufacturer: Contact your supplier or distributor. Consult the latest edition of the *Chemicalweek Buyers' Guide* (Genium ref. 73) for a list of suppliers.

SECTION 2. INGREDIENTS AND HAZARDS

%

EXPOSURE LIMITS

Ethylene Glycol, CAS No. 0107-21-1

Ca 100

ACGIH TLV, 1987-88

TLV-Ceiling: 50 ppm, 125 mg/m³ (Vapor and Mist)

Toxicity Data*

Human, Oral, LD₅₀: 786 mg/kg

Human, Inhalation, TC₅₀: 10000 mg/kg

*See NIOSH, RTECS (KW2975000), for additional data with references to reproductive, irritative, and mutagenic effects.

SECTION 3. PHYSICAL DATA

Boiling Point: 387°F(197°C)

Melting Point: 9°F(-13°C)

Vapor Pressure: 0.06 Torr at 68°F(20°C)

Water Solubility (%): Miscible

Molecular Weight: 62 Grams/Mole

Specific Gravity (H₂O = 1): 1.1135 at 68°F(20°C)

Appearance and Odor: A clear, colorless, syrupy, hygroscopic liquid; odorless; sweet taste. (Caution: This is a poisonous material; do not taste it.)

SECTION 4. FIRE AND EXPLOSION DATA

LOWER

UPPER

Flash Point and Method

Autoignition Temperature

Flammability Limits in Air

240°F (115°C)

748°F (398°C)

% by Volume

3.2

Not Found

Extinguishing Media: Use dry chemical, carbon dioxide, water spray, or "alcohol" foam (especially for large fires). Use a water spray to cool fire-exposed containers, to flush spills away from sensitive exposures (sources of ignition), or to dilute spills to nonflammable mixtures.

Unusual Fire or Explosion Hazards: Ethylene glycol that is heated or misted into the air presents a moderate fire and explosion hazard.

Special Fire-fighting Procedures: Wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in the pressure-demand or positive-pressure mode.

SECTION 5. REACTIVITY DATA

Ethylene glycol is a stable, noncorrosive liquid during routine work operations; however, its flammability hazards increase when ethylene glycol is heated or misted into the air during nonroutine work operations. It cannot undergo hazardous polymerization.

Chemical Incompatibilities: Ethylene glycol can react dangerously with chlorosulfonic acid, oleum, sulfuric acid, and strong oxidizing agents.

Conditions to Avoid: Avoid direct contact with incompatible chemicals or exposure to sources of ignition.

Hazardous Products of Decomposition: Toxic gases such as carbon monoxide (CO) can be produced during fires involving ethylene glycol.

SECTION 6. HEALTH HAZARD INFORMATION

Ethylene glycol is not listed as a carcinogen by the NTP, IARC, or OSHA.

Summary of Risks: Ethylene glycol is poisonous by ingestion, inhalation, and skin absorption. Its effects are similar to those of ethyl alcohol intoxication: stimulation followed by depression of the central nervous system (CNS). Inhalation of ethylene glycol vapor or mist can cause irritation of the upper respiratory tract, or URT, (difficulty in breathing, coughing, burning in chest, or pulmonary edema).

Ingestion, if not fatal, can cause lack of appetite, spastic motion of the eyeballs, dizziness, abdominal pain, respiratory arrest or cardiovascular collapse, coma, or acute renal failure with uremia. Skin absorption can also contribute to the systemic poisoning. People who drank 3 to 4 ounces of ethylene glycol and survived the initial acute effects because of quick emergency response died later (3 to 17 days) from kidney failure. **Medical Conditions Aggravated by Long-Term Exposure:** None reported. **Target Organs:** Kidneys, CNS, URT, eyes. **Primary Entry:** Inhalation, skin contact/absorption. **Acute Effects:** Irritation of the eyes, nose, throat, and URT. **Chronic Effects:** None reported.

FIRST AID: **Eyes.** Immediately flush eyes, including under the eyelids, gently but thoroughly with plenty of running water for at least 15 minutes. **Skin.** Rinse the area with water and then wash it with soap and water. **Inhalation.** Remove the exposed person to fresh air; restore and/or support his or her breathing as needed. Have medical personnel administer oxygen as required. **Ingestion.** Give the exposed person three glasses of milk or water to drink; induce vomiting at once.

GET MEDICAL HELP (IN PLANT, PARAMEDIC, COMMUNITY) FOR ALL EXPOSURES. Seek prompt medical assistance for further treatment, observation, and support after first aid. **NOTE TO PHYSICIAN:** Carefully monitor fluids and electrolytes. Prevent oxalate deposition by forcing diuresis. Correct metabolic acidosis. Delayed (12 to 24 hours) cardiopulmonary effects such as tachypnea (increased rate of respiration), tachycardia (rapid heart action), mild hypertension, cyanosis, and cardiac failure with pulmonary edema are possible. Urinalysis for oxalic acid, a metabolic product of absorbed ethylene glycol, can be used to diagnose poisoning by ingestion. Monitor the functions of the kidneys, heart, respiratory system, and the CNS. Intravenous ethanol therapy may inhibit formation of toxic metabolites.

SECTION 7. SPILL, LEAK, AND DISPOSAL PROCEDURES

Spill/Leak: Notify safety personnel; provide adequate ventilation. Normal ventilation may be acceptable if the ethylene glycol liquid is at room temperature and is not misted into the air. Cleanup personnel need protection against skin contact with the liquid and inhalation of its vapor (see sect. 8). Contain large spills and collect waste. Wash residues of small spills to a sewer with large quantities of water.

Waste Disposal: Large quantities of ethylene glycol may be disposed of by mixing the material with more flammable solvents and atomizing the mixture into an incinerator. Contact your supplier or a licensed contractor for detailed recommendations. Follow Federal, state, and local regulations. Consider recycling or destruction of this material.

OSHA Designations

Air Contaminant (29 CFR 1910.1000 Subpart Z): Not Listed

EPA Designations (40 CFR 302.4): Not Listed

SECTION 8. SPECIAL PROTECTION INFORMATION

Goggles: Always wear protective eyeglasses or chemical safety goggles. Where splashing of ethylene glycol is possible, wear a full face shield. Follow OSHA eye- and face-protection regulations (29 CFR 1910.133). **Respirator:** Wear a NIOSH-approved respirator per the *NIOSH Pocket Guide to Chemical Hazards* (Genium ref. 88) for the maximum-use concentrations and/or the exposure limits cited in section 2. Follow OSHA respirator regulations (29 CFR 1910.134). For emergency or nonroutine operations (spills or cleaning reactor vessels and storage tanks), wear an SCBA. **Warning:** Air-purifying respirators will *not* protect workers in oxygen-deficient atmospheres.

Other: Wear impervious gloves, boots, aprons, and gauntlets, etc., to prevent excessive or prolonged skin contact. **Ventilation:** Install and operate general and local exhaust-ventilation systems powerful enough to maintain airborne levels of ethylene glycol below the ACGIH TLV cited in section 2. Design all ventilation systems to be explosion proof in order to minimize sources of ignition. Airborne concentrations of this material are likely to be low because of its low vapor pressure unless it is heated. **Safety Stations:** Make emergency eyewash stations, safety/quick-drench showers, and washing facilities available in work areas. **Contaminated**

Equipment: Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them. Do *not* wear contact lenses in any work area. Remove contaminated clothing and launder it before wearing it again; clean this material from shoes and equipment. **Comments:** Practice good personal hygiene; always wash thoroughly after using this material. Keep it off your clothing and equipment. Avoid transferring it from your hands to your mouth while eating, drinking, or smoking. Do *not* eat, drink, or smoke in any work area. Avoid skin contact with this material; do not inhale its vapor or mist.

SECTION 9. SPECIAL PRECAUTIONS AND COMMENTS

Storage/Segregation: Store ethylene glycol in closed containers in a cool, dry, well-ventilated area away from sources of ignition and incompatible chemicals (see sect. 5). Some containers can affect the color of this material; to avoid this, use resin-coated steel, glass, aluminum, or stainless steel containers for storage. Otherwise, mild steel is sufficient. Keep containers tightly closed to prevent moisture contamination.

Special Handling/Storage: Protect containers from physical damage. Test a small amount of ethylene glycol for moisture content before using this material in bulk operations.

Comments: Ethylene glycol is poisonous; do not take it internally. Toxic airborne concentrations are not likely to occur at room temperature; however, heated and mechanically agitated solutions are likely to produce enough airborne ethylene glycol vapor to cause poisoning in exposed workers. These situations require effective local exhaust-ventilation systems.

Transportation Data (49 CFR 172.101-2): Not Listed

References: 1, 84, 86-94, 100, 112, 113, 114.

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Appendix D

DEPARTMENT OF LABOR

Occupational Safety and Health Administration

29 CFR Part 1926

[Docket No. H-004L]

Lead Exposure in Construction

AGENCY: Occupational Safety And Health Administration (OSHA), Labor.

ACTION: Interim final rule.

SUMMARY: This interim final rule amends the Occupational Safety and Health Administration (OSHA) standards for occupational health and environmental controls in subpart D of 29 CFR part 1926 by adding a new § 1926.62 containing employee protection requirements for construction workers exposed to lead.

This standard reduces the permitted level of exposure to lead for construction workers from 200 micrograms per cubic meter of air (200 $\mu\text{g}/\text{m}^3$) as an 8-hour time weighted average (TWA) to an 8-hour TWA of 50 $\mu\text{g}/\text{m}^3$. The standard also includes requirements addressing exposure assessment, methods of compliance, respiratory protection, protective clothing and equipment, hygiene facilities and practices, medical surveillance, medical removal protection, employee information and training, signs, recordkeeping, and observation of monitoring. An action level of 30 $\mu\text{g}/\text{m}^3$ as an 8-hour TWA is established as the level at which employers must initiate certain compliance activities. In instances where employers can demonstrate that employee exposures are below 30 $\mu\text{g}/\text{m}^3$ as an 8-hour TWA, the employer is not obligated to comply with most of the requirements in this interim final rule.

This interim final rule is mandated by, and issued under the exclusive authority of, title X, subtitle C, sections 1031 and 1032, Worker Protection, of the Housing and Community Development Act of 1992.

DATES: This interim final standard shall become effective June 3, 1993. Start-up dates for various provisions are set forth in paragraph (r) of the standard (§ 1926.62(r)).

FOR FURTHER INFORMATION CONTACT: Mr. James F. Foster, U.S. Department of Labor, Occupational Safety and Health Administration, Office of Public Affairs, room N-3647, 200 Constitution Avenue, NW., Washington, DC 20210. Telephone (202) 219-8151.

SUPPLEMENTARY INFORMATION:

I. Background

In 1971, in accordance with section 6(a) of the OSH Act, OSHA adopted standards incorporating a permissible exposure limit (PEL) of 200 $\mu\text{g}/\text{m}^3$ to regulate occupational exposure to lead in general industry (29 CFR 1910.1000) and in the construction industry (29 CFR 1926.55). In both standards, the PEL had to be achieved by engineering and work practice controls. Some years later in 1978, after a section 6(b) rulemaking, OSHA promulgated a final lead standard for general industry (29 CFR 1910.1025), which lowered the PEL to 50 $\mu\text{g}/\text{m}^3$. The 1978 lead standard also required that the PEL be achieved, to the extent feasible, by engineering and work practice controls and in addition included a number of ancillary provisions requiring employers to provide medical surveillance, medical removal protection (MRP), hygiene facilities, appropriate respirators, and air monitoring, among other things.

The 1978 lead standard in paragraph (a) excluded the construction industry from its coverage. OSHA in the preamble explained that it had exempted the industry because of insufficient information in the record to resolve issues raised about the applicability of the standard to conditions in the construction industry. OSHA said it would request the Construction Advisory Committee (ACCSH) to review the record and make recommendations for a lead standard for the construction industry (43 FR 52986, November 14, 1978).

Subsequently, OSHA's exemption of the construction industry was challenged in litigation involving the lead standard for general industry. In response to that challenge, the court upheld OSHA's decision. Although the court declared that "OSHA would be shirking its statutory responsibilities if it made no effort to protect workers in the construction industry from lead exposure * * * the court accepted OSHA's assurances at the time "that it will take reasonably prompt steps to fashion this protection", and indicated that "So long as it does so, OSHA has met its duty." "Nothing in the Act," the court said, "prevents the agency from exercising discretion in delaying specific standards according to the unique problems of specific industries. * * * (United Steelworkers of America v. Marshall, 647 F.2d 1189, 1310 (DC Cir. 1980).)

Since 1979, employers have been required to comply with a PEL for lead in the construction industry that is four times the PEL for general industry.

Employers have also been required to take other actions to protect construction workers from excess lead exposure to the extent that employers' obligations to provide respirators, protective clothing, hygiene facilities, training, and the like were imposed by generic standards that covered construction (e.g., 1910.20; 1910.94; 1910.134; 1926.20; 1926.21; 1926.28; 1926.51; 1926.55; 1926.57; 1926.59; 1926.103; 1926.200; 1926.353; 1926.354). However, there has still been no comprehensive standard regulating occupational lead exposure in construction.

In 1990, NIOSH set as a national goal the elimination of exposures that result in workers having blood lead concentrations greater than 25 $\mu\text{g}/\text{dL}$ of whole blood. Under these circumstances, OSHA in the fall of 1990 announced it would begin to develop a proposal for a comprehensive standard regulating occupational lead exposure in construction. In addition, on June 12, 1992 OSHA proposed to amend its existing air contaminants standards by, among other things, reducing the PEL for occupational lead exposure in construction from 200 $\mu\text{g}/\text{m}^3$ to 50 $\mu\text{g}/\text{m}^3$ (57 FR 26001). However, progress on that air contaminants proposal was suspended because of the decision by the U.S. Court of Appeals for the Eleventh Circuit vacating an earlier rule on air contaminants for general industry (*AFL-CIO v. OSHA* 965 F.2d, 962 (1992)).

The Housing and Community Development Act of 1992

Because Congress did not anticipate publication of OSHA's proposed comprehensive lead standard for the construction industry before late spring of 1993 or publication of a final standard before 1996 (House Report on H.R. 5730, pp. 14-15), Congress in October 1992 passed Sections 1031 and 1032 of Title X of the Housing and Community Development Act of 1992 ("the Act," Pub. L. 102-550, signed by the President on October 28, 1992, 106 Stat. 3924).

In those sections, Congress included worker protection provisions expressly requiring that:

(1) No later than 180 days after enactment (April 26, 1993), the Secretary of Labor must issue an interim final lead standard covering the construction industry.

(2) The standard must be as protective as the worker protection guidelines for identification and abatement of lead-based paint in public and Indian housing issued by the Department of Housing and Urban Development . . .

regarding this burden estimate, or any other aspect of this collection of information, including suggestions for reducing this burden, to the Office of Information Management, Department of Labor, room N-1301, 200 Constitution Avenue NW., Washington DC, 20210; and to the Office of Management and Budget, Paperwork Reduction Project (Lead Interim Final Rule), Washington, DC, 20503.

IX. Signature

Signed at Washington, DC, this 26 day of April, 1993.

David C. Zeigler,

Acting Assistant Secretary of Labor for Occupational Safety and Health.

Accordingly, 29 CFR part 1926 is amended as follows:

PART 1926—OCCUPATIONAL SAFETY AND HEALTH STANDARDS

1. The authority citation for subpart D of 29 CFR part 1926 is amended by adding the following:

Authority: * * * Section 1926.62 issued under sec. 1031 of the Housing and Community Development Act of 1992 (sec. 1031, title X, 166 Stat. 3924 (42 U.S.C. 4853)).

2. By adding a new § 1926.62, with Appendices A, B, C, and D to subpart D to read as follows:

§ 1926.62 Lead

(a) *Scope.* This section applies to all construction work where an employee may be occupationally exposed to lead. All construction work excluded from coverage in the general industry standard for lead by 29 CFR 1910.1025(a)(2) is covered by this standard. Construction work is defined as work for construction, alteration and/or repair, including painting and decorating. It includes but is not limited to the following:

- (1) Demolition or salvage of structures where lead or materials containing lead are present;
- (2) Removal or encapsulation of materials containing lead;
- (3) New construction, alteration, repair, or renovation of structures, substrates, or portions thereof, that contain lead, or materials containing lead;
- (4) Installation of products containing lead;
- (5) Lead contamination/emergency cleanup;
- (6) Transportation, disposal, storage, or containment of lead or materials containing lead on the site or location at which construction activities are performed, and
- (7) Maintenance operations associated with the construction activities

described in this paragraph.

(b) Definitions.

Action level means employee exposure, without regard to the use of respirators, to an airborne concentration of lead of 30 micrograms per cubic meter of air ($30 \mu\text{g}/\text{m}^3$) calculated as an 8-hour time-weighted average (TWA).

Assistant Secretary means the Assistant Secretary of Labor for Occupational Safety and Health, U.S. Department of Labor, or designee.

Competent person means one who is capable of identifying existing and predictable lead hazards in the surroundings or working conditions and who has authorization to take prompt corrective measures to eliminate them.

Director means the Director, National Institute for Occupational Safety and Health (NIOSH), U.S. Department of Health and Human Services, or designee.

Lead means metallic lead, all inorganic lead compounds, and organic lead soaps. Excluded from this definition are all other organic lead compounds.

This section means this standard.

(c) *Permissible exposure limit.* (1) The employer shall assure that no employee is exposed to lead at concentrations greater than fifty micrograms per cubic meter of air ($50 \mu\text{g}/\text{m}^3$) averaged over an 8-hour period.

(2) If an employee is exposed to lead for more than 8 hours in any work day the employees' allowable exposure, as a time weighted average (TWA) for that day, shall be reduced according to the following formula:

Allowable employee exposure ($\mu\text{g}/\text{m}^3$) = 400 divided by hours worked in the day.

(3) When respirators are used to limit employee exposure as required under paragraph (c) of this section and all the requirements of paragraphs (e)(1) and (f) of this section have been met, employee exposure may be considered to be at the level provided by the protection factor of the respirator for those periods the respirator is worn. Those periods may be averaged with exposure levels during periods when respirators are not worn to determine the employee's daily TWA exposure.

(d) Exposure assessment—(1) General.

(i) Each employer who has a workplace or operation covered by this standard shall initially determine if any employee may be exposed to lead at or above the action level.

(ii) For the purposes of paragraph (d) of this section, employee exposure is that exposure which would occur if the employee were not using a respirator.

(iii) With the exception of monitoring under paragraph (d)(3), where

monitoring is required under this section, the employer shall collect personal samples representative of a full shift including at least one sample for each job classification in each work area either for each shift or for the shift with the highest exposure level.

(iv) Full shift personal samples shall be representative of the monitored employee's regular, daily exposure to lead.

(2) Protection of employees during assessment of exposure.

(i) With respect to the lead related tasks listed in paragraph (d)(2)(i) of this section, where lead is present, until the employer performs an employee exposure assessment as required in paragraph (d) of this section and documents that the employee performing any of the listed tasks is not exposed above the PEL, the employer shall treat the employee as if the employee were exposed above the PEL, and not in excess of ten (10) times the PEL, and shall implement employee protective measures prescribed in paragraph (d)(2)(v) of this section. The tasks covered by this requirement are:

(A) Where lead containing coatings or paint are present: Manual demolition of structures (e.g. dry wall), manual scraping, manual sanding, heat gun applications, and power tool cleaning with dust collection systems;

(B) Spray painting with lead paint

(ii) In addition, with regard to tasks not listed in paragraph (d)(2)(i), where the employee has any reason to believe that an employee performing the task may be exposed to lead in excess of the PEL, until the employer performs an employee exposure assessment as required by paragraph (d) of this section and documents that the employee's lead exposure is not above the PEL the employer shall treat the employee as if the employee were exposed above the PEL and shall implement employee protective measures as prescribed in paragraph (d)(2)(v) of this section.

(iii) With respect to the tasks listed in paragraph (d)(2)(iii) of this section, where lead is present, until the employer performs an employee exposure assessment as required in paragraph (d) of this section, and documents that the employee performing any of the listed tasks is not exposed in excess of $500 \mu\text{g}/\text{m}^3$, the employer shall treat the employee as if the employee were exposed to lead in excess of $500 \mu\text{g}/\text{m}^3$ and shall implement employee protective measures as prescribed in paragraph (d)(2)(v) of this section. Where the employer does establish that the employee is exposed to levels of lead below $500 \mu\text{g}/\text{m}^3$, the employer may

provide the exposed employee with the appropriate respirator prescribed for such use at such lower exposures, in accordance with Table 1 of this section. The tasks covered by this requirement are:

(A) Using lead containing mortar; lead burning

(B) Where lead containing coatings or paint are present: rivet busting; power tool cleaning without dust collection systems; cleanup activities where dry expendable abrasives are used; and abrasive blasting enclosure movement and removal.

(iv) With respect to the tasks listed in paragraph (d)(2)(iv) of this section, where lead is present, until the employer performs an employee exposure assessment as required in paragraph (d) of this section and documents that the employee performing any of the listed tasks is not exposed to lead in excess of 2,500 µg/m³ (50×PEL), the employer shall treat the employee as if the employee were exposed to lead in excess of 2,500 µg/m³ and shall implement employee protective measures as prescribed in paragraph (d)(2)(v) of this section. Where the employer does establish that the employee is exposed to levels of lead below 2,500 µg/m³, the employer may provide the exposed employee with the appropriate respirator prescribed for use at such lower exposures, in accordance with Table I of this section. Interim protection as described in this paragraph is required where lead containing coatings or paint are present on structures when performing:

- (A) Abrasive blasting,
- (B) Welding,
- (C) Cutting, and
- (D) Torch burning.

(v) Until the employer performs an employee exposure assessment as required under paragraph (d) of this section and determines actual employee exposure, the employer shall provide to employees performing the tasks described in paragraphs (d)(2)(i), (d)(2)(ii), (d)(2)(iii), and (d)(2)(iv) of this section with interim protection as follows:

(A) Appropriate respiratory protection in accordance with paragraph (f) of this section.

(B) Appropriate personal protective clothing and equipment in accordance with paragraph (g) of this section.

(C) Change areas in accordance with paragraph (i)(2) of this section.

(D) Hand washing facilities in accordance with paragraph (i)(5) of this section.

(E) Biological monitoring in accordance with paragraph (j)(1)(i) of this section, to consist of blood

sampling and analysis for lead and zinc protoporphyrin levels, and

(F) Training as required under paragraph (l)(1)(i) of this section regarding 29 CFR 1926.59, Hazard Communication; training as required under paragraph (l)(2)(ii)(C) of this section, regarding use of respirators; and training in accordance with 29 CFR 1926.21, Safety training and education.

(3) *Basis of initial determination.* (i) Except as provided under paragraphs (d)(3)(iii) and (d)(3)(iv) of this section the employer shall monitor employee exposures and shall base initial determinations on the employee exposure monitoring results and any of the following, relevant considerations:

(A) Any information, observations, or calculations which would indicate employee exposure to lead;

(B) Any previous measurements of airborne lead; and

(C) Any employee complaints of symptoms which may be attributable to exposure to lead.

(ii) Monitoring for the initial determination where performed may be limited to a representative sample of the exposed employees who the employer reasonably believes are exposed to the greatest airborne concentrations of lead in the workplace.

(iii) Where the employer has previously monitored for lead exposures, and the data were obtained within the past 12 months during work operations conducted under workplace conditions closely resembling the processes, type of material, control methods, work practices, and environmental conditions used and prevailing in the employer's current operations, the employer may rely on such earlier monitoring results to satisfy the requirements of paragraphs (d)(3)(i) and (d)(6) of this section if the sampling and analytical methods meet the accuracy and confidence levels of paragraph (d)(10) of this section.

(iv) Where the employer has objective data, demonstrating that a particular product or material containing lead or a specific process, operation or activity involving lead cannot result in employee exposure to lead at or above the action level during processing, use, or handling, the employer may rely upon such data instead of implementing initial monitoring.

(A) The employer shall establish and maintain an accurate record documenting the nature and relevancy of objective data as specified in paragraph (n)(4) of this section, where used in assessing employee exposure in lieu of exposure monitoring.

(B) Objective data, as described in paragraph (d)(3)(iv) of this section, is

not permitted to be used for exposure assessment in connection with paragraph (d)(2) of this section.

(4) *Positive initial determination and initial monitoring.*

(i) Where a determination conducted under paragraphs (d) (1), (2) and (3) of this section shows the possibility of any employee exposure at or above the action level the employer shall conduct monitoring which is representative of the exposure for each employee in the workplace who is exposed to lead.

(ii) Where the employer has previously monitored for lead exposure, and the data were obtained within the past 12 months during work operations conducted under workplace conditions closely resembling the processes, type of material, control methods, work practices, and environmental conditions used and prevailing in the employer's current operations, the employer may rely on such earlier monitoring results to satisfy the requirements of paragraph (d)(4)(i) of this section if the sampling and analytical methods meet the accuracy and confidence levels of paragraph (d)(10) of this section.

(5) *Negative initial determination.* Where a determination, conducted under paragraphs (d) (1), (2), and (3) of this section is made that no employee is exposed to airborne concentrations of lead at or above the action level the employer shall make a written record of such determination. The record shall include at least the information specified in paragraph (d)(3)(i) of this section and shall also include the date of determination, location within the worksite, and the name and social security number of each employee monitored.

(6) *Frequency.* (i) If the initial determination reveals employee exposure to be below the action level further exposure determination need not be repeated except as otherwise provided in paragraph (d)(7) of this section.

(ii) If the initial determination or subsequent determination reveals employee exposure to be at or above the action level but at or below the PEL the employer shall perform monitoring in accordance with this paragraph at least every 6 months. The employer shall continue monitoring at the required frequency until at least two consecutive measurements, taken at least 7 days apart, are below the action level at which time the employer may discontinue monitoring for that employee except as otherwise provided in paragraph (d)(7) of this section.

(iii) If the initial determination reveals that employee exposure is above the PEL the employer shall perform

monitoring quarterly. The employer shall continue monitoring at the required frequency until at least two consecutive measurements, taken at least 7 days apart, are at or below the PEL but at or above the action level at which time the employer shall repeat monitoring for that employee at the frequency specified in paragraph (d)(6)(ii) of this section, except as otherwise provided in paragraph (d)(7) of this section. The employer shall continue monitoring at the required frequency until at least two consecutive measurements, taken at least 7 days apart, are below the action level at which time the employer may discontinue monitoring for that employee except as otherwise provided in paragraph (d)(7) of this section.

(7) *Additional exposure assessments.* Whenever there has been a change of equipment, process, control, personnel or a new task has been initiated that may result in additional employees being exposed to lead at or above the action level or may result in employees already exposed at or above the action level being exposed above the PEL, the employer shall conduct additional monitoring in accordance with this paragraph.

(8) *Employee notification.* (i) Within 5 working days after completion of the exposure assessment the employer shall notify each employee in writing of the results which represent that employee's exposure.

(ii) Whenever the results indicate that the representative employee exposure, without regard to respirators, is at or above the PEL the employer shall include in the written notice a statement that the employee's exposure was at or above that level and a description of the corrective action taken or to be taken to reduce exposure to below that level.

(9) *Accuracy of measurement.* The employer shall use a method of monitoring and analysis which has an accuracy (to a confidence level of 95%) of not less than plus or minus 25 percent for airborne concentrations of lead equal to or greater than $30\mu\text{g}/\text{m}^3$.

(e) *Methods of compliance* (1) *Engineering and work practice controls.* The employer shall implement engineering and work practice controls, including administrative controls, to reduce and maintain employee exposure to lead to or below the permissible exposure limit to the extent that such controls are feasible. Wherever all feasible engineering and work practice controls that can be instituted are not sufficient to reduce employee exposure to or below the permissible exposure limit prescribed in paragraph (c) of this section, the employer shall nonetheless

use them to reduce employee exposure to the lowest feasible level and shall supplement them by the use of respiratory protection that complies with the requirements of paragraph (f) of this section.

(2) *Compliance program.* (i) Prior to commencement of the job each employer shall establish and implement a written compliance program to achieve compliance with paragraph (c) of this section.

(ii) Written plans for these compliance programs shall include at least the following:

(A) A description of each activity in which lead is emitted; e.g. equipment used, material involved, controls in place, crew size, employee job responsibilities, operating procedures and maintenance practices;

(B) A description of the specific means that will be employed to achieve compliance and, where engineering controls are required engineering plans and studies used to determine methods selected for controlling exposure to lead;

(C) A report of the technology considered in meeting the PEL;

(D) Air monitoring data which documents the source of lead emissions;

(E) A detailed schedule for implementation of the program, including documentation such as copies of purchase orders for equipment, construction contracts, etc.;

(F) A work practice program which includes items required under paragraphs (g), (h) and (i) of this section and incorporates other relevant work practices such as those specified in paragraph (e)(5) of this section;

(G) An administrative control schedule required by paragraph (e)(4) of this section, if applicable;

(H) A description of arrangements made among contractors on multi-contractor sites with respect to informing affected employees of potential exposure to lead and with respect to responsibility for compliance with this section as set forth in § 1926.16.

(I) Other relevant information.

(iii) The compliance program shall provide for frequent and regular inspections of job-sites, materials, and equipment to be made by a competent person.

(iv) Written programs shall be submitted upon request to any affected employee or authorized employee representatives, to the Assistant Secretary and the Director, and shall be available at the worksite for examination and copying by the Assistant Secretary and the Director.

(v) Written programs shall be revised and updated at least every 6 months to reflect the current status of the program.

(3) *Mechanical ventilation.* When ventilation is used to control lead exposure, the employer shall evaluate the mechanical performance of the system in controlling exposure as necessary to maintain its effectiveness.

(4) *Administrative controls.* If administrative controls are used as a means of reducing employees TWA exposure to lead, the employer shall establish and implement a job rotation schedule which includes:

(i) Name or identification number of each affected employee;

(ii) Duration and exposure levels at each job or work station where each affected employee is located; and

(iii) Any other information which may be useful in assessing the reliability of administrative controls to reduce exposure to lead.

(5) The employer shall ensure that, to the extent relevant, employees follow good work practices such as described in Appendix B of this section.

(f) *Respiratory protection*—(1)

General. Where the use of respirators is required under this section the employer shall provide, at no cost to the employee, and assure the use of respirators which comply with the requirements of this paragraph. Respirators shall be used in the following circumstances:

(i) Whenever an employee's exposure to lead exceeds the PEL;

(ii) In work situations in which engineering controls and work practices are not sufficient to reduce exposures to or below the PEL;

(iii) Whenever an employee requests a respirator; and

(iv) An interim protection for employees performing tasks as specified in paragraph (d)(2) of this section.

(2) *Respirator selection.* (i) Where respirators are used under this section the employer shall select the appropriate respirator or combination of respirators from Table I below.

(ii) The employer shall provide a powered, air-purifying respirator in lieu of the respirator specified in Table I whenever:

(A) An employee chooses to use this type of respirator; and (B) This respirator will provide adequate protection to the employee.

(iii) The employer shall select respirators from among those approved for protection against lead dust, fume, and mist by the Mine Safety and Health Administration and the National Institute for Occupational Safety and Health (NIOSH) under the provisions of 30 CFR part 11.

TABLE I.—RESPIRATORY PROTECTION FOR LEAD AEROSOLS

Airborne concentration of lead or condition of use	Required respirator ¹
Not in excess of 500 µg/m ³ .	<ul style="list-style-type: none"> • ½ mask air purifying respirator with high efficiency filters.^{2, 3} • ½ mask supplied air respirator operated in demand (negative pressure) mode.
Not in excess of 1,250 µg/m ³ .	<ul style="list-style-type: none"> • Loose fitting hood or helmet powered air purifying respirator with high efficiency filters.³ • Hood or helmet supplied air respirator operated in a continuous-flow mode—e.g., type CE abrasive blasting respirators operated in a continuous-flow mode.
Not in excess of 2,500 µg/m ³ .	<ul style="list-style-type: none"> • Full facepiece air purifying respirator with high efficiency filters.³ • Tight fitting powered air purifying respirator with high efficiency filters.³ • Full facepiece supplied air respirator operated in demand mode. • ½ mask or full facepiece supplied air respirator operated in a continuous-flow mode. • Full facepiece self-contained breathing apparatus (SCBA) operated in demand mode.
Not in excess of 50,000 µg/m ³ .	<ul style="list-style-type: none"> • ½ mask supplied air respirator operated in pressure demand or other positive-pressure mode.
Not in excess of 100,000 µg/m ³ .	<ul style="list-style-type: none"> • Full facepiece supplied air respirator operated in pressure demand or other positive-pressure mode—e.g., type CE abrasive blasting respirators operated in a positive-pressure mode.

TABLE I.—RESPIRATORY PROTECTION FOR LEAD AEROSOLS—Continued

Airborne concentration of lead or condition of use	Required respirator ¹
Greater than 100,000 µg/m ³ unknown concentration, or fire fighting.	• Full facepiece SCBA operated in pressure demand or other positive-pressure mode.

¹ Respirators specified for higher concentrations can be used at lower concentrations of lead.

² Full facepiece is required if the lead aerosols cause eye or skin irritation at the use concentrations.

³ A high efficiency particulate filter (HEPA) means a filter that is 99.97 percent efficient against particles of 0.3 micron size or larger.

(3) *Respirator usage.* (i) The employer shall assure that the respirator issued to the employee exhibits minimum facepiece leakage and that the respirator is fitted properly.

(ii) Employers shall perform either quantitative or qualitative face fit tests at the time of initial fitting and at least every six months thereafter for each employee wearing negative pressure respirators. The qualitative fit tests may be used only for testing the fit of half-mask respirators where they are permitted to be worn, and shall be conducted in accordance with appendix D of this section. The tests shall be used to select facepieces that provide the required protection as prescribed in Table I.

(iii) If an employee exhibits difficulty in breathing during the fitting test or during use, the employer shall make available to the employee an examination in accordance with paragraph (j)(3)(i)(B) of this section to determine whether the employee can wear a respirator while performing the required duty.

(4) *Respirator program.* (i) The employer shall institute a respiratory protection program in accordance with 29 CFR 1910.134 (b), (d), (e) and (f).

(ii) The employer shall permit each employee who uses a filter respirator to change the filter elements whenever an increase in breathing resistance is detected and shall maintain an adequate supply of filter elements for this purpose.

(iii) Employees who wear respirators shall be permitted to leave work areas to wash their face and respirator facepiece whenever necessary to prevent skin irritation associated with respirator use.

(g) *Protective work clothing and equipment—(1) Provision and use.* Where an employee is exposed to lead above the PEL without regard to the use

of respirators, where employees are exposed to lead compounds which may cause skin or eye irritation (e.g. lead arsenate, lead azide), and as interim protection for employees performing tasks as specified in paragraph (d)(2) of this section, the employer shall provide at no cost to the employee and assure that the employee uses appropriate protective work clothing and equipment that prevents contamination of the employee and the employee's garments such as, but not limited to:

(i) Coveralls or similar full-body work clothing;

(ii) Gloves, hats, and shoes or disposable shoe coverlets; and

(iii) Face shields, vented goggles, or other appropriate protective equipment which complies with § 1910.133 of this chapter.

(2) *Cleaning and replacement.* (i) The employer shall provide the protective clothing required in paragraph (g)(1) of this section in a clean and dry condition at least weekly, and daily to employees whose exposure levels without regard to a respirator are over 200 µg/m³ of lead as an 8-hour TWA.

(ii) The employer shall provide for the cleaning, laundering, and disposal of protective clothing and equipment required by paragraph (g)(1) of this section.

(iii) The employer shall repair or replace required protective clothing and equipment as needed to maintain their effectiveness.

(iv) The employer shall assure that all protective clothing is removed at the completion of a work shift only in change areas provided for that purpose as prescribed in paragraph (i)(2) of this section.

(v) The employer shall assure that contaminated protective clothing which is to be cleaned, laundered, or disposed of, is placed in a closed container in the change area which prevents dispersion of lead outside the container.

(vi) The employer shall inform in writing any person who cleans or launders protective clothing or equipment of the potentially harmful effects of exposure to lead.

(vii) The employer shall assure that the containers of contaminated protective clothing and equipment required by paragraph (g)(2)(v) of this section are labelled as follows:

Caution: Clothing contaminated with lead. Do not remove dust by blowing or shaking. Dispose of lead contaminated wash water in accordance with applicable local, state, or federal regulations.

(viii) The employer shall prohibit the removal of lead from protective clothing or equipment by blowing, shaking, or

any other means which disperses lead into the air.

(h) *Housekeeping*—(1) All surfaces shall be maintained as free as practicable of accumulations of lead.

(2) Clean-up of floors and other surfaces where lead accumulates shall wherever possible, be cleaned by vacuuming or other methods that minimize the likelihood of lead becoming airborne.

(3) Shovel, dry or wet sweeping, and brushing may be used only where vacuuming or other equally effective methods have been tried and found not to be effective.

(4) Where vacuuming methods are selected, the vacuums shall be equipped with HEPA filters and used and emptied in a manner which minimizes the reentry of lead into the workplace.

(5) Compressed air shall not be used to remove lead from any surface unless the compressed air is used in conjunction with a ventilation system designed to capture the airborne dust created by the compressed air.

(i) *Hygiene facilities and practices*. (1) The employer shall assure that in areas where employees are exposed to lead above the PEL without regard to the use of respirators, food or beverage is not present or consumed, tobacco products are not present or used, and cosmetics are not applied.

(2) *Change areas*. (i) The employer shall provide clean change areas for employees whose airborne exposure to lead is above the PEL, and as interim protection for employees performing tasks as specified in paragraph (d)(2) of this section, without regard to the use of respirators.

(ii) The employer shall assure that change areas are equipped with separate storage facilities for protective work clothing and equipment and for street clothes which prevent cross-contamination.

(iii) The employer shall assure that employees do not leave the workplace wearing any protective clothing or equipment that is required to be worn during the work shift.

(3) *Showers*. (i) The employer shall provide shower facilities, where feasible, for use by employees whose airborne exposure to lead is above the PEL.

(ii) The employer shall assure, where shower facilities are available, that employees shower at the end of the work shift and shall provide an adequate supply of cleansing agents and towels for use by affected employees.

(4) *Eating facilities*. (i) The employer shall provide lunchroom facilities or eating areas for employees whose airborne exposure to lead is above the

PEL, without regard to the use of respirators.

(ii) The employer shall assure that lunchroom facilities or eating areas are as free as practicable from lead contamination and are readily accessible to employees.

(iii) The employer shall assure that employees whose airborne exposure to lead is above the PEL, without regard to the use of a respirator, wash their hands and face prior to eating, drinking, smoking or applying cosmetics.

(iv) The employer shall assure that employees do not enter lunchroom facilities or eating areas with protective work clothing or equipment unless surface lead dust has been removed by vacuuming, downdraft booth, or other cleaning method that limits dispersion of lead dust.

(5) *Hand washing facilities*. (i) The employer shall provide adequate handwashing facilities for use by employees exposed to lead in accordance with 29 CFR 1926.51(f).

(ii) Where showers are not provided the employer shall assure that employees wash their hands and face at the end of the work-shift.

(j) *Medical surveillance*—(1) *General*.

(i) The employer shall make available initial medical surveillance to employees occupationally exposed on any day to lead at or above the action level. Initial medical surveillance consists of biological monitoring in the form of blood sampling and analysis for lead and zinc protoporphyrin levels.

(ii) The employer shall institute a medical surveillance program in accordance with paragraphs (j)(2) and (j)(3) of this section for all employees who are or may be exposed by the employer at or above the action level for more than 30 days in any consecutive 12 months;

(iii) The employer shall assure that all medical examinations and procedures are performed by or under the supervision of a licensed physician.

(iv) The employer shall make available the required medical surveillance including multiple physician review under paragraph (j)(3)(iii) without cost to employees and at a reasonable time and place.

(2) *Biological monitoring*—(i) *Blood lead and ZPP level sampling and analysis*. The employer shall make available biological monitoring in the form of blood sampling and analysis for lead and zinc protoporphyrin levels to each employee covered under paragraphs (j)(1)(i) and (ii) of this section on the following schedule:

(A) For each employee covered under paragraph (j)(1)(ii) of this section, at

least every 2 months for the first 6 months and every 6 months thereafter;

(B) For each employee covered under paragraphs (j)(1)(i) or (ii) of this section whose last blood sampling and analysis indicated a blood lead level at or above 40 µg/dl, at least every two months. This frequency shall continue until two consecutive blood samples and analyses indicate a blood lead level below 40 µg/dl; and

(C) For each employee who is removed from exposure to lead due to an elevated blood lead level at least monthly during the removal period.

(ii) *Follow-up blood sampling tests*. Whenever the results of a blood lead level test indicate that an employee's blood lead level exceeds the numerical criterion for medical removal under paragraph (k)(1)(i) of this section, the employer shall provide a second (follow-up) blood sampling test within two weeks after the employer receives the results of the first blood sampling test.

(iii) *Accuracy of blood lead level sampling and analysis*. Blood lead level sampling and analysis provided pursuant to this section shall have an accuracy (to a confidence level of 95 percent) within plus or minus 15 percent or 6 µg/dl, whichever is greater, and shall be conducted by a laboratory approved by OSHA.

(iv) *Employee notification*. (A) Within five working days after the receipt of biological monitoring results, the employer shall notify each employee in writing of his or her blood lead level; and

(B) the employer shall notify each employee whose blood lead level exceeds 40 µg/dl that the standard requires temporary medical removal with Medical Removal Protection benefits when an employee's blood lead level exceeds the numerical criterion for medical removal under paragraph (k)(1)(i) of this section.

(3) *Medical examinations and consultations*—(i) *Frequency*. The employer shall make available medical examinations and consultations to each employee covered under paragraph (j)(1)(ii) of this section on the following schedule:

(A) At least annually for each employee for whom a blood sampling test conducted at any time during the preceding 12 months indicated a blood lead level at or above 40 µg/dl;

(B) As soon as possible, upon notification by an employee either that the employee has developed signs or symptoms commonly associated with lead intoxication, that the employee desires medical advice concerning the effects of current or past exposure to

lead on the employee's ability to procreate a healthy child, that the employee is pregnant, or that the employee has demonstrated difficulty in breathing during a respirator fitting test or during use; and

(C) As medically appropriate for each employee either removed from exposure to lead due to a risk of sustaining material impairment to health, or otherwise limited pursuant to a final medical determination.

(ii) *Content.* The content of medical examinations made available pursuant to paragraph (j)(3)(i)(B)-(C) of this section shall be determined by an examining physician and, if requested by an employee, shall include pregnancy testing or laboratory evaluation of male fertility. Medical examinations made available pursuant to paragraph (j)(3)(i)(A) of this section shall include the following elements:

(A) A detailed work history and a medical history, with particular attention to past lead exposure (occupational and non-occupational), personal habits (smoking, hygiene), and past gastrointestinal, hematologic, renal, cardiovascular, reproductive and neurological problems;

(B) A thorough physical examination, with particular attention to teeth, gums, hematologic, gastrointestinal, renal, cardiovascular, and neurological systems. Pulmonary status should be evaluated if respiratory protection will be used;

(C) A blood pressure measurement;

(D) A blood sample and analysis which determines:

(1) Blood lead level;

(2) Hemoglobin and hematocrit determinations, red cell indices, and examination of peripheral smear morphology;

(3) Zinc protoporphyrin;

(4) Blood urea nitrogen; and

(5) Serum creatinine;

(E) A routine urinalysis with microscopic examination; and

(F) Any laboratory or other test relevant to lead exposure which the examining physician deems necessary by sound medical practice.

(iii) *Multiple physician review mechanism.* (A) If the employer selects the initial physician who conducts any medical examination or consultation provided to an employee under this section, the employee may designate a second physician:

(1) To review any findings, determinations or recommendations of the initial physician; and

(2) To conduct such examinations, consultations, and laboratory tests as the second physician deems necessary to facilitate this review.

(B) The employer shall promptly notify an employee of the right to seek a second medical opinion after each occasion that an initial physician conducts a medical examination or consultation pursuant to this section. The employer may condition its participation in, and payment for, the multiple physician review mechanism upon the employee doing the following within fifteen (15) days after receipt of the foregoing notification, or receipt of the initial physician's written opinion, whichever is later:

(1) The employee informing the employer that he or she intends to seek a second medical opinion, and

(2) The employee initiating steps to make an appointment with a second physician.

(C) If the findings, determinations or recommendations of the second physician differ from those of the initial physician, then the employer and the employee shall assure that efforts are made for the two physicians to resolve any disagreement.

(D) If the two physicians have been unable to quickly resolve their disagreement, then the employer and the employee through their respective physicians shall designate a third physician:

(1) To review any findings, determinations or recommendations of the prior physicians; and

(2) To conduct such examinations, consultations, laboratory tests and discussions with the prior physicians as the third physician deems necessary to resolve the disagreement of the prior physicians.

(E) The employer shall act consistent with the findings, determinations and recommendations of the third physician, unless the employer and the employee reach an agreement which is otherwise consistent with the recommendations of at least one of the three physicians.

(iv) *Information provided to examining and consulting physicians.*

(A) The employer shall provide an initial physician conducting a medical examination or consultation under this section with the following information:

(1) A copy of this regulation for lead including all Appendices;

(2) A description of the affected employee's duties as they relate to the employee's exposure;

(3) The employee's exposure level or anticipated exposure level to lead and to any other toxic substance (if applicable);

(4) A description of any personal protective equipment used or to be used;

(5) Prior blood lead determinations; and

(6) All prior written medical opinions concerning the employee in the employer's possession or control.

(B) The employer shall provide the foregoing information to a second or third physician conducting a medical examination or consultation under this section upon request either by the second or third physician, or by the employee.

(v) *Written medical opinions.* (A) The employer shall obtain and furnish the employee with a copy of a written medical opinion from each examining or consulting physician which contains only the following information:

(1) The physician's opinion as to whether the employee has any detected medical condition which would place the employee at increased risk of material impairment of the employee's health from exposure to lead;

(2) Any recommended special protective measures to be provided to the employee, or limitations to be placed upon the employee's exposure to lead;

(3) Any recommended limitation upon the employee's use of respirators, including a determination of whether the employee can wear a powered air purifying respirator if a physician determines that the employee cannot wear a negative pressure respirator; and

(4) The results of the blood lead determinations.

(B) The employer shall instruct each examining and consulting physician to:

(1) Not reveal either in the written opinion or orally, or in any other means of communication with the employer, findings, including laboratory results, or diagnoses unrelated to an employee's occupational exposure to lead; and

(2) Advise the employee of any medical condition, occupational or nonoccupational, which dictates further medical examination or treatment.

(vi) *Alternate physician determination mechanisms.* The employer and an employee or authorized employee representative may agree upon the use of any alternate physician determination mechanism in lieu of the multiple physician review mechanism provided by paragraph (j)(3)(iii) of this section so long as the alternate mechanism is as expeditious and protective as the requirements contained in this paragraph.

(4) *Chelation.* (i) The employer shall assure that any person whom he retains, employs, supervises or controls does not engage in prophylactic chelation of any employee at any time.

(ii) If therapeutic or diagnostic chelation is to be performed by any person in paragraph (j)(4)(i) of this section, the employer shall assure that

it be done under the supervision of a licensed physician in a clinical setting with thorough and appropriate medical monitoring and that the employee is notified in writing prior to its occurrence.

(k) *Medical removal protection—(1) Temporary medical removal and return of an employee—(i) Temporary removal due to elevated blood lead level.* The employer shall remove an employee from work having an exposure to lead at or above the action level on each occasion that a periodic and a follow-up blood sampling test conducted pursuant to this section indicate that the employee's blood lead level is at or above 50 µg/dl; and,

(ii) *Temporary removal due to a final medical determination.* (A) The employer shall remove an employee from work having an exposure to lead at or above the action level on each occasion that a final medical determination results in a medical finding, determination, or opinion that the employee has a detected medical condition which places the employee at increased risk of material impairment to health from exposure to lead.

(B) For the purposes of this section, the phrase "final medical determination" means the written medical opinion on the employees' health status by the examining physician or, where relevant, the outcome of the multiple physician review mechanism or alternate medical determination mechanism used pursuant to the medical surveillance provisions of this section.

(C) Where a final medical determination results in any recommended special protective measures for an employee, or limitations on an employee's exposure to lead, the employer shall implement and act consistent with the recommendation.

(iii) *Return of the employee to former job status.* (A) The employer shall return an employee to his or her former job status:

(1) For an employee removed due to a blood lead level at or above 50 µg/dl when two consecutive blood sampling tests indicate that the employee's blood lead level is at or below 40 µg/dl;

(2) For an employee removed due to a final medical determination, when a subsequent final medical determination results in a medical finding, determination, or opinion that the employee no longer has a detected medical condition which places the employee at increased risk of material impairment to health from exposure to lead.

(B) For the purposes of this section, the requirement that an employer return an employee to his or her former job status is not intended to expand upon or restrict any rights an employee has or would have had, absent temporary medical removal, to a specific job classification or position under the terms of a collective bargaining agreement.

(iv) *Removal of other employee special protective measure or limitations.* The employer shall remove any limitations placed on an employee or end any special protective measures provided to an employee pursuant to a final medical determination when a subsequent final medical determination indicates that the limitations or special protective measures are no longer necessary.

(v) *Employer options pending a final medical determination.* Where the multiple physician review mechanism, or alternate medical determination mechanism used pursuant to the medical surveillance provisions of this section, has not yet resulted in a final medical determination with respect to an employee, the employer shall act as follows:

(A) *Removal.* The employer may remove the employee from exposure to lead, provide special protective measures to the employee, or place limitations upon the employee, consistent with the medical findings, determinations, or recommendations of any of the physicians who have reviewed the employee's health status.

(B) *Return.* The employer may return the employee to his or her former job status, end any special protective measures provided to the employee, and remove any limitations placed upon the employee, consistent with the medical findings, determinations, or recommendations of any of the physicians who have reviewed the employee's health status, with two exceptions.

If (1) the initial removal, special protection, or limitation of the employee resulted from a final medical determination which differed from the findings, determinations, or recommendations of the initial physician or;

(2) If the employee has been on removal status for the preceding eighteen months due to an elevated blood lead level, then the employer shall await a final medical determination.

(2) *Medical removal protection benefits—(i) Provision of medical removal protection benefits.* The employer shall provide an employee up to eighteen (18) months of medical

removal protection benefits on each occasion that an employee is removed from exposure to lead or otherwise limited pursuant to this section.

(ii) *Definition of medical removal protection benefits.* For the purposes of this section, the requirement that an employer provide medical removal protection benefits means that, as long as the job the employee was removed from continues, the employer shall maintain the total normal earnings, seniority and other employment rights and benefits of an employee, including the employee's right to his or her former job status as though the employee had not been medically removed from the employee's job or otherwise medically limited.

(iii) *Follow-up medical surveillance during the period of employee removal or limitation.* During the period of time that an employee is medically removed from his or her job or otherwise medically limited, the employer may condition the provision of medical removal protection benefits upon the employee's participation in follow-up medical surveillance made available pursuant to this section.

(iv) *Workers' compensation claims.* If a removed employee files a claim for workers' compensation payments for a lead-related disability, then the employer shall continue to provide medical removal protection benefits pending disposition of the claim. To the extent that an award is made to the employee for earnings lost during the period of removal, the employer's medical removal protection obligation shall be reduced by such amount. The employer shall receive no credit for workers' compensation payments received by the employee for treatment-related expenses.

(v) *Other credits.* The employer's obligation to provide medical removal protection benefits to a removed employee shall be reduced to the extent that the employee receives compensation for earnings lost during the period of removal either from a publicly or employer-funded compensation program, or receives income from employment with another employer made possible by virtue of the employee's removal.

(vi) *Voluntary removal or restriction of an employee.* Where an employer, although not required by this section to do so, removes an employee from exposure to lead or otherwise places limitations on an employee due to the effects of lead exposure on the employee's medical condition, the employer shall provide medical removal protection benefits to the employee

equal to that required by paragraph (k)(2) (i) and (ii) of this section.

(l) *Employee information and training*—(1) *General* (i) The employer shall communicate information concerning lead hazards according to the requirements of OSHA's Hazard Communication Standard for the construction industry, 29 CFR 1926.59, including but not limited to the requirements concerning warning signs and labels, material safety data sheets (MSDS), and employee information and training. In addition, employers shall comply with the following requirements:

(ii) For all employees who are subject to exposure to lead at or above the action level on any day or who are subject to exposure to lead compounds which may cause skin or eye irritation (e.g. lead arsenate, lead azide), the employer shall provide a training program in accordance with paragraph (l)(2) of this section and assure employee participation.

(iii) The employer shall provide the training program as initial training prior to the time of job assignment or prior to the start up date for this requirement, whichever comes last.

(iv) The employer shall also provide the training program at least annually for each employee who is subject to lead exposure at or above the action level on any day.

(2) *Training program*. The employer shall assure that each employee is trained in the following:

(i) The content of this standard and its appendices;

(ii) The specific nature of the operations which could result in exposure to lead above the action level;

(iii) The purpose, proper selection, fitting, use, and limitations of respirators;

(iv) The purpose and a description of the medical surveillance program, and the medical removal protection program including information concerning the adverse health effects associated with excessive exposure to lead (with particular attention to the adverse reproductive effects on both males and females and hazards to the fetus and additional precautions for employees who are pregnant);

(v) The engineering controls and work practices associated with the employee's job assignment including training of employees to follow relevant good work practices described in Appendix B of this section;

(vi) The contents of any compliance plan in effect;

(vii) Instructions to employees that cleaning agents should not routinely be used to remove lead from their bodies

and should not be used at all except under the direction of a licensed physician; and

(viii) The employee's right of access to records under 29 CFR 1910.20.

(3) *Access to information and training materials*. (i) The employer shall make readily available to all affected employees a copy of this standard and its appendices.

(ii) The employer shall provide, upon request, all materials relating to the employee information and training program to affected employees and their designated representatives, and to the Assistant Secretary and the Director.

(m) *Signs*—(1) *General*. (i) The employer may use signs required by other statutes, regulations or ordinances in addition to, or in combination with, signs required by this paragraph.

(ii) The employer shall assure that no statement appears on or near any sign required by this paragraph which contradicts or detracts from the meaning of the required sign.

(2) *Signs*. (i) The employer shall post the following warning signs in each work area where an employee's exposure to lead is above the PEL.

WARNING
LEAD WORK AREA
POISON
NO SMOKING OR EATING

(ii) The employer shall assure that signs required by this paragraph are illuminated and cleaned as necessary so that the legend is readily visible.

(n) *Recordkeeping*—(1) *Exposure assessment*. (i) The employer shall establish and maintain an accurate record of all monitoring and other data used in conducting employee exposure assessments as required in paragraph (d) of this section.

(ii) Exposure monitoring records shall include:

(A) The date(s), number, duration, location and results of each of the samples taken if any, including a description of the sampling procedure used to determine representative employee exposure where applicable;

(B) A description of the sampling and analytical methods used and evidence of their accuracy;

(C) The type of respiratory protective devices worn, if any;

(D) Name, social security number, and job classification of the employee monitored and of all other employees whose exposure the measurement is intended to represent; and

(E) The environmental variables that could affect the measurement of employee exposure.

(iii) The employer shall maintain monitoring and other exposure

assessment records in accordance with the provisions of 29 CFR 1910.20.

(2) *Medical surveillance*. (i) The employer shall establish and maintain an accurate record for each employee subject to medical surveillance as required by paragraph (j) of this section.

(ii) This record shall include:

(A) The name, social security number, and description of the duties of the employee;

(B) A copy of the physician's written opinions;

(C) Results of any airborne exposure monitoring done on or for that employee and provided to the physician; and

(D) Any employee medical complaints related to exposure to lead.

(iii) The employer shall keep, or assure that the examining physician keeps, the following medical records:

(A) A copy of the medical examination results including medical and work history required under paragraph (j) of this section;

(B) A description of the laboratory procedures and a copy of any standards or guidelines used to interpret the test results or references to that information;

(C) A copy of the results of biological monitoring.

(iv) The employer shall maintain or assure that the physician maintains medical records in accordance with the provisions of 29 CFR 1910.20.

(3) *Medical removals*. (i) The employer shall establish and maintain an accurate record for each employee removed from current exposure to lead pursuant to paragraph (k) of this section.

(ii) Each record shall include:

(A) The name and social security number of the employee;

(B) The date of each occasion that the employee was removed from current exposure to lead as well as the corresponding date on which the employee was returned to his or her former job status;

(C) A brief explanation of how each removal was or is being accomplished; and

(D) A statement with respect to each removal indicating whether or not the reason for the removal was an elevated blood lead level.

(iii) The employer shall maintain each medical removal record for at least the duration of an employee's employment.

(4) *Objective data for exemption from requirement for initial monitoring*. (i) For purposes of this section, objective data are information demonstrating that a particular product or material containing lead or a specific process, operation, or activity involving lead cannot release dust or fumes in concentrations at or above the action level under any expected conditions of

use. Objective data can be obtained from an industry-wide study or from laboratory product test results from manufacturers of lead containing products or materials. The data the employer uses from an industry-wide survey must be obtained under workplace conditions closely resembling the processes, types of material, control methods, work practices and environmental conditions in the employer's current operations.

(ii) The employer shall maintain the record of the objective data relied upon for at least 30 years.

(5) *Availability.* The employer shall make available upon request all records required to be maintained by paragraph (n) of this section to affected employees, former employees, and their designated representatives, and to the Assistant Secretary and the Director for examination and copying.

(6) *Transfer of records.* (i) Whenever the employer ceases to do business, the successor employer shall receive and retain all records required to be maintained by paragraph (n) of this section.

(ii) Whenever the employer ceases to do business and there is no successor employer to receive and retain the records required to be maintained by this section for the prescribed period, these records shall be transmitted to the Director.

(iii) At the expiration of the retention period for the records required to be maintained by this section, the employer shall notify the Director at least 3 months prior to the disposal of such records and shall transmit those records to the Director if requested within the period.

(iv) The employer shall also comply with any additional requirements involving transfer of records set forth in 29 CFR 1910.20(h).

(o) *Observation of monitoring.* (1) *Employee observation.* The employer shall provide affected employees or their designated representatives an opportunity to observe any monitoring of employee exposure to lead conducted pursuant to paragraph (d) of this section.

(2) *Observation procedures.* (i) Whenever observation of the monitoring of employee exposure to lead requires entry into an area where the use of respirators, protective clothing or equipment is required, the employer shall provide the observer with and assure the use of such respirators, clothing and equipment, and shall require the observer to comply with all other applicable safety and health procedures.

(ii) Without interfering with the monitoring, observers shall be entitled to:

(A) Receive an explanation of the measurement procedures;

(B) Observe all steps related to the monitoring of lead performed at the place of exposure; and

(C) Record the results obtained or receive copies of the results when returned by the laboratory.

(p) *Effective date.* This standard (§ 1926.62) shall become effective June 3, 1993.

(q) *Appendices.* The information contained in the appendices to this section is not intended by itself, to create any additional obligations not otherwise imposed by this standard nor detract from any existing obligation.

(r) *Startup dates.* (1) The requirements of paragraphs (c) through (o) of this section, including administrative controls and feasible work practice controls, but not including engineering controls specified in paragraph (e)(1) of this section, shall be complied with as soon as possible, but no later than 60 days from the effective date of this section.

(2) Feasible engineering controls specified by paragraph (e)(1) of this section shall be implemented as soon as possible, but no later than 120 days from the effective date of this section.

Appendix A to § 1926.62—Substance Data Sheet for Occupational Exposure to Lead

I. Substance Identification

A. *Substance.* Pure lead (Pb) is a heavy metal at room temperature and pressure and is a basic chemical element. It can combine with various other substances to form numerous lead compounds.

B. *Compounds covered by the standard:* The word "lead" when used in this interim final standard means elemental lead, all inorganic lead compounds and a class of organic lead compounds called lead soaps. This standard does not apply to other organic lead compounds.

C. *Uses:* Exposure to lead occurs in several different occupations in the construction industry, including demolition or salvage of structures where lead or lead-containing materials are present; removal or encapsulation of lead-containing materials, new construction, alteration, repair, or renovation of structures that contain lead or materials containing lead; installation of products containing lead. In addition, there are construction related activities where exposure to lead may occur, including transportation, disposal, storage, or containment of lead or materials containing lead on construction sites, and maintenance operations associated with construction activities.

D. *Permissible exposure:* The permissible exposure limit (PEL) set by the standard is 50 micrograms of lead per cubic meter of air (50 $\mu\text{g}/\text{m}^3$), averaged over an 8-hour workday.

E. *Action level:* The interim final standard establishes an action level of 30 micrograms of lead per cubic meter of air (30 $\mu\text{g}/\text{m}^3$), averaged over an 8-hour workday. The action level triggers several ancillary provisions of the standard such as exposure monitoring, medical surveillance, and training.

II. Health Hazard Data

A. *Ways in which lead enters your body.* When absorbed into your body in certain doses, lead is a toxic substance. The object of the lead standard is to prevent absorption of harmful quantities of lead. The standard is intended to protect you not only from the immediate toxic effects of lead, but also from the serious toxic effects that may not become apparent until years of exposure have passed. Lead can be absorbed into your body by inhalation (breathing) and ingestion (eating). Lead (except for certain organic lead compounds not covered by the standard, such as tetraethyl lead) is not absorbed through your skin. When lead is scattered in the air as a dust, fume respiratory tract. Inhalation of airborne lead is generally the most important source of occupational lead absorption. You can also absorb lead through your digestive system if lead gets into your mouth and is swallowed. If you handle food, cigarettes, chewing tobacco, or make-up which have lead on them or handle them with hands contaminated with lead, this will contribute to ingestion. A significant portion of the lead that you inhale or ingest gets into your blood stream. Once in your blood stream, lead is circulated throughout your body and stored in various organs and body tissues. Some of this lead is quickly filtered out of your body and excreted, but some remains in the blood and other tissues. As exposure to lead continues, the amount stored in your body will increase if you are absorbing more lead than your body is excreting. Even though you may not be aware of any immediate symptoms of disease, this lead stored in your tissues can be slowly causing irreversible damage, first to individual cells, then to your organs and whole body systems.

B. *Effects of overexposure to lead—(1) Short term (acute) overexposure.* Lead is a potent, systemic poison that serves no known useful function once absorbed by your body. Taken in large enough doses, lead can kill you in a matter of days. A condition affecting the brain called acute encephalopathy may arise which develops quickly to seizures, coma, and death from cardiorespiratory arrest. A short term dose of lead can lead to acute encephalopathy. Short term occupational exposures of this magnitude are highly unusual, but not impossible. Similar forms of encephalopathy may, however, arise from extended, chronic exposure to lower doses of lead. There is no sharp dividing line between rapidly developing acute effects of lead, and chronic effects which take longer to acquire. Lead adversely affects numerous body systems, and causes forms of health impairment and disease which arise after periods of exposure as short as days or as long as several years.

(2) *Long-term (chronic) overexposure.* Chronic overexposure to lead may result in severe damage to your blood-forming,

nervous, urinary and reproductive systems. Some common symptoms of chronic overexposure include loss of appetite, metallic taste in the mouth, anxiety, constipation, nausea, pallor, excessive tiredness, weakness, insomnia, headache, nervous irritability, muscle and joint pain or soreness, fine tremors, numbness, dizziness, hyperactivity and colic. In lead colic there may be severe abdominal pain. Damage to the central nervous system in general and the brain (encephalopathy) in particular is one of the most severe forms of lead poisoning. The most severe, often fatal, form of encephalopathy may be preceded by vomiting, a feeling of dullness progressing to drowsiness and stupor, poor memory, restlessness, irritability, tremor, and convulsions. It may arise suddenly with the onset of seizures, followed by coma, and death. There is a tendency for muscular weakness to develop at the same time. This weakness may progress to paralysis often observed as a characteristic "wrist drop" or "foot drop" and is a manifestation of a disease to the nervous system called peripheral neuropathy. Chronic overexposure to lead also results in kidney disease with few, if any, symptoms appearing until extensive and most likely permanent kidney damage has occurred. Routine laboratory tests reveal the presence of this kidney disease only after about two-thirds of kidney function is lost. When overt symptoms of urinary dysfunction arise, it is often too late to correct or prevent worsening conditions, and progression to kidney dialysis or death is possible. Chronic overexposure to lead impairs the reproductive systems of both men and women. Overexposure to lead may result in decreased sex drive, impotence and sterility in men. Lead can alter the structure of sperm cells raising the risk of birth defects. There is evidence of miscarriage and stillbirth in women whose husbands were exposed to lead or who were exposed to lead themselves. Lead exposure also may result in decreased fertility, and abnormal menstrual cycles in women. The course of pregnancy may be adversely affected by exposure to lead since lead crosses the placental barrier and poses risks to developing fetuses. Children born of parents either one of whom were exposed to excess lead levels are more likely to have birth defects, mental retardation, behavioral disorders or die during the first year of childhood. Overexposure to lead also disrupts the blood-forming system resulting in decreased hemoglobin (the substance in the blood that carries oxygen to the cells) and ultimately anemia. Anemia is characterized by weakness, pallor and fatigability as a result of decreased oxygen carrying capacity in the blood.

(3) *Health protection goals of the standard.* Prevention of adverse health effects for most workers from exposure to lead throughout a working lifetime requires that a worker's blood lead level (BLL, also expressed as PbB) be maintained at or below forty micrograms per deciliter of whole blood (40 $\mu\text{g}/\text{dl}$). The blood lead levels of workers (both male and female workers) who intend to have children should be maintained below 30 $\mu\text{g}/\text{dl}$ to minimize adverse reproductive health effects

to the parents and to the developing fetus. The measurement of your blood lead level (BLL) is the most useful indicator of the amount of lead being absorbed by your body. Blood lead levels are most often reported in units of milligrams (mg) or micrograms (μg) of lead (1 mg=1000 μg) per 100 grams (100g), 100 milliliters (100 ml) or deciliter (dl) of blood. These three units are essentially the same. Sometime BLLs are expressed in the form of mg% or $\mu\text{g}\%$. This is a shorthand notation for 100g, 100 ml, or dl. (References to BLL measurements in this standard are expressed in the form of $\mu\text{g}/\text{dl}$.)

BLL measurements show the amount of lead circulating in your blood stream, but do not give any information about the amount of lead stored in your various tissues. BLL measurements merely show current absorption of lead, not the effect that lead is having on your body or the effects that past lead exposure may have already caused. Past research into lead-related diseases, however, has focused heavily on associations between BLLs and various diseases. As a result, your BLL is an important indicator of the likelihood that you will gradually acquire a lead-related health impairment or disease.

Once your blood lead level climbs above 40 $\mu\text{g}/\text{dl}$, your risk of disease increases. There is a wide variability of individual response to lead, thus it is difficult to say that a particular BLL in a given person will cause a particular effect. Studies have associated fatal encephalopathy with BLLs as low as 150 $\mu\text{g}/\text{dl}$. Other studies have shown other forms of diseases in some workers with BLLs well below 80 $\mu\text{g}/\text{dl}$. Your BLL is a crucial indicator of the risks to your health, but one other factor is also extremely important. This factor is the length of time you have had elevated BLLs. The longer you have an elevated BLL, the greater the risk that large quantities of lead are being gradually stored in your organs and tissues (body burden). The greater your overall body burden, the greater the chances of substantial permanent damage. The best way to prevent all forms of lead-related impairments and diseases—both short term and long term—is to maintain your BLL below 40 $\mu\text{g}/\text{dl}$. The provisions of the standard are designed with this end in mind.

Your employer has prime responsibility to assure that the provisions of the standard are complied with both by the company and by individual workers. You, as a worker, however, also have a responsibility to assist your employer in complying with the standard. You can play a key role in protecting your own health by learning about the lead hazards and their control, learning what the standard requires, following the standard where it governs your own actions, and seeing that your employer complies with provisions governing his or her actions.

(4) *Reporting signs and symptoms of health problems.* You should immediately notify your employer if you develop signs or symptoms associated with lead poisoning or if you desire medical advice concerning the effects of current or past exposure to lead or your ability to have a healthy child. You should also notify your employer if you have difficulty breathing during a respirator fit test or while wearing a respirator. In each of these

cases, your employer must make available to you appropriate medical examinations or consultations. These must be provided at no cost to you and at a reasonable time and place. The standard contains a procedure whereby you can obtain a second opinion by a physician of your choice if your employer selected the initial physician.

Appendix B to § 1926.62—Employee Standard Summary

This appendix summarizes key provisions of the interim final standard for lead in construction that you as a worker should become familiar with.

I. Permissible Exposure Limit (PEL)—Paragraph (C)

The standard sets a permissible exposure limit (PEL) of 50 micrograms of lead per cubic meter of air (50 $\mu\text{g}/\text{m}^3$), averaged over an 8-hour workday which is referred to as a time-weighted average (TWA). This is the highest level of lead in air to which you may be permissibly exposed over an 8-hour workday. However, since this is an 8-hour average, short exposures above the PEL are permitted so long as for each 8-hour work day your average exposure does not exceed this level. This interim final standard, however, takes into account the fact that your daily exposure to lead can extend beyond a typical 8-hour workday as the result of overtime or other alterations in your work schedule. To deal with this situation, the standard contains a formula which reduces your permissible exposure when you are exposed more than 8 hours. For example, if you are exposed to lead for 10 hours a day, the maximum permitted average exposure would be 40 $\mu\text{g}/\text{m}^3$.

II. Exposure Assessment—Paragraph (D)

If lead is present in your workplace in any quantity, your employer is required to make an initial determination of whether any employee's exposure to lead exceeds the action level (30 $\mu\text{g}/\text{m}^3$ averaged over an 8-hour day). Employee exposure is that exposure which would occur if the employee were not using a respirator. This initial determination requires your employer to monitor workers' exposures unless he or she has objective data which can demonstrate conclusively that no employee will be exposed to lead in excess of the action level. Where objective data is used in lieu of actual monitoring the employer must establish and maintain an accurate record, documenting its relevancy in assessing exposure levels for current job conditions. If such objective data is available, the employer need proceed no further on employee exposure assessment until such time that conditions have changed and the determination is no longer valid.

Objective data may be compiled from various sources, e.g., insurance companies and trade associations and information from suppliers or exposure data collected from similar operations. Objective data may also comprise previously-collected sampling data including area monitoring. If it cannot be determined through using objective data that worker exposure is less than the action level, your employer must conduct monitoring or must rely on relevant previous personal sampling, if available. Where monitoring is

required for the initial determination, it may be limited to a representative number of employees who are reasonably expected to have the highest exposure levels. If your employer has conducted appropriate air sampling for lead in the past 12 months, he or she may use these results, provided they are applicable to the same employee tasks and exposure conditions and meet the requirements for accuracy as specified in the standard. As with objective data, if such results are relied upon for the initial determination, your employer must establish and maintain a record as to the relevancy of such data to current job conditions.

If there have been any employee complaints of symptoms which may be attributable to exposure to lead or if there is any other information or observations which would indicate employee exposure to lead, this must also be considered as part of the initial determination.

If this initial determination shows that a reasonable possibility exists that any employee may be exposed, without regard to respirators, over the action level, your employer must set up an air monitoring program to determine the exposure level representative of each employee exposed to lead at your workplace. In carrying out this air monitoring program, your employer is not required to monitor the exposure of every employee, but he or she must monitor a representative number of employees and job types. Enough sampling must be done to enable each employee's exposure level to be reasonably represent full shift exposure. In addition, these air samples must be taken under conditions which represent each employee's regular, daily exposure to lead. Sampling performed in the past 12 months may be used to determine exposures above the action level if such sampling was conducted during work activities essentially similar to present work conditions.

The standard lists certain tasks which may likely result in exposures to lead in excess of the PEL and, in some cases, exposures in excess of 50 times the PEL. If you are performing any of these tasks, your employer must provide you with appropriate respiratory protection, protective clothing and equipment, change areas, hand washing facilities, biological monitoring, and training until such time that an exposure assessment is conducted which demonstrates that your exposure level is below the PEL.

If you are exposed to lead and air sampling is performed, your employer is required to notify you in writing within 5 working days of the air monitoring results which represent your exposure. If the results indicate that your exposure exceeds the PEL (without regard to your use of a respirator), then your employer must also notify you of this in writing, and provide you with a description of the corrective action that has been taken or will be taken to reduce your exposure.

Your exposure must be rechecked by monitoring, at least every six months if your exposure is at or over the action level but below the PEL. Your employer may discontinue monitoring for you if 2 consecutive measurements, taken at least 7 days apart, are at or below the action level. Air monitoring must be repeated every 3

months if you are exposed over the PEL.

Your employer must continue monitoring for you at this frequency until 2 consecutive measurements, taken at least 7 days apart, are below the PEL but above the action level, at which time your employer must repeat monitoring of your exposure every six months and may discontinue monitoring only after your exposure drops to or below the action level. However, whenever there is a change of equipment, process, control, or personnel or a new type of job is added at your workplace which may result in new or additional exposure to lead, your employer must perform additional monitoring.

III. Methods of Compliance—Paragraph (E)

Your employer is required to assure that no employee is exposed to lead in excess of the PEL as an 8-hour TWA. The interim final standard for lead in construction requires employers to institute engineering and work practice controls including administrative controls to the extent feasible to reduce employee exposure to lead. Where such controls are feasible but not adequate to reduce exposures below the PEL they must be used nonetheless to reduce exposures to the lowest level that can be accomplished by these means and then supplemented with appropriate respiratory protection.

Your employer is required to develop and implement a written compliance program prior to the commencement of any job where employee exposures may reach the PEL as an 8-hour TWA. The interim final standard identifies the various elements that must be included in the plan. For example, employers are required to include a description of operations in which lead is emitted, detailing other relevant information about the operation such as the type of equipment used, the type of material involved, employee job responsibilities, operating procedures and maintenance practices. In addition, your employer's compliance plan must specify the means that will be used to achieve compliance and, where engineering controls are required, include any engineering plans or studies that have been used to select the control methods. If administrative controls involving job rotation are used to reduce employee exposure to lead, the job rotation schedule must be included in the compliance plan. The plan must also detail the type of protective clothing and equipment, including respirators, housekeeping and hygiene practices that will be used to protect you from the adverse effects of exposure to lead.

The written compliance program must be made available, upon request, to affected employees and their designated representatives, the Assistant Secretary and the Director.

Finally, the plan must be reviewed and updated at least every 6 months to assure it reflects the current status in exposure control.

IV. Respiratory Protection—Paragraph (F)

Your employer is required to provide and assure your use of respirators when your exposure to lead is not controlled below the PEL by other means. The employer must pay the cost of the respirator. Whenever you request one, your employer is also required

to provide you a respirator even if your air exposure level is not above the PEL. You might desire a respirator when, for example, you have received medical advice that your lead absorption should be decreased. Or, you may intend to have children in the near future, and want to reduce the level of lead in your body to minimize adverse reproductive effects. While respirators are the least satisfactory means of controlling your exposure, they are capable of providing significant protection if properly chosen, fitted, worn, cleaned, maintained, and replaced when they stop providing adequate protection.

Your employer is required to select respirators from the types listed in Table I of the Respiratory Protection section of the standard. Any respirator chosen must be approved by the Mine Safety and Health Administration (MSHA) or the National Institute for Occupational Safety and Health (NIOSH). This respirator selection table will enable your employer to choose a type of respirator which will give you a proper amount of protection based on your airborne lead exposure. Your employer may select a type of respirator that provides greater protection than that required by the standard; that is, one recommended for a higher concentration of lead than is present in your workplace. For example, a powered air purifying respirator (PAPR) is much more protective than a typical negative pressure respirator, and may also be more comfortable to wear. A PAPR has a filter, cartridge or canister to clean the air, and a power source which continuously blows filtered air into your breathing zone. Your employer might make a PAPR available to you to ease the burden of having to wear a respirator for long periods of time. The standard provides that you can obtain a PAPR upon request.

Your employer must also start a Respiratory Protection Program. This program must include written procedures for the proper selection, use, cleaning, storage, and maintenance of respirators.

Your employer must assure that your respirator facepiece fits properly. Proper fit of a respirator facepiece is critical. Obtaining a proper fit on each employee may require your employer to make available two or three different mask types. In order to assure that your respirator fits properly and that facepiece leakage is minimized, your employer must give you either a qualitative fit test or a quantitative fit test (if you use a negative pressure respirator) in accordance with appendix D. Any respirator which has a filter, cartridge or canister which cleans the work room air before you breathe it and which requires the force of your inhalation to draw air through the filtering element is a negative pressure respirator. A positive pressure respirator supplies air to you directly. A quantitative fit test uses a sophisticated machine to measure the amount, if any, of test material that leaks into the facepiece of your respirator.

You must also receive from your employer proper training in the use of respirators. Your employer is required to teach you how to wear a respirator, to know why it is needed, and to understand its limitations.

Your employer must test the effectiveness of your negative pressure respirator initially

and at least every six months thereafter with a "qualitative fit test." In this test, the fit of the facepiece is checked by seeing if you can smell a substance placed outside the respirator. If you can, there is appreciable leakage where the facepiece meets your face.

The standard provides that if your respirator uses filter elements, you must be given an opportunity to change the filter elements whenever an increase in breathing resistance is detected. You also must be permitted to periodically leave your work area to wash your face and respirator facepiece whenever necessary to prevent skin irritation. If you ever have difficulty in breathing during a fit test or while using a respirator, your employer must make a medical examination available to you to determine whether you can safely wear a respirator. The result of this examination may be to give you a positive pressure respirator (which reduces breathing resistance) or to provide alternative means of protection.

V. Protective Work Clothing and Equipment—Paragraph (G)

If you are exposed to lead above the PEL as an 8-hour TWA, without regard to your use of a respirator, or if you are exposed to lead compounds such as lead arsenate or lead azide which can cause skin and eye irritation, your employer must provide you with protective work clothing and equipment appropriate for the hazard. If work clothing is provided, it must be provided in a clean and dry condition at least weekly, and daily if your airborne exposure to lead is greater than 200 $\mu\text{g}/\text{m}^3$. Appropriate protective work clothing and equipment can include coveralls or similar full-body work clothing, gloves, hats, shoes or disposable shoe coverlets, and face shields or vented goggles. Your employer is required to provide all such equipment at no cost to you. In addition, your employer is responsible for providing repairs and replacement as necessary, and also is responsible for the cleaning, laundering or disposal of protective clothing and equipment.

The interim final standard requires that your employer assure that you follow good work practices when you are working in areas where your exposure to lead may exceed the PEL. With respect to protective clothing and equipment, where appropriate, the following procedures should be observed prior to beginning work:

1. Change into work clothing and shoe covers in the clean section of the designated changing areas;
2. Use work garments of appropriate protective gear, including respirators before entering the work area; and
3. Store any clothing not worn under protective clothing in the designated changing area.

Workers should follow these procedures upon leaving the work area:

1. HEPA vacuum heavily contaminated protective work clothing while it is still being worn. At no time may lead be removed from protective clothing by any means which result in uncontrolled dispersal of lead into the air;
2. Remove shoe covers and leave them in the work area;

3. Remove protective clothing and gear in the dirty area of the designated changing area. Remove protective coveralls by carefully rolling down the garment to reduce exposure to dust.

4. Remove respirators last; and
5. Wash hands and face.

Workers should follow these procedures upon finishing work for the day (in addition to procedures described above):

1. Where applicable, place disposal coveralls and shoe covers with the abatement waste;
2. Contaminated clothing which is to be cleaned, laundered or disposed of must be placed in closed containers in the change room.
3. Clean protective gear, including respirators, according to standard procedures;
4. Wash hands and face again. If showers are available, take a shower and wash hair. If shower facilities are not available at the work site, shower immediately at home and wash hair.

VI. Housekeeping—Paragraph (H)

Your employer must establish a housekeeping program sufficient to maintain all surfaces as free as practicable of accumulations of lead dust. Vacuuming is the preferred method of meeting this requirement, and the use of compressed air to clean floors and other surfaces is generally prohibited unless removal with compressed air is done in conjunction with ventilation systems designed to contain dispersal of the lead dust. Dry or wet sweeping, shoveling, or brushing may not be used except where vacuuming or other equally effective methods have been tried and do not work. Vacuums must be used equipped with a special filter called a high-efficiency particulate air (HEPA) filter and emptied in a manner which minimizes the reentry of lead into the workplace.

VII. Hygiene Facilities and Practices—Paragraph (I)

The standard requires that hand washing facilities be provided where occupational exposure to lead occurs. In addition, change areas, showers (where feasible), and lunchrooms or eating areas are to be made available to workers exposed to lead above the PEL. Your employer must assure that except in these facilities, food and beverage is not present or consumed, tobacco products are not present or used, and cosmetics are not applied, where airborne exposures are above the PEL. Change rooms provided by your employer must be equipped with separate storage facilities for your protective clothing and equipment and street clothes to avoid cross-contamination. After showering, no required protective clothing or equipment worn during the shift may be worn home. It is important that contaminated clothing or equipment be removed in change areas and not be worn home or you will extend your exposure and expose your family since lead from your clothing can accumulate in your house, car, etc.

Lunchrooms or eating areas may not be entered with protective clothing or equipment unless surface dust has been

removed by vacuuming, downdraft booth, or other cleaning method. Finally, workers exposed above the PEL must wash both their hands and faces prior to eating, drinking, smoking or applying cosmetics.

All of the facilities and hygiene practices just discussed are essential to minimize additional sources of lead absorption from inhalation or ingestion of lead that may accumulate on you, your clothes, or your possessions. Strict compliance with these provisions can virtually eliminate several sources of lead exposure which significantly contribute to excessive lead absorption.

VIII. Medical Surveillance—Paragraph (J)

The medical surveillance program is part of the standard's comprehensive approach to the prevention of lead-related disease. Its purpose is to supplement the main thrust of the standard which is aimed at minimizing airborne concentrations of lead and sources of ingestion. Only medical surveillance can determine if the other provisions of the standard have effectively protected you as an individual. Compliance with the standard's provision will protect most workers from the adverse effects of lead exposure, but may not be satisfactory to protect individual workers (1) who have high body burdens of lead acquired over past years, (2) who have additional uncontrolled sources of non-occupational lead exposure, (3) who exhibit unusual variations in lead absorption rates, or (4) who have specific non-work related medical conditions which could be aggravated by lead exposure (e.g., renal disease, anemia). In addition, control systems may fail, or hygiene and respirator programs may be inadequate. Periodic medical surveillance of individual workers will help detect those failures. Medical surveillance will also be important to protect your reproductive ability—regardless of whether you are a man or woman.

All medical surveillance required by the interim final standard must be performed by or under the supervision of a licensed physician. The employer must provide required medical surveillance without cost to employees and at a reasonable time and place. The standard's medical surveillance program has two parts—periodic biological monitoring and medical examinations. Your employer's obligation to offer you medical surveillance is triggered by the results of the air monitoring program. Full medical surveillance must be made available to all employees who are or may be exposed to lead in excess of the action level for more than 30 days a year and whose blood lead level exceeds 40 $\mu\text{g}/\text{dl}$. Initial medical surveillance consisting of blood sampling and analysis for lead and zinc protoporphyrin must be provided to all employees exposed at any time (1 day) above the action level.

Biological monitoring under the standard must be provided at least every 2 months for the first 6 months and every 6 months thereafter until your blood lead level is below 40 $\mu\text{g}/\text{dl}$. A zinc protoporphyrin (ZPP) test is a very useful blood test which measures an adverse metabolic effect of lead on your body and is therefore an indicator of lead toxicity.

If your BLL exceeds 40 $\mu\text{g}/\text{dl}$ the monitoring frequency must be increased from

every 6 months to at least every 2 months and not reduced until two consecutive BLLs indicate a blood lead level below 40 µg/dl. Each time your BLL is determined to be over 40 µg/dl, your employer must notify you of this in writing within five working days of his or her receipt of the test results. The employer must also inform you that the standard requires temporary medical removal with economic protection when your BLL exceeds 50 µg/dl. (See Discussion of Medical Removal Protection—Paragraph (k).) Anytime your BLL exceeds 50 µg/dl your employer must make available to you within two weeks of receipt of these test results a second follow-up BLL test to confirm your BLL. If the two tests both exceed 50 µg/dl, and you are temporarily removed, then your employer must make successive BLL tests available to you on a monthly basis during the period of your removal.

Medical examinations beyond the initial one must be made available on an annual basis if your blood lead level exceeds 40 µg/dl at any time during the preceding year and you are being exposed above the airborne action level of 30 µg/m³ for 30 or more days per year. The initial examination will provide information to establish a baseline to which subsequent data can be compared.

An initial medical examination to consist of blood sampling and analysis for lead and zinc protoporphyrin must also be made available (prior to assignment) for each employee being assigned for the first time to an area where the airborne concentration of lead equals or exceeds the action level at any time. In addition, a medical examination or consultation must be made available as soon as possible if you notify your employer that you are experiencing signs or symptoms commonly associated with lead poisoning or that you have difficulty breathing while wearing a respirator or during a respirator fit test. You must also be provided a medical examination or consultation if you notify your employer that you desire medical advice concerning the effects of current or past exposure to lead on your ability to procreate a healthy child.

Finally, appropriate follow-up medical examinations or consultations may also be provided for employees who have been temporarily removed from exposure under the medical removal protection provisions of the standard. (See Part IX, below.)

The standard specifies the minimum content of pre-assignment and annual medical examinations. The content of other types of medical examinations and consultations is left up to the sound discretion of the examining physician. Pre-assignment and annual medical examinations must include (1) a detailed work history and medical history; (2) a thorough physical examination, including an evaluation of your pulmonary status if you will be required to use a respirator; (3) a blood pressure measurement; and (4) a series of laboratory tests designed to check your blood chemistry and your kidney function. In addition, at any time upon your request, a laboratory evaluation of male fertility will be made (microscopic examination of a sperm sample), or a pregnancy test will be given.

The standard does not require that you participate in any of the medical procedures,

tests, etc. which your employer is required to make available to you. Medical surveillance can, however, play a very important role in protecting your health. You are strongly encouraged, therefore, to participate in a meaningful fashion. The standard contains a multiple physician review mechanism which will give you a chance to have a physician of your choice directly participate in the medical surveillance program. If you are dissatisfied with an examination by a physician chosen by your employer, you can select a second physician to conduct an independent analysis. The two doctors would attempt to resolve any differences of opinion, and select a third physician to resolve any firm dispute. Generally your employer will choose the physician who conducts medical surveillance under the lead standard—unless you and your employer can agree on the choice of a physician or physicians. Some companies and unions have agreed in advance, for example, to use certain independent medical laboratories or panels of physicians. Any of these arrangements are acceptable so long as required medical surveillance is made available to workers.

The standard requires your employer to provide certain information to a physician to aid in his or her examination of you. This information includes (1) the standard and its appendices, (2) a description of your duties as they relate to occupational lead exposure, (3) your exposure level or anticipated exposure level, (4) a description of any personal protective equipment you wear, (5) prior blood lead level results, and (6) prior written medical opinions concerning you that the employer has. After a medical examination or consultation the physician must prepare a written report which must contain (1) the physician's opinion as to whether you have any medical condition which places you at increased risk of material impairment to health from exposure to lead, (2) any recommended special protective measures to be provided to you, (3) any blood lead level determinations, and (4) any recommended limitation on your use of respirators. This last element must include a determination of whether you can wear a powered air purifying respirator (PAPR) if you are found unable to wear a negative pressure respirator.

The medical surveillance program of the interim lead standard may at some point in time serve to notify certain workers that they have acquired a disease or other adverse medical condition as a result of occupational lead exposure. If this is true, these workers might have legal rights to compensation from public agencies, their employers, firms that supply hazardous products to their employers, or other persons. Some states have laws, including worker compensation laws, that disallow a worker who learns of a job-related health impairment to sue, unless the worker sues within a short period of time after learning of the impairment. (This period of time may be a matter of months or years.) An attorney can be consulted about these possibilities. It should be stressed that OSHA is in no way trying to either encourage or discourage claims or lawsuits. However, since results of the standard's medical

surveillance program can significantly affect the legal remedies of a worker who has acquired a job-related disease or impairment, it is proper for OSHA to make you aware of this.

The medical surveillance section of the standard also contains provisions dealing with chelation. Chelation is the use of certain drugs (administered in pill form or injected into the body) to reduce the amount of lead absorbed in body tissues. Experience accumulated by the medical and scientific communities has largely confirmed the effectiveness of this type of therapy for the treatment of very severe lead poisoning. On the other hand, it has also been established that there can be a long list of extremely harmful side effects associated with the use of chelating agents. The medical community has balanced the advantages and disadvantages resulting from the use of chelating agents in various circumstances and has established when the use of these agents is acceptable. The standard includes these accepted limitations due to a history of abuse of chelation therapy by some lead companies. The most widely used chelating agents are calcium disodium EDTA, (Ca Na₂ EDTA), Calcium Disodium Versenate (Versenate), and D-penicillamine (penicillamine or Cupramine).

The standard prohibits "prophylactic chelation" of any employee by any person the employer retains, supervises or controls. "Prophylactic chelation" is the routine use of chelating or similarly acting drugs to prevent elevated blood levels in workers who are occupationally exposed to lead, or the use of these drugs to routinely lower blood lead levels to predesignated concentrations believed to be "safe". It should be emphasized that when an employer takes a worker who has no symptoms of lead poisoning and has chelation carried out by a physician (either inside or outside of a hospital) solely to reduce the worker's blood lead level, that will generally be considered prophylactic chelation. The use of a hospital and a physician does not mean that prophylactic chelation is not being performed. Routine chelation to prevent increased or reduce current blood lead levels is unacceptable whatever the setting.

The standard allows the use of "therapeutic" or "diagnostic" chelation if administered under the supervision of a licensed physician in a clinical setting with thorough and appropriate medical monitoring. Therapeutic chelation responds to severe lead poisoning where there are marked symptoms. Diagnostic chelation involved giving a patient a dose of the drug then collecting all urine excreted for some period of time as an aid to the diagnosis of lead poisoning.

In cases where the examining physician determines that chelation is appropriate, you must be notified in writing of this fact before such treatment. This will inform you of a potentially harmful treatment, and allow you to obtain a second opinion.

IX. Medical Removal Protection—Paragraph (K)

Excessive lead absorption subjects you to increased risk of disease. Medical removal

protection (MRP) is a means of protecting you when, for whatever reasons, other methods, such as engineering controls, work practices, and respirators, have failed to provide the protection you need. MRP involves the temporary removal of a worker from his or her regular job to a place of significantly lower exposure without any loss of earnings, seniority, or other employment rights or benefits. The purpose of this program is to cease further lead absorption and allow your body to naturally excrete lead which has previously been absorbed.

Temporary medical removal can result from an elevated blood lead level, or a medical opinion. For up to 18 months, or for as long as the job the employee was removed from lasts, protection is provided as a result of either form of removal. The vast majority of removed workers, however, will return to their former jobs long before this eighteen month period expires.

You may also be removed from exposure even if your blood lead level is below 50 µg/dl if a final medical determination indicates that you temporarily need reduced lead exposure for medical reasons. If the physician who is implementing your employer's medical program makes a final written opinion recommending your removal or other special protective measures, your employer must implement the physician's recommendation. If you are removed in this manner, you may only be returned when the doctor indicates that it is safe for you to do so.

The standard does not give specific instructions dealing with what an employer must do with a removed worker. Your job assignment upon removal is a matter for you, your employer and your union (if any) to work out consistent with existing procedures for job assignments. Each removal must be accomplished in a manner consistent with existing collective bargaining relationships. Your employer is given broad discretion to implement temporary removals so long as no attempt is made to override existing agreements. Similarly, a removed worker is provided no right to veto an employer's choice which satisfies the standard.

In most cases, employers will likely transfer removed employees to other jobs with sufficiently low lead exposure. Alternatively, a worker's hours may be reduced so that the time weighted average exposure is reduced, or he or she may be temporarily laid off if no other alternative is feasible.

In all of these situations, MRP benefits must be provided during the period of removal—i.e., you continue to receive the same earnings, seniority, and other rights and benefits you would have had if you had not been removed. Earnings includes more than just your base wage; it includes overtime, shift differentials, incentives, and other compensation you would have earned if you had not been removed. During the period of removal you must also be provided with appropriate follow-up medical surveillance. If you were removed because your blood lead level was too high, you must be provided with a monthly blood test. If a medical opinion caused your removal, you must be provided medical tests or examinations that

the doctor believes to be appropriate. If you do not participate in this follow up medical surveillance, you may lose your eligibility for MRP benefits.

When you are medically eligible to return to your former job, your employer must return you to your "former job status." This means that you are entitled to the position, wages, benefits, etc., you would have had if you had not been removed. If you would still be in your old job if no removal had occurred that is where you go back. If not, you are returned consistent with whatever job assignment discretion your employer would have had if no removal had occurred. MRP only seeks to maintain your rights, not expand them or diminish them.

If you are removed under MRP and you are also eligible for worker compensation or other compensation for lost wages, your employer's MRP benefits obligation is reduced by the amount that you actually receive from these other sources. This is also true if you obtain other employment during the time you are laid off with MRP benefits.

The standard also covers situations where an employer voluntarily removes a worker from exposure to lead due to the effects of lead on the employee's medical condition, even though the standard does not require removal. In these situations MRP benefits must still be provided as though the standard required removal. Finally, it is important to note that in all cases where removal is required, respirators cannot be used as a substitute. Respirators may be used before removal becomes necessary, but not as an alternative to a transfer to a low exposure job, or to a lay-off with MRP benefits.

X. Employee Information and Training—Paragraph (L)

Your employer is required to provide an information and training program for all employees exposed to lead above the action level or who may suffer skin or eye irritation from lead compounds such as lead arsenate or lead azide. The program must train these employees regarding the specific hazards associated with their work environment, protective measures which can be taken, including the contents of any compliance plan in effect, the danger of lead to their bodies (including their reproductive systems), and their rights under the standard. All employees must be trained prior to initial assignment to areas where there is a possibility of exposure over the action level.

This training program must also be provided at least annually thereafter unless further exposure above the action level will not occur.

XI. Signs—Paragraph (M)

The standard requires that the following warning sign be posted in work areas where the exposure to lead exceeds the PEL:

WARNING
LEAD WORK AREA
POISON
NO SMOKING OR EATING

These signs are to be posted and maintained in a manner which assures that the legend is readily visible.

XII. Recordkeeping—Paragraph (N)

Your employer is required to keep all records of exposure monitoring for airborne lead. These records must include the name and job classification of employees measured, details of the sampling and analytical techniques, the results of this sampling, and the type of respiratory protection being worn by the person sampled. Such records are to be retained for at least 30 years. Your employer is also required to keep all records of biological monitoring and medical examination results. These records must include the names of the employees, the physician's written opinion, and a copy of the results of the examination. Medical records must be preserved and maintained for the duration of employment plus 30 years. However, if the employee's duration of employment is less than one year, the employer need not retain that employee's medical records beyond the period of employment if they are provided to the employee upon termination of employment.

Recordkeeping is also required if you are temporarily removed from your job under the medical removal protection program. This record must include your name and social security number, the date of your removal and return, how the removal was or is being accomplished, and whether or not the reason for the removal was an elevated blood lead level. Your employer is required to keep each medical removal record only for as long as the duration of an employee's employment.

The standard requires that if you request to see or copy environmental monitoring, blood lead level monitoring, or medical removal records, they must be made available to you or to a representative that you authorize. Your union also has access to these records. Medical records other than BLL's must also be provided upon request to you, to your physician or to any other person whom you may specifically designate. Your union does not have access to your personal medical records unless you authorize their access.

XIII. Observation of Monitoring—Paragraph (O)

When air monitoring for lead is performed at your workplace as required by this standard, your employer must allow you or someone you designate to act as an observer of the monitoring. Observers are entitled to an explanation of the measurement procedure, and to record the results obtained. Since results will not normally be available at the time of the monitoring, observers are entitled to record or receive the results of the monitoring when returned by the laboratory. Your employer is required to provide the observer with any personal protective devices required to be worn by employees working in the area that is being monitored. The employer must require the observer to wear all such equipment and to comply with all other applicable safety and health procedures.

XIV. Effective Date—Paragraph (P)

The standard's effective date is June 3, 1993. Employer obligations under the standard begin as of that date with full implementation of engineering controls as soon as possible but no later than within 4

months, and all other provisions completed as soon as possible, but no later than within 2 months from the effective date.

XV. For Additional Information

A. A copy of the interim standard for lead in construction can be obtained free of charge by calling or writing the OSHA Office of Publications, room N-3101, United States Department of Labor, Washington, DC 20210: Telephone (202) 219-4667.

B. Additional information about the standard, its enforcement, and your employer's compliance can be obtained from the nearest OSHA Area Office listed in your telephone directory under United States Government/Department of Labor.

Appendix C to § 1926.62—Medical Surveillance Guidelines

Introduction

The primary purpose of the Occupational Safety and Health Act of 1970 is to assure, so far as possible, safe and healthful working conditions for every working man and woman. The interim final occupational health standard for lead in construction is designed to protect workers exposed to inorganic lead including metallic lead, all inorganic lead compounds and organic lead soaps.

Under this interim final standard occupational exposure to inorganic lead is to be limited to 50 $\mu\text{g}/\text{m}^3$ (micrograms per cubic meter) based on an 8 hour time-weighted average (TWA). This permissible exposure limit (PEL) must be achieved through a combination of engineering, work practice and administrative controls to the extent feasible. Where these controls are in place but are found not to reduce employee exposures to or below the PEL, they must be used nonetheless, and supplemented with respirators to meet the 50 $\mu\text{g}/\text{m}^3$ exposure limit.

The standard also provides for a program of biological monitoring for employees exposed to lead above the action level at any time, and additional medical surveillance for all employees exposed to levels of inorganic lead above 30 $\mu\text{g}/\text{m}^3$ (TWA) for more than 30 days per year and whose BLL exceeds 40 $\mu\text{g}/\text{dl}$.

The purpose of this document is to outline the medical surveillance provisions of the interim standard for inorganic lead in construction, and to provide further information to the physician regarding the examination and evaluation of workers exposed to inorganic lead.

Section 1 provides a detailed description of the monitoring procedure including the required frequency of blood testing for exposed workers, provisions for medical removal protection (MRP), the recommended right of the employee to a second medical opinion, and notification and recordkeeping requirements of the employer. A discussion of the requirements for respirator use and respirator monitoring and OSHA's position on prophylactic chelation therapy are also included in this section.

Section 2 discusses the toxic effects and clinical manifestations of lead poisoning and effects of lead intoxication on enzymatic pathways in heme synthesis. The adverse

effects on both male and female reproductive capacity and on the fetus are also discussed.

Section 3 outlines the recommended medical evaluation of the worker exposed to inorganic lead, including details of the medical history, physical examination, and recommended laboratory tests, which are based on the toxic effects of lead as discussed in Section 2.

Section 4 provides detailed information concerning the laboratory tests available for the monitoring of exposed workers. Included also is a discussion of the relative value of each test and the limitations and precautions which are necessary in the interpretation of the laboratory results.

1. Medical Surveillance and Monitoring Requirements for Workers Exposed to Inorganic Lead

Under the interim final standard for inorganic lead in the construction industry, initial medical surveillance consisting of biological monitoring to include blood lead and ZPP level determination shall be provided to employees exposed to lead at or above the action level on any one day. In addition, a program of biological monitoring is to be made available to all employees exposed above the action level at any time and additional medical surveillance is to be made available to all employees exposed to lead above 30 $\mu\text{g}/\text{m}^3$ TWA for more than 30 days each year and whose BLL exceeds 40 $\mu\text{g}/\text{dl}$. This program consists of periodic blood sampling and medical evaluation to be performed on a schedule which is defined by previous laboratory results, worker complaints or concerns, and the clinical assessment of the examining physician.

Under this program, the blood lead level (BLL) of all employees who are exposed to lead above 30 $\mu\text{g}/\text{m}^3$ for more than 30 days per year or whose blood lead is above 40 $\mu\text{g}/\text{dl}$ but exposed for no more than 30 days per year is to be determined at least every two months for the first six months of exposure and every six months thereafter. The frequency is increased to every two months for employees whose last blood lead level was 40 $\mu\text{g}/\text{dl}$ or above. For employees who are removed from exposure to lead due to an elevated blood lead, a new blood lead level must be measured monthly. A zinc protoporphyrin (ZPP) measurement is strongly recommended on each occasion that a blood lead level measurement is made.

An annual medical examination and consultation performed under the guidelines discussed in Section 3 is to be made available to each employee exposed above 30 $\mu\text{g}/\text{m}^3$ for more than 30 days per year for whom a blood test conducted at any time during the preceding 12 months indicated a blood lead level at or above 40 $\mu\text{g}/\text{dl}$. Also, an examination is to be given to all employees prior to their assignment to an area in which airborne lead concentrations reach or exceed the 30 $\mu\text{g}/\text{m}^3$ for more than 30 days per year. In addition, a medical examination must be provided as soon as possible after notification by an employee that the employee has developed signs or symptoms commonly associated with lead intoxication, that the employee desires medical advice regarding lead exposure and the ability to

procreate a healthy child, or that the employee has demonstrated difficulty in breathing during a respirator fitting test or during respirator use. An examination is also to be made available to each employee removed from exposure to lead due to a risk of sustaining material impairment to health, or otherwise limited or specially protected pursuant to medical recommendations.

Results of biological monitoring or the recommendations of an examining physician may necessitate removal of an employee from further lead exposure pursuant to the standard's medical removal protection (MRP) program. The object of the MRP program is to provide temporary medical removal to workers either with substantially elevated blood lead levels or otherwise at risk of sustaining material health impairment from continued substantial exposure to lead.

Under the standard's ultimate worker removal criteria, a worker is to be removed from any work having an eight hour TWA exposure to lead of 30 $\mu\text{g}/\text{m}^3$ when his or her blood lead level reaches 50 $\mu\text{g}/\text{dl}$ and is confirmed by a second follow-up blood lead level performed within two weeks after the employer receives the results of the first blood sampling test. Return of the employee to his or her job status depends on a worker's blood lead level declining to 40 $\mu\text{g}/\text{dl}$.

As part of the interim standard, the employer is required to notify in writing each employee whose blood lead level exceeds 40 $\mu\text{g}/\text{dl}$. In addition each such employee is to be informed that the standard requires medical removal with MRP benefits, discussed below, when an employee's blood lead level exceeds the above defined limit.

In addition to the above blood lead level criterion, temporary worker removal may also take place as a result of medical determinations and recommendations. Written medical opinions must be prepared after each examination pursuant to the standard. If the examining physician includes a medical finding, determination or opinion that the employee has a medical condition which places the employee at increased risk of material health impairment from exposure to lead, then the employee must be removed from exposure to lead at or above 30 $\mu\text{g}/\text{m}^3$. Alternatively, if the examining physician recommends special protective measures for an employee (e.g., use of a powered air purifying respirator) or recommends limitations on an employee's exposure to lead, then the employer must implement these recommendations.

Recommendations may be more stringent than the specific provisions of the standard. The examining physician, therefore, is given broad flexibility to tailor special protective procedures to the needs of individual employees. This flexibility extends to the evaluation and management of pregnant workers and male and female workers who are planning to raise children. Based on the history, physical examination, and laboratory studies, the physician might recommend special protective measures or medical removal for an employee who is pregnant or who is planning to conceive a child when, in the physician's judgment, continued exposure to lead at the current job would pose a significant risk. The return of the

employee to his or her former job status, or the removal of special protections or limitations, depends upon the examining physician determining that the employee is no longer at increased risk of material impairment or that special measures are no longer needed.

During the period of any form of special protection or removal, the employer must maintain the worker's earnings, seniority, and other employment rights and benefits (as though the worker had not been removed) for a period of up to 18 months or for as long as the job the employee was removed from lasts if less than 18 months. This economic protection will maximize meaningful worker participation in the medical surveillance program, and is appropriate as part of the employer's overall obligation to provide a safe and healthful workplace. The provisions of MRP benefits during the employee's removal period may, however, be conditioned upon participation in medical surveillance.

The lead standard provides for a multiple physician review in cases where the employee wishes a second opinion concerning potential lead poisoning or toxicity. If an employee wishes a second opinion, he or she can make an appointment with a physician of his or her choice. This second physician will review the findings, recommendations or determinations of the first physician and conduct any examinations, consultations or tests deemed necessary in an attempt to make a final medical determination. If the first and second physicians do not agree in their assessment they must try to resolve their differences. If they cannot reach an agreement then they must designate a third physician to resolve the dispute.

The employer must provide examining and consulting physicians with the following specific information: A copy of the lead regulations and all appendices, a description of the employee's duties as related to exposure, the exposure level or anticipated level to lead and any other toxic substances (if applicable), a description of personal protective equipment used, blood lead levels, and all prior written medical opinions regarding the employee in the employer's possession or control. The employer must also obtain from the physician and provide the employee with a written medical opinion containing blood lead levels, the physician's opinion as to whether the employee is at risk of material impairment to health, any recommended protective measures for the employee if further exposure is permitted, as well as any recommended limitations upon an employee's use of respirators.

Employers must instruct each physician not to reveal to the employer in writing or in any other way his or her findings, laboratory results, or diagnoses which are felt to be unrelated to occupational lead exposure. They must also instruct each physician to advise the employee of any occupationally or non-occupationally related medical condition requiring further treatment or evaluation.

The standard provides for the use of respirators where engineering and other primary controls are not effective. However,

the use of respirator protection shall not be used in lieu of temporary medical removal due to elevated blood lead levels or findings that an employee is at risk of material health impairment. This is based on the numerous inadequacies of respirators including skin rash where the facepiece makes contact with the skin, unacceptable stress to breathing in some workers with underlying cardiopulmonary impairment, difficulty in providing adequate fit, the tendency for respirators to create additional hazards by interfering with vision, hearing, and mobility, and the difficulties of assuring the maximum effectiveness of a complicated work practice program involving respirators. Respirators do, however, serve a useful function where engineering and work practice controls are inadequate by providing supplementary, interim, or short-term protection, provided they are properly selected for the environment in which the employee will be working, properly fitted to the employee, maintained and cleaned periodically, and worn by the employee when required.

In its interim final standard on occupational exposure to inorganic lead in the construction industry, OSHA has prohibited prophylactic chelation. Diagnostic and therapeutic chelation are permitted only under the supervision of a licensed physician with appropriate medical monitoring in an acceptable clinical setting. The decision to initiate chelation therapy must be made on an individual basis and take into account the severity of symptoms felt to be a result of lead toxicity along with blood lead levels, ZPP levels, and other laboratory tests as appropriate. EDTA and penicillamine which are the primary chelating agents used in the therapy of occupational lead poisoning have significant potential side effects and their use must be justified on the basis of expected benefits to the worker. Unless frank and severe symptoms are present, therapeutic chelation is not recommended, given the opportunity to remove a worker from exposure and allow the body to naturally excrete accumulated lead. As a diagnostic aid, the chelation mobilization test using CA-EDTA has limited applicability. According to some investigators, the test can differentiate between lead-induced and other nephropathies. The test may also provide an estimation of the mobile fraction of the total body lead burden.

Employers are required to assure that accurate records are maintained on exposure assessment, including environmental monitoring, medical surveillance, and medical removal for each employee. Exposure assessment records must be kept for at least 30 years. Medical surveillance records must be kept for the duration of employment plus 30 years except in cases where the employment was less than one year. If duration of employment is less than one year, the employer need not retain this record beyond the term of employment if the record is provided to the employee upon termination of employment. Medical removal records also must be maintained for the duration of employment. All records required under the standard must be made available upon request to the Assistant Secretary of

Labor for Occupational Safety and Health and the Director of the National Institute for Occupational Safety and Health. Employers must also make environmental and biological monitoring and medical removal records available to affected employees and to former employees or their authorized employee representatives. Employees or their specifically designated representatives have access to their entire medical surveillance records.

In addition, the standard requires that the employer inform all workers exposed to lead at or above 30 $\mu\text{g}/\text{m}^3$ of the provisions of the standard and all its appendices, the purpose and description of medical surveillance and provisions for medical removal protection if temporary removal is required. An understanding of the potential health effects of lead exposure by all exposed employees along with full understanding of their rights under the lead standard is essential for an effective monitoring program.

II. Adverse Health Effects of Inorganic Lead

Although the toxicity of lead has been known for 2,000 years, the knowledge of the complex relationship between lead exposure and human response is still being refined. Significant research into the toxic properties of lead continues throughout the world, and it should be anticipated that our understanding of thresholds of effects and margins of safety will be improved in future years. The provisions of the lead standard are founded on two prime medical judgments: First, the prevention of adverse health effects from exposure to lead throughout a working lifetime requires that worker blood lead levels be maintained at or below 40 $\mu\text{g}/\text{dl}$ and second, the blood lead levels of workers, male or female, who intend to parent in the near future should be maintained below 30 $\mu\text{g}/\text{dl}$ to minimize adverse reproductive health effects to the parents and developing fetus. The adverse effects of lead on reproduction are being actively researched and OSHA encourages the physician to remain abreast of recent developments in the area to best advise pregnant workers or workers planning to conceive children.

The spectrum of health effects caused by lead exposure can be subdivided into five developmental stages: Normal, physiological changes of uncertain significance, pathophysiological changes, overt symptoms (morbidity), and mortality. Within this process there are no sharp distinctions, but rather a continuum of effects. Boundaries between categories overlap due to the wide variation of individual responses and exposures in the working population. OSHA's development of the lead standard focused on pathophysiological changes as well as later stages of disease.

1. Heme Synthesis Inhibition. The earliest demonstrated effect of lead involves its ability to inhibit at least two enzymes of the heme synthesis pathway at very low blood levels. Inhibition of delta aminolevulinic acid dehydrase (ALA-D) which catalyzes the conversion of delta-aminolevulinic acid (ALA) to protoporphyrin is observed at a blood lead level below 20 $\mu\text{g}/\text{dl}$. At a blood lead level of 40 $\mu\text{g}/\text{dl}$, more than 20% of the population would have 70% inhibition of

ALA-D. There is an exponential increase in ALA excretion at blood lead levels greater than 40 µg/dl.

Another enzyme, ferrochelatase, is also inhibited at low blood lead levels. Inhibition of ferrochelatase leads to increased free erythrocyte protoporphyrin (FEP) in the blood which can then bind to zinc to yield zinc protoporphyrin. At a blood lead level of 50 µg/dl or greater, nearly 100% of the population will have an increase in FEP. There is also an exponential relationship between blood lead levels greater than 40 µg/dl and the associated ZPP level, which has led to the development of the ZPP screening test for lead exposure.

While the significance of these effects is subject to debate, it is OSHA's position that these enzyme disturbances are early stages of a disease process which may eventually result in the clinical symptoms of lead poisoning. Whether or not the effects do progress to the later stages of clinical disease, disruption of these enzyme processes over a working lifetime is considered to be a material impairment of health.

One of the eventual results of lead-induced inhibition of enzymes in the heme synthesis pathway is anemia which can be asymptomatic if mild but associated with a wide array of symptoms including dizziness, fatigue, and tachycardia when more severe. Studies have indicated that lead levels as low as 50 µg/dl can be associated with a definite decreased hemoglobin, although most cases of lead-induced anemia, as well as shortened red-cell survival times, occur at lead levels exceeding 80 µg/dl. Inhibited hemoglobin synthesis is more common in chronic cases whereas shortened erythrocyte life span is more common in acute cases.

In lead-induced anemias, there is usually a reticulocytosis along with the presence of basophilic stippling, and ringed sideroblasts, although none of the above are pathognomonic for lead-induced anemia.

2. Neurological Effects. Inorganic lead has been found to have toxic effects on both the central and peripheral nervous systems. The earliest stages of lead-induced central nervous system effects first manifest themselves in the form of behavioral disturbances and central nervous system symptoms including irritability, restlessness, insomnia and other sleep disturbances, fatigue, vertigo, headache, poor memory, tremor, depression, and apathy. With more severe exposure, symptoms can progress to drowsiness, stupor, hallucinations, delirium, convulsions and coma.

The most severe and acute form of lead poisoning which usually follows ingestion or inhalation of large amounts of lead is acute encephalopathy which may arise precipitously with the onset of intractable seizures, coma, cardiorespiratory arrest, and death within 48 hours.

While there is disagreement about what exposure levels are needed to produce the earliest symptoms, most experts agree that symptoms definitely can occur at blood lead levels of 60 µg/dl whole blood and therefore recommend a 40 µg/dl maximum. The central nervous system effects frequently are not reversible following discontinued exposure or chelation therapy and when improvement does occur, it is almost always only partial.

The peripheral neuropathy resulting from lead exposure characteristically involves only motor function with minimal sensory damage and has a marked predilection for the extensor muscles of the most active extremity. The peripheral neuropathy can occur with varying degrees of severity. The earliest and mildest form which can be detected in workers with blood lead levels as low as 50 µg/dl is manifested by slowing of motor nerve conduction velocity often without clinical symptoms. With progression of the neuropathy there is development of painless extensor muscle weakness usually involving the extensor muscles of the fingers and hand in the most active upper extremity, followed in severe cases by wrist drop or, much less commonly, foot drop.

In addition to slowing of nerve conduction, electromyographical studies in patients with blood lead levels greater than 50 µg/dl have demonstrated a decrease in the number of acting motor unit potentials, an increase in the duration of motor unit potentials, and spontaneous pathological activity including fibrillations and fasciculations. Whether these effects occur at levels of 40 µg/dl is undetermined.

While the peripheral neuropathies can occasionally be reversed with therapy, again such recovery is not assured particularly in the more severe neuropathies and often improvement is only partial. The lack of reversibility is felt to be due in part to segmental demyelination.

3. Gastrointestinal. Lead may also affect the gastrointestinal system producing abdominal colic or diffuse abdominal pain, constipation, obstipation, diarrhea, anorexia, nausea and vomiting. Lead colic rarely develops at blood lead levels below 80 µg/dl.

4. Renal. Renal toxicity represents one of the most serious health effects of lead poisoning. In the early stages of disease nuclear inclusion bodies can frequently be identified in proximal renal tubular cells. Renal function remains normal and the changes in this stage are probably reversible. With more advanced disease there is progressive interstitial fibrosis and impaired renal function. Eventually extensive interstitial fibrosis ensues with sclerotic glomeruli and dilated and atrophied proximal tubules; all represent end stage kidney disease. Azotemia can be progressive, eventually resulting in frank uremia necessitating dialysis. There is occasionally associated hypertension and hyperuricemia with or without gout.

Early kidney disease is difficult to detect. The urinalysis is normal in early lead nephropathy and the blood urea nitrogen and serum creatinine increase only when two-thirds of kidney function is lost. Measurement of creatinine clearance can often detect earlier disease as can other methods of measurement of glomerular filtration rate. An abnormal Ca-EDTA mobilization test has been used to differentiate between lead-induced and other nephropathies, but this procedure is not widely accepted. A form of Fanconi syndrome with aminoaciduria, glycosuria, and hyperphosphaturia indicating severe injury to the proximal renal tubules is occasionally seen in children.

5. Reproductive effects. Exposure to lead can have serious effects on reproductive function in both males and females. In male workers exposed to lead there can be a decrease in sexual drive, impotence, decreased ability to produce healthy sperm, and sterility. Malformed sperm (teratospermia), decreased number of sperm (hypospermia), and sperm with decreased motility (asthenospermia) can all occur. Teratospermia has been noted at mean blood lead levels of 53 µg/dl and hypospermia and asthenospermia at 41 µg/dl. Furthermore, there appears to be a dose-response relationship for teratospermia in lead exposed workers.

Women exposed to lead may experience menstrual disturbances including dysmenorrhea, menorrhagia and amenorrhea. Following exposure to lead, women have a higher frequency of sterility, premature births, spontaneous miscarriages, and stillbirths.

Germ cells can be affected by lead and cause genetic damage in the egg or sperm cells before conception and result in failure to implant, miscarriage, stillbirth, or birth defects.

Infants of mothers with lead poisoning have a higher mortality during the first year and suffer from lowered birth weights, slower growth, and nervous system disorders.

Lead can pass through the placental barrier and lead levels in the mother's blood are comparable to concentrations of lead in the umbilical cord at birth. Transplacental passage becomes detectable at 12-14 weeks of gestation and increases until birth.

There is little direct data on damage to the fetus from exposure to lead but it is generally assumed that the fetus and newborn would be at least as susceptible to neurological damage as young children. Blood lead levels of 50-60 µg/dl in children can cause significant neurobehavioral impairments and there is evidence of hyperactivity at blood levels as low as 25 µg/dl. Given the overall body of literature concerning the adverse health effects of lead in children, OSHA feels that the blood lead level in children should be maintained below 30 µg/dl with a population mean of 15 µg/dl. Blood lead levels in the fetus and newborn likewise should not exceed 30 µg/dl.

Because of lead's ability to pass through the placental barrier and also because of the demonstrated adverse effects of lead on reproductive function in both the male and female as well as the risk of genetic damage of lead on both the ovum and sperm, OSHA recommends a 30 µg/dl maximum permissible blood lead level in both males and females who wish to bear children.

6. Other toxic effects. Debate and research continue on the effects of lead on the human body. Hypertension has frequently been noted in occupationally exposed individuals although it is difficult to assess whether this is due to lead's adverse effects on the kidney or if some other mechanism is involved. Vascular and electrocardiographic changes have been detected but have not been well characterized. Lead is thought to impair thyroid function and interfere with the pituitary-adrenal axis, but again these effects have not been well defined.

III. Medical Evaluation

The most important principle in evaluating a worker for any occupational disease including lead poisoning is a high index of suspicion on the part of the examining physician. As discussed in Section 2, lead can affect numerous organ systems and produce a wide array of signs and symptoms, most of which are non-specific and subtle in nature at least in the early stages of disease. Unless serious concern for lead toxicity is present, many of the early clues to diagnosis may easily be overlooked.

The crucial initial step in the medical evaluation is recognizing that a worker's employment can result in exposure to lead. The worker will frequently be able to define exposures to lead and lead containing materials but often will not volunteer this information unless specifically asked. In other situations the worker may not know of any exposures to lead but the suspicion might be raised on the part of the physician because of the industry or occupation of the worker. Potential occupational exposure to lead and its compounds occur in many occupations in the construction industry, including demolition and salvaging operations, removal or encapsulation of materials containing lead, construction, alteration, repair or renovation of structures containing lead, transportation, disposal, storage or containment of lead or lead-containing materials on construction sites, and maintenance operations associated with construction activities.

Once the possibility for lead exposure is raised, the focus can then be directed toward eliciting information from the medical history, physical exam, and finally from laboratory data to evaluate the worker for potential lead toxicity.

A complete and detailed work history is important in the initial evaluation. A listing of all previous employment with information on job description, exposure to fumes or dust, known exposures to lead or other toxic substances, a description of any personal protective equipment used, and previous medical surveillance should all be included in the worker's record. Where exposure to lead is suspected, information concerning on-the-job personal hygiene, smoking or eating habits in work areas, laundry procedures, and use of any protective clothing or respiratory protection equipment should be noted. A complete work history is essential in the medical evaluation of a worker with suspected lead toxicity, especially when long term effects such as neurotoxicity and nephrotoxicity are considered.

The medical history is also of fundamental importance and should include a listing of all past and current medical conditions, current medications including proprietary drug intake, previous surgeries and hospitalizations, allergies, smoking history, alcohol consumption, and also non-occupational lead exposures such as hobbies (hunting, riflery). Also known childhood exposures should be elicited. Any previous history of hematological, neurological, gastrointestinal, renal, psychological, gynecological, genetic, or reproductive problems should be specifically noted.

A careful and complete review of systems must be performed to assess both recognized

complaints and subtle or slowly acquired symptoms which the worker might not appreciate as being significant. The review of symptoms should include the following:

1. General—weight loss, fatigue, decreased appetite.
2. Head, Eyes, Ears, Nose, Throat (HEENT)—headaches, visual disturbances or decreased visual acuity, hearing deficits or tinnitus, pigmentation of the oral mucosa, or metallic taste in mouth.
3. Cardio-pulmonary—shortness of breath, cough, chest pains, palpitations, or orthopnea.
4. Gastrointestinal—nausea, vomiting, heartburn, abdominal pain, constipation or diarrhea.
5. Neurologic—irritability, insomnia, weakness (fatigue), dizziness, loss of memory, confusion, hallucinations, incoordination, ataxia, decreased strength in hands or feet, disturbances in gait, difficulty in climbing stairs, or seizures.
6. Hematologic—pallor, easy fatigability, abnormal blood loss, melena.
7. Reproductive (male and female and spouse where relevant)—history of infertility, impotence, loss of libido, abnormal menstrual periods, history of miscarriages, stillbirths, or children with birth defects.
8. Musculo-skeletal—muscle and joint pains.

The physical examination should emphasize the neurological, gastrointestinal, and cardiovascular systems. The worker's weight and blood pressure should be recorded and the oral mucosa checked for pigmentation characteristic of a possible Burtonian or lead line on the gingiva. It should be noted, however, that the lead line may not be present even in severe lead poisoning if good oral hygiene is practiced.

The presence of pallor on skin examination may indicate an anemia which, if severe, might also be associated with a tachycardia. If an anemia is suspected, an active search for blood loss should be undertaken including potential blood loss through the gastrointestinal tract.

A complete neurological examination should include an adequate mental status evaluation including a search for behavioral and psychological disturbances, memory testing, evaluation for irritability, insomnia, hallucinations, and mental clouding. Gait and coordination should be examined along with close observation for tremor. A detailed evaluation of peripheral nerve function including careful sensory and motor function testing is warranted. Strength testing particularly of extensor muscle groups of all extremities is of fundamental importance.

Cranial nerve evaluation should also be included in the routine examination.

The abdominal examination should include auscultation for bowel sounds and abdominal bruits and palpation for organomegaly, masses, and diffuse abdominal tenderness.

Cardiovascular examination should evaluate possible early signs of congestive heart failure. Pulmonary status should be addressed particularly if respirator protection is contemplated.

As part of the medical evaluation, the interim lead standard requires the following laboratory studies:

1. Blood lead level
2. Hemoglobin and hematocrit determinations, red cell indices, and examination of the peripheral blood smear to evaluate red blood cell morphology
3. Blood urea nitrogen
4. Serum creatinine
5. Routine urinalysis with microscopic examination.
6. A zinc protoporphyrin level.

In addition to the above, the physician is authorized to order any further laboratory or other tests which he or she deems necessary in accordance with sound medical practice. The evaluation must also include pregnancy testing or laboratory evaluation of male fertility if requested by the employee. Additional tests which are probably not warranted on a routine basis but may be appropriate when blood lead and ZPP levels are equivocal include delta aminolevulinic acid and coproporphyrin concentrations in the urine, and dark-field illumination for detection of basophilic stippling in red blood cells.

If an anemia is detected further studies including a careful examination of the peripheral smear, reticulocyte count, stool for occult blood, serum iron, total iron binding capacity, bilirubin, and, if appropriate, vitamin B12 and folate may be of value in attempting to identify the cause of the anemia.

If a peripheral neuropathy is suspected, nerve conduction studies are warranted both for diagnosis and as a basis to monitor any therapy.

If renal disease is questioned, a 24 hour urine collection for creatinine clearance, protein, and electrolytes may be indicated. Elevated uric acid levels may result from lead-induced renal disease and a serum uric acid level might be performed.

An electrocardiogram and chest x-ray may be obtained as deemed appropriate.

Sophisticated and highly specialized testing should not be done routinely and where indicated should be under the direction of a specialist.

IV. Laboratory Evaluation

The blood lead level at present remains the single most important test to monitor lead exposure and is the test used in the medical surveillance program under the lead standard to guide employee medical removal. The ZPP has several advantages over the blood lead level. Because of its relatively recent development and the lack of extensive data concerning its interpretation, the ZPP currently remains an ancillary test.

This section will discuss the blood lead level and ZPP in detail and will outline their relative advantages and disadvantages. Other blood tests currently available to evaluate lead exposure will also be reviewed.

The blood lead level is a good index of current or recent lead absorption when there is no anemia present and when the worker has not taken any chelating agents. However, blood lead levels along with urinary lead levels do not necessarily indicate the total body burden of lead and are not adequate measures of past exposure. One reason for this is that lead has a high affinity for bone and up to 90% of the body's total lead is

deposited there. A very important component of the total lead body burden is lead in soft tissue (liver, kidney, and brain). This fraction of the lead body burden, the biologically active lead, is not entirely reflected by blood lead levels since it is a function of the dynamics of lead absorption, distribution, deposition in bone and excretion. Following discontinuation of exposure to lead, the excess body burden is only slowly mobilized from bone and other relatively stable body stores and excreted. Consequently, a high blood lead level may only represent recent heavy exposure to lead without a significant total body excess and likewise a low blood lead level does not exclude an elevated total body burden of lead.

Also due to its correlation with recent exposures, the blood lead level may vary considerably over short time intervals.

To minimize laboratory error and erroneous results due to contamination, blood specimens must be carefully collected after thorough cleaning of the skin with appropriate methods using lead-free blood containers and analyzed by a reliable laboratory. Under the standard, samples must be analyzed in laboratories which are approved by OSHA. Analysis is to be made using atomic absorption spectrophotometry, anodic stripping voltammetry or any method which meets the accuracy requirements set forth by the standard.

The determination of lead in urine is generally considered a less reliable monitoring technique than analysis of whole blood primarily due to individual variability in urinary excretion capacity as well as the technical difficulty of obtaining accurate 24 hour urine collections. In addition, workers with renal insufficiency, whether due to lead or some other cause, may have decreased lead clearance and consequently urine lead levels may underestimate the true lead burden. Therefore, urine lead levels should not be used as a routine test.

The zinc protoporphyrin test, unlike the blood lead determination, measures an adverse metabolic effect of lead and as such is a better indicator of lead toxicity than the level of blood lead itself. The level of ZPP reflects lead absorption over the preceding 3 to 4 months, and therefore is a better indicator of lead body burden. The ZPP requires more time than the blood lead to reach significantly elevated levels; the return to normal after discontinuing lead exposure is also slower. Furthermore, the ZPP test is simpler, faster, and less expensive to perform and no contamination is possible. Many investigators believe it is the most reliable means of monitoring chronic lead absorption.

Zinc protoporphyrin results from the inhibition of the enzyme ferrochelatase which catalyzes the insertion of an iron molecule into the protoporphyrin molecule, which then becomes heme. If iron is not inserted into the molecule then zinc, having a greater affinity for protoporphyrin, takes the place of the iron, forming ZPP.

An elevation in the level of circulating ZPP may occur at blood lead levels as low as 20-30 µg/dl in some workers. Once the blood lead level has reached 40 µg/dl there is more marked rise in the ZPP value from its normal range of less than 100 µg/dl/100 ml. Increases

in blood lead levels beyond 40 µg/100 g are associated with exponential increases in ZPP.

Whereas blood lead levels fluctuate over short time spans, ZPP levels remain relatively stable. ZPP is measured directly in red blood cells and is present for the cell's entire 120 day life-span. Therefore, the ZPP level in blood reflects the average ZPP production over the previous 3-4 months and consequently the average lead exposure during that time interval.

It is recommended that a hematocrit be determined whenever a confirmed ZPP of 50 µg/100 ml whole blood is obtained to rule out a significant underlying anemia. If the ZPP is in excess of 100 µg/100 ml and not associated with abnormal elevations in blood lead levels, the laboratory should be checked to be sure that blood leads were determined using atomic absorption spectrophotometry anodic stripping voltammetry, or any method which meets the accuracy requirements set forth by the standard by an OSHA approved laboratory which is experienced in lead level determinations. Repeat periodic blood lead studies should be obtained in all individuals with elevated ZPP levels to be certain that an associated elevated blood lead level has not been missed due to transient fluctuations in blood leads.

ZPP has a characteristic fluorescence spectrum with a peak at 594 nm which is detectable with a hematofluorimeter. The hematofluorimeter is accurate and portable and can provide on-site, instantaneous results for workers who can be frequently tested via a finger prick.

However, careful attention must be given to calibration and quality control procedures. Limited data on blood lead-ZPP correlations and the ZPP levels which are associated with the adverse health effects discussed in Section 2 are the major limitations of the test. Also it is difficult to correlate ZPP levels with environmental exposure and there is some variation of response with age and sex. Nevertheless, the ZPP promises to be an important diagnostic test for the early detection of lead toxicity and its value will increase as more data is collected regarding its relationship to other manifestations of lead poisoning.

Levels of delta-aminolevulinic acid (ALA) in the urine are also used as a measure of lead exposure. Increasing concentrations of ALA are believed to result from the inhibition of the enzyme delta-aminolevulinic acid dehydrase (ALA-D). Although the test is relatively easy to perform, inexpensive, and rapid, the disadvantages include variability in results, the necessity to collect a complete 24 hour urine sample which has a specific gravity greater than 1.010, and also the fact that ALA decomposes in the presence of light.

The pattern of porphyrin excretion in the urine can also be helpful in identifying lead intoxication. With lead poisoning, the urine concentrations of coproporphyrins I and II, porphobilinogen and uroporphyrin I rise. The most important increase, however, is that of coproporphyrin III; levels may exceed 5,000 µg/l in the urine in lead poisoned individuals, but its correlation with blood lead levels and ZPP are not as good as those of ALA. Increases in urinary porphyrins are

not diagnostic of lead toxicity and may be seen in porphyria, some liver diseases, and in patients with high reticulocyte counts.

Summary. The Occupational Safety and Health Administration's interim standard for inorganic lead in the construction industry places significant emphasis on the medical surveillance of all workers exposed to levels of inorganic lead above 30 µg/m³ TWA. The physician has a fundamental role in this surveillance program, and in the operation of the medical removal protection program.

Even with adequate worker education on the adverse health effects of lead and appropriate training in work practices, personal hygiene and other control measures, the physician has a primary responsibility for evaluating potential lead toxicity in the worker. It is only through a careful and detailed medical and work history, a complete physical examination and appropriate laboratory testing that an accurate assessment can be made. Many of the adverse health effects of lead toxicity are either irreversible or only partially reversible and therefore early detection of disease is very important.

This document outlines the medical monitoring program as defined by the occupational safety and health standard for inorganic lead. It reviews the adverse health effects of lead poisoning and describes the important elements of the history and physical examinations as they relate to these adverse effects. Finally, the appropriate laboratory testing for evaluating lead exposure and toxicity is presented.

It is hoped that this review and discussion will give the physician a better understanding of the OSHA standard with the ultimate goal of protecting the health and well-being of the worker exposed to lead under his or her care.

Appendix D to § 1926.62— Qualitative and Quantitative Fit Test Protocols

I. Fit Test Protocols

A. General: The employer shall include the following provisions in the fit test procedures. These provisions apply to both qualitative fit testing (QLFT) and quantitative fit testing (QNFT) permissible for compliance with paragraph (f)(3)(iii) of § 1926.62. All testing is to be conducted annually.

1. The test subject shall be allowed to pick the most comfortable respirator from a selection including respirators of various sizes from different manufacturers. The selection shall include at least three sizes of elastomeric facepieces of the type of respirator that is to be tested, i.e., three sizes of half mask; or three sizes of full facepiece. Respirators of each size must be provided from at least two manufacturers.

2. Prior to the selection process, the test subject shall be shown how to put on a respirator, how it should be positioned on the face, how to set strap tension and how to determine a comfortable fit. A mirror shall be available to assist the subject in evaluating the fit and positioning the respirator. This instruction may not constitute the subject's formal training on respirator use, as it is only a review.

3. The test subject shall be informed that he/she is being asked to select the respirator

which provides the most comfortable fit. Each respirator represents a different size and shape, and if fitted, maintained and used properly, will provide adequate protection.

4. The test subject shall be instructed to hold each facepiece up to the face and eliminate those which obviously do not give a comfortable fit.

5. The more comfortable facepieces are noted; the most comfortable mask is donned and worn at least five minutes to assess comfort. Assistance in assessing comfort can be given by discussing the points in item 6 below. If the test subject is not familiar with using a particular respirator, the test subject shall be directed to don the mask several times and to adjust the straps each time to become adept at setting proper tension on the straps.

6. Assessment of comfort shall include reviewing the following points with the test subject and allowing the test subject adequate time to determine the comfort of the respirator:

- (a) position of the mask on the nose;
- (b) room for eye protection;
- (c) room to talk; and
- (d) position of mask on face and cheeks.

7. The following criteria shall be used to help determine the adequacy of the respirator fit:

- (a) chin properly placed;
- (b) adequate strap tension, not overly tightened;
- (c) fit across nose bridge;
- (d) respirator of proper size to span distance from nose to chin;
- (e) tendency of respirator to slip; and
- (f) self-observation in mirror to evaluate fit and respirator position.

8. The test subject shall conduct the negative and positive pressure fit checks as described below or in ANSI Z88.2-1980. Before conducting the negative or positive pressure test, the subject shall be told to seat the mask on the face by moving the head from side-to-side and up and down slowly while taking in a few slow deep breaths. Another facepiece shall be selected and retested if the test subject fails the fit check tests.

(a) *Positive pressure check.* Close off the exhalation valve and exhale gently into the facepiece. The face fit is considered satisfactory if a slight positive pressure can be built up inside the facepiece without any evidence of outward leakage of air at the seal. For most respirators this method of leak testing requires the wearer to first remove the exhalation valve cover before closing off the exhalation valve and then carefully replacing it after the test.

(b) *Negative pressure check.* Close off the inlet opening of the canister or cartridge(s) by covering with the palm of the hand(s) or by replacing the filter seal(s), inhale gently so that the facepiece collapses slightly, and hold the breath for ten seconds. If the facepiece remains in its slightly collapsed condition and no inward leakage of air is detected, the tightness of the respirator is considered satisfactory.

9. The test shall not be conducted if there is any hair growth between the skin and the facepiece sealing surface, such as stubble

beard growth, beard, or long sideburns which cross the respirator sealing surface. Any type of apparel which interferes with a satisfactory fit shall be altered or removed.

10. If a test subject exhibits difficulty in breathing during the tests, she or he shall be referred to a physician to determine whether the test subject can wear a respirator while performing her or his duties.

11. If at any time within the first two week of use the respirator becomes uncomfortable, the test subject shall be given the opportunity to select a different facepiece and to be retested.

12. The employer shall maintain a record of the fit test administered to an employee. The record shall contain at least the following information:

- (a) name of employee;
- (b) type of respirator;
- (c) brand, size of respirator;
- (d) date of test;
- (e) where QNFT is used: the fit factor, strip chart recording or other recording of the results of the test. The record shall be maintained until the next fit test is administered.

13. Exercise regimen. Prior to the commencement of the fit test, the test subject shall be given a description of the fit test and the test subject's responsibilities during the test procedure. The description of the process shall include a description of the test exercises that the subject will be performing. The respirator to be tested shall be worn for at least 5 minutes before the start of the fit test.

14. Test Exercises. The test subject shall perform exercises, in the test environment, in the manner described below:

(a) *Normal breathing.* In a normal standing position, without talking, the subject shall breathe normally.

(b) *Deep breathing.* In a normal standing position, the subject shall breathe slowly and deeply, taking caution so as to not hyperventilate.

(c) *Turning head side to side.* Standing in place, the subject shall slowly turn his/her head from side to side between the extreme positions on each side. The head shall be held at each extreme momentarily so the subject can inhale at each side.

(d) *Moving head up and down.* Standing in place, the subject shall slowly move his/her head up and down. The subject shall be instructed to inhale in the up position (i.e., when looking toward the ceiling).

(e) *Talking.* The subject shall talk out loud slowly and loud enough so as to be heard clearly by the test conductor. The subject can read from a prepared text such as the Rainbow Passage (see below), count backward from 100, or recite a memorized poem or song.

Rainbow Passage

When the sunlight strikes raindrops in the air, they act like a prism and form a rainbow. The rainbow is a division of white light into many beautiful colors. These take the shape of a long round arch, with its path high above, and its two ends apparently beyond the horizon. There is, according to legend, a boiling pot of gold at one end. People look, but no one ever finds it. When a man looks for something beyond reach, his friends say

he is looking for the pot of gold at the end of the rainbow.

(f) *Grimace.* The test subject shall grimace by smiling or frowning.

(g) *Bending over.* The test subject shall bend at the waist as if he/she were to touch his/her toes. Jogging in place shall be substituted for this exercise in those test environments such as shroud type QNFT units which prohibit bending at the waist.

(h) *Normal breathing.* Same as exercise 1.

Each test exercise shall be performed for one minute except for the grimace exercise which shall be performed for 15 seconds. The test subject shall be questioned by the test conductor regarding the comfort of the respirator upon completion of the protocol. If it has become uncomfortable, another model of respirator shall be tried.

B. Qualitative Fit Test (QLFT) Protocols. 1.

General (a) The employer shall assign specific individuals who shall assume full responsibility for implementing the respirator qualitative fit test program.

(b) The employer shall ensure that persons administering QLFT are able to prepare test solutions, calibrate equipment and perform tests properly, recognize invalid tests, and assure that test equipment is in proper working order.

(c) The employer shall assure that QLFT equipment is kept clean and well maintained so as to operate at the parameters for which it was designed.

2. Isoamyl Acetate Protocol. (a) Odor threshold screening. The odor threshold screening test, performed without wearing a respirator, is intended to determine if the individual tested can detect the odor of isoamyl acetate.

(1) Three 1 liter glass jars with metal lids are required.

(2) Odor free water (e.g. distilled or spring water) at approximately 25 degrees C shall be used for the solutions.

(3) The isoamyl acetate (IAA) (also known as isopentyl acetate) stock solution is prepared by adding 1 cc of pure IAA to 800 cc of odor free water in a 1 liter jar and shaking for 30 seconds. A new solution shall be prepared at least weekly.

(4) The screening test shall be conducted in a room separate from the room used for actual fit testing. The two rooms shall be well ventilated but shall not be connected to the same recirculating ventilation system.

(5) The odor test solution is prepared in a second jar by placing 0.4 cc of the stock solution into 500 cc of odor free water using a clean dropper or pipette. The solution shall be shaken for 30 seconds and allowed to stand for two to three minutes so that the IAA concentration above the liquid may reach equilibrium. This solution shall be used for only one day.

(6) A test blank shall be prepared in a third jar by adding 500 cc of odor free water.

(7) The odor test and test blank jars shall be labeled 1 and 2 for jar identification. Labels shall be placed on the lids so they can be periodically peeled, dried off and switched to maintain the integrity of the test.

(8) The following instruction shall be typed on a card and placed on the table in front of the two test jars (i.e., 1 and 2): "The purpose of this test is to determine if you can smell

banana oil at a low concentration. The two bottles in front of you contain water. One of these bottles also contains a small amount of banana oil. Be sure the covers are on tight, then shake each bottle for two seconds. Unscrew the lid of each bottle, one at a time, and sniff at the mouth of the bottle. Indicate to the test conductor which bottle contains banana oil."

(9) The mixtures used in the IAA odor detection test shall be prepared in an area separate from where the test is performed, in order to prevent olfactory fatigue in the subject.

(10) If the test subject is unable to correctly identify the jar containing the odor test solution, the IAA qualitative fit test shall not be performed.

(11) If the test subject correctly identifies the jar containing the odor test solution, the test subject may proceed to respirator selection and fit testing.

(b) Isoamyl acetate fit test.

(1) The fit test chamber shall be similar to a clear 55-gallon drum liner suspended inverted over a 2-foot diameter frame so that the top of the chamber is about 6 inches above the test subject's head. The inside top center of the chamber shall have a small hook attached.

(2) Each respirator used for the fitting and fit testing shall be equipped with organic vapor cartridges or offer protection against organic vapors. The cartridges or masks shall be changed at least weekly.

(3) After selecting, donning, and properly adjusting a respirator, the test subject shall wear it to the fit testing room. This room shall be separate from the room used for odor threshold screening and respirator selection, and shall be well ventilated, as by an exhaust fan or lab hood, to prevent general room contamination.

(4) A copy of the test exercises and any prepared text from which the subject is to read shall be taped to the inside of the test chamber.

(5) Upon entering the test chamber, the test subject shall be given a 6-inch by 5-inch piece of paper towel, or other porous, absorbent, single-ply material, folded in half and wetted with 0.75 cc of pure IAA. The test subject shall hang the wet towel on the hook at the top of the chamber.

(6) Allow two minutes for the IAA test concentration to stabilize before starting the fit test exercises. This would be an appropriate time to talk with the test subject; to explain the fit test, the importance of his/her cooperation, and the purpose for the head exercises; or to demonstrate some of the exercises.

(7) If at any time during the test, the subject detects the banana like odor of IAA, the test has failed. The subject shall quickly exit from the test chamber and leave the test area to avoid olfactory fatigue.

(8) If the test has failed, the subject shall return to the selection room and remove the respirator, repeat the odor sensitivity test, select and put on another respirator, return to the test chamber and again begin the procedure described in (1)(B)(2)(b) (1) through (7) of this appendix. The process continues until a respirator that fits well has been found. Should the odor sensitivity test

be failed, the subject shall wait about 5 minutes before retesting. Odor sensitivity will usually have returned by this time.

(9) When a respirator is found that passes the test, its efficiency shall be demonstrated for the subject by having the subject break the face seal and take a breath before exiting the chamber.

(10) When the test subject leaves the chamber, the subject shall remove the saturated towel and return it to the person conducting the test. To keep the test area from becoming contaminated, the used towels shall be kept in a self sealing bag so there is no significant IAA concentration build-up in the test chamber during subsequent tests.

3. *Saccharin Solution Aerosol Protocol.* The entire screening and testing procedure shall be explained to the test subject prior to the conduct of the screening test.

(a) Taste threshold screening. The saccharin taste threshold screening, performed without wearing a respirator, is intended to determine whether the individual being tested can detect the taste of saccharin.

(1) During threshold screening as well as during fit testing, subjects shall wear an enclosure about the head and shoulders that is approximately 12 inches in diameter by 14 inches tall with at least the front portion clear and that allows free movements of the head when a respirator is worn. An enclosure substantially similar to the 3M hood assembly, parts # FT 14 and # FT 15 combined, is adequate.

(2) The test enclosure shall have a 3/4 inch hole in front of the test subject's nose and mouth area to accommodate the nebulizer nozzle.

(3) The test subject shall don the test enclosure. Throughout the threshold screening test, the test subject shall breathe through his/her wide open mouth with tongue extended.

(4) Using a DeVilbiss Model 40 Inhalation Medication Nebulizer the test conductor shall spray the threshold check solution into the enclosure. This nebulizer shall be clearly marked to distinguish it from the fit test solution nebulizer.

(5) The threshold check solution consists of 0.83 grams of sodium saccharin USP in 1 cc of warm water. It can be prepared by putting 1 cc of the fit test solution (see (b)(5) below) in 100 cc of distilled water.

(6) To produce the aerosol, the nebulizer bulb is firmly squeezed so that it collapses completely, then released and allowed to fully expand.

(7) Ten squeezes are repeated rapidly and then the test subject is asked whether the saccharin can be tasted.

(8) If the first response is negative, ten more squeezes are repeated rapidly and the test subject is again asked whether the saccharin is tasted.

(9) If the second response is negative, ten more squeezes are repeated rapidly and the test subject is again asked whether the saccharin is tasted.

(10) The test conductor will take note of the number of squeezes required to solicit a taste response.

(11) If the saccharin is not tasted after 30 squeezes (step 10), the test subject may not perform the saccharin fit test.

(12) If a taste response is elicited, the test subject shall be asked to take note of the taste for reference in the fit test.

(13) Correct use of the nebulizer means that approximately 1 cc of liquid is used at a time in the nebulizer body.

(14) The nebulizer shall be thoroughly rinsed in water, shaken dry, and refilled at least each morning and afternoon or at least every four hours.

(b) Saccharin solution aerosol fit test procedure

(1) The test subject may not eat, drink (except plain water), or chew gum for 15 minutes before the test.

(2) The fit test uses the same enclosure described in I. B. 3. (e) of this appendix.

(3) The test subject shall don the enclosure while wearing the respirator selected in section I. B. 3. (a) of this appendix. The respirator shall be properly adjusted and equipped with a particulate filter(s).

(4) A second DeVilbiss Model 40 Inhalation Medication Nebulizer is used to spray the fit test solution into the enclosure. This nebulizer shall be clearly marked to distinguish it from the screening test solution nebulizer.

(5) The fit test solution is prepared by adding 83 grams of sodium saccharin to 100 cc of warm water.

(6) As before, the test subject shall breathe through the wide open mouth with tongue extended.

(7) The nebulizer is inserted into the hole in the front of the enclosure and the fit test solution is sprayed into the enclosure using the same number of squeezes required to elicit a taste response in the screening test.

(8) After generating the aerosol the test subject shall be instructed to perform the exercises in section I. A. 14 above.

(9) Every 30 seconds the aerosol concentration shall be replenished using one half the number of squeezes as initially.

(10) The test subject shall indicate to the test conductor if at any time during the fit test the taste of saccharin is detected.

(11) If the taste of saccharin is detected, the fit is deemed unsatisfactory and a different respirator shall be tried.

(12) Successful completion of the test protocol shall allow the use of the tested respirator in contaminated atmospheres up to 10 times the PEL. In other words, this protocol may be used for assigned protection factors no higher than 10.

4. *Irritant Fume Protocol.* (a) The respirator to be tested shall be equipped with high-efficiency particulate air (HEPA) filters.

(b) The test subject shall be allowed to smell a weak concentration of the irritant smoke before the respirator is donned to become familiar with its characteristic odor.

(c) Break both ends of a ventilation smoke tube containing stannic oxychloride, such as the MSA part No. 5645, or equivalent. Attach one end of the smoke tube to a low flow air pump set to deliver 200 milliliters per minute.

(d) Advise the test subject that the smoke can be irritating to the eyes and instruct the subject to keep his/her eyes closed while the test is performed.

(e) The test conductor shall direct the stream of irritant smoke from the smoke tube towards the face seal area of the test subject. He/She shall begin at least 12 inches from the facepiece and gradually move to within one inch, moving around the whole perimeter of the mask.

(f) The exercises identified in section I. A. 14 above shall be performed by the test subject while the respirator seal is being challenged by the smoke.

(g) Each test subject passing the smoke test without evidence of a response shall be given a sensitivity check of the smoke from the same tube once the respirator has been removed to determine whether he/she reacts to the smoke. Failure to evoke a response shall void the fit test.

(h) The fit test shall be performed in a location with exhaust ventilation sufficient to prevent general contamination of the testing area by the test agent.

C. Quantitative Fit Test (QNFT) Protocol. 1. General. (a) The employer shall assign specific individuals who shall assume full responsibility for implementing the respirator quantitative fit test program.

(b) The employer shall ensure that persons administering QNFT are able to calibrate equipment and perform tests properly, recognize invalid tests, calculate fit factors properly and assure that test equipment is in proper working order.

(c) The employer shall assure that QNFT equipment is kept clean and well maintained so as to operate at the parameters for which it was designed.

2. Definitions. (a) Quantitative fit test. The test is performed in a test chamber. The normal air-purifying element of the respirator is replaced by a high-efficiency particulate air (HEPA) filter in the case of particulate QNFT aerosols or a sorbent offering contaminant penetration protection equivalent to high-efficiency filters where the QNFT test agent is a gas or vapor.

(b) Challenge agent means the aerosol, gas or vapor introduced into a test chamber so that its concentration inside and outside the respirator may be measured.

(c) Test subject means the person wearing the respirator for quantitative fit testing.

(d) Normal standing position means standing erect and straight with arms down along the sides and looking straight ahead.

(e) Maximum peak penetration method means the method of determining test agent penetration in the respirator as determined by strip chart recordings of the test. The highest peak penetration for a given exercise is taken to be representative of average penetration into the respirator for that exercise.

(f) Average peak penetration method means the method of determining test agent penetration into the respirator utilizing a strip chart recorder, integrator, or computer. The agent penetration is determined by an average of the peak heights on the graph or by computer integration, for each exercise except the grimace exercise. Integrators or computers which calculate the actual test agent penetration into the respirator for each exercise will also be considered to meet the requirements of the average peak penetration method.

(g) "Fit Factor" means the ratio of challenge agent concentration outside with respect to the inside of a respirator inlet covering (facepiece or enclosure).

3. Apparatus. (a) Instrumentation. Aerosol generation, dilution, and measurement systems using corn oil or sodium chloride as test aerosols shall be used for quantitative fit testing.

(b) Test chamber. The test chamber shall be large enough to permit all test subjects to perform freely all required exercises without disturbing the challenge agent concentration or the measurement apparatus. The test chamber shall be equipped and constructed so that the challenge agent is effectively isolated from the ambient air, yet uniform in concentration throughout the chamber.

(c) When testing air-purifying respirators, the normal filter or cartridge element shall be replaced with a high-efficiency particulate filter supplied by the same manufacturer.

(d) The sampling instrument shall be selected so that a strip chart record may be made of the test showing the rise and fall of the challenge agent concentration with each inspiration and expiration at fit factors of at least 2,000. Integrators or computers which integrate the amount of test agent penetration leakage into the respirator for each exercise may be used provided a record of the readings is made.

(e) The combination of substitute air-purifying elements, challenge agent and challenge agent concentration in the test chamber shall be such that the test subject is not exposed in excess of an established exposure limit for the challenge agent at any time during the testing process.

(f) The sampling port on the test specimen respirator shall be placed and constructed so that no leakage occurs around the port (e.g. where the respirator is probed), a free air flow is allowed into the sampling line at all times and so that there is no interference with the fit or performance of the respirator.

(g) The test chamber and test set up shall permit the person administering the test to observe the test subject inside the chamber during the test.

(h) The equipment generating the challenge atmosphere shall maintain the concentration of challenge agent inside the test chamber constant to within a 10 percent variation for the duration of the test.

(i) The time lag (interval between an event and the recording of the event on the strip chart or computer or integrator) shall be kept to a minimum. There shall be a clear association between the occurrence of an event inside the test chamber and its being recorded.

(j) The sampling line tubing for the test chamber atmosphere and for the respirator sampling port shall be of equal diameter and of the same material. The length of the two lines shall be equal.

(k) The exhaust flow from the test chamber shall pass through a high-efficiency filter before release.

(l) When sodium chloride aerosol is used, the relative humidity inside the test chamber shall not exceed 50 percent.

(m) The limitations of instrument detection shall be taken into account when determining the fit factor.

(n) Test respirators shall be maintained in proper working order and inspected for deficiencies such as cracks, missing valves and gaskets, etc.

4. Procedural Requirements. (a) When performing the initial positive or negative pressure test the sampling line shall be crimped closed in order to avoid air pressure leakage during either of these tests.

(b) An abbreviated screening isoamyl acetate test or irritant fume test may be utilized in order to quickly identify poor fitting respirators which passed the positive and/or negative pressure test and thus reduce the amount of QNFT time. When performing a screening isoamyl acetate test, combination high-efficiency organic vapor cartridges/canisters shall be used.

(c) A reasonably stable challenge agent concentration shall be measured in the test chamber prior to testing. For canopy or shower curtain type of test units the determination of the challenge agent stability may be established after the test subject has entered the test environment.

(d) Immediately after the subject enters the test chamber, the challenge agent concentration inside the respirator shall be measured to ensure that the peak penetration does not exceed 5 percent for a half mask or 1 percent for a full facepiece respirator.

(e) A stable challenge concentration shall be obtained prior to the actual start of testing.

(f) Respirator restraining straps shall not be overtightened for testing. The straps shall be adjusted by the wearer without assistance from other persons to give a reasonable comfortable fit typical of normal use.

(g) The test shall be terminated whenever any single peak penetration exceeds 5 percent for half masks and 1 percent for full facepiece respirators. The test subject shall be refitted and retested. If two of the three required tests are terminated, the fit shall be deemed inadequate.

(h) In order to successfully complete a QNFT, three successful fit tests are required. The results of each of the three independent fit tests must exceed the minimum fit factor needed for the class of respirator (e.g. half mask respirator, full facepiece respirator).

(i) Calculation of fit factors.

(1) The fit factor shall be determined for the quantitative fit test by taking the ratio of the average chamber concentration to the concentration inside the respirator.

(2) The average test chamber concentration is the arithmetic average of the test chamber concentration at the beginning and of the end of the test.

(3) The concentration of the challenge agent inside the respirator shall be determined by one of the following methods:

(i) Average peak concentration
(ii) Maximum peak concentration
(iii) Integration by calculation of the area under the individual peak for each exercise. This includes computerized integration.

(j) Interpretation of test results. The fit factor established by the quantitative fit testing shall be the lowest of the three fit factor values calculated from the three required fit tests.

(k) The test subject shall not be permitted to wear a half mask, or full facepiece

respirator unless a minimum fit factor equivalent to at least 10 times the hazardous exposure level is obtained.

(1) Filters used for quantitative fit testing shall be replaced at least weekly, or

whenever increased breathing resistance is encountered, or when the test agent has altered the integrity of the filter media. Organic vapor cartridges/canisters shall be replaced daily (when used) or sooner if there

is any indication of breakthrough by a test agent.

[FR Doc. 93-10102 Filed 4-27-93; 4:12 pm]

BILLING CODE 4810-26-P

Appendix E

CHASE ENVIRONMENTAL GROUP, INC.

environmental engineering and consulting

Proudly presents this certificate to

ARTHUR BENDER

for successful completion of the

8-Hour Site Supervisor

29 CFR 1910.120

course conducted by Chase Environmental Group, Inc.

October 22, 1993

Completion Date

8SU10229301

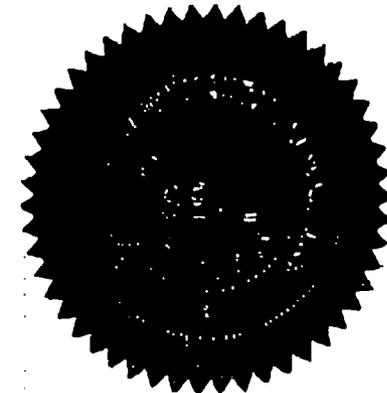
Certification Number



Course Director



Manager, Corporate Safety



109 Daventry Lane, Suite 300 • Louisville, Kentucky 40223
(502) 327-6191

CHASE ENVIRONMENTAL GROUP, INC.
environmental engineering and consulting

Proudly presents this certificate to

DARRELL HIGGINS

for successful completion of the

40-Hour Health & Safety

29 CFR 1910.120

course conducted by Chase Environmental Group, Inc.

October 21, 1993

Completion Date

40H10219302

Certification Number



Course Director



Manager, Corporate Safety



10th Daventry Lane, Suite 300 • Louisville, Kentucky 40223
(502) 327-6191

CHASE ENVIRONMENTAL GROUP, INC.
environmental engineering and consulting

Proudly presents this certificate to

ARTHUR BENDER

for successful completion of the

40-Hour Health & Safety

29 CFR 1910.120

course conducted by Chase Environmental Group, Inc.

October 21, 1993

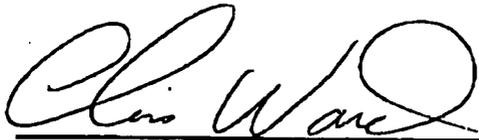
Completion Date

40H10219304

Certification Number



Course Director



Manager, Corporate Safety



109 Daventry Lane, Suite 300 Louisville, Kentucky 40223
(502) 327-6191

CHASE ENVIRONMENTAL GROUP, INC.

environmental engineering and consulting

Proudly presents this certificate to

SUE MYERS

for successful completion of the

40-Hour Health & Safety

29 CFR 1910.120

course conducted by Chase Environmental Group, Inc.

October 21, 1993

Completion Date

40H10219303

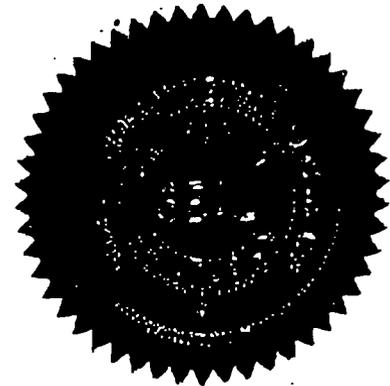
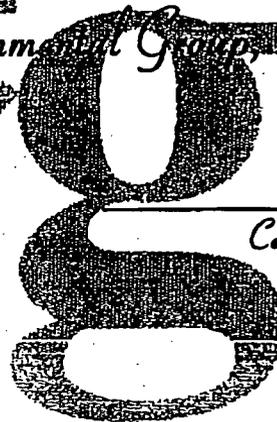
Certification Number



Course Director



Manager, Corporate Safety



109 Daventry Lane, Suite 300 • Louisville, Kentucky 40223

(502) 327-6191

CHASE ENVIRONMENTAL GROUP, INC.

environmental engineering and consulting

Proudly presents this certificate to

JOHN CHRISTAKIS

for successful completion of the

40-Hour Health & Safety

29 CER 1910.120

course conducted by Chase Environmental Group, Inc.

October 21, 1993

Completion Date

40H10219301

Certification Number



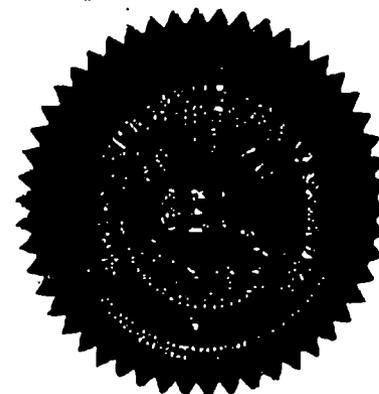
Course Director



Manager, Corporate Safety

109 Daventry Lane, Suite 300 • Louisville, Kentucky 40223

(502) 327-6191



CHASE ENVIRONMENTAL GROUP, INC.
environmental engineering and consulting

Proudly presents this certificate to

CURTIS C. SCHOPP

for successful completion of the

8-Hour Health & Safety Refresher

29 CFR 1910.120

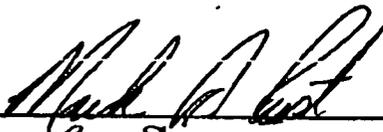
course conducted by Chase Environmental Group, Inc.

October 22, 1993

Completion Date

8HR10229302

Certification Number

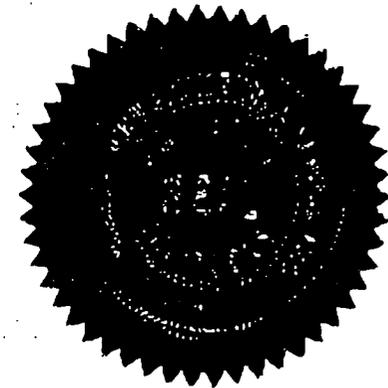


Course Director



Manager, Corporate Safety

CEG



109 Daventry Lane, Suite 300 Louisville, Kentucky 40223
(502) 327-6191

CHASE ENVIRONMENTAL GROUP, INC.

environmental engineering and consulting

Proudly presents this certificate to

CHRISTOPHER E. KOHLER

for successful completion of the

8-Hour Health & Safety Refresher

29 CFR 1910.120

course conducted by Chase Environmental Group, Inc.

October 22, 1993

Completion Date

8HR10229301

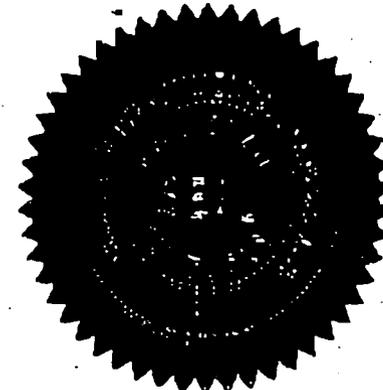
Certification Number



Course Director



Manager, Corporate Safety



109 Daventry Lane, Suite 300 Louisville, Kentucky 40223
(502) 327-6191

HAZARDOUS WORKER EXAMINATION

EMPLOYEE NAME Angene Myers

SS# _____

DATE 10-16-93

IN THE OPINION OF THE PHYSICIAN, DOES THIS EMPLOYEE HAVE ANY DETECTED MEDICAL CONDITION THAT WOULD PLACE THE EMPLOYEE AT AN INCREASED RISK OF MATERIAL HEALTH IMPAIRMENT FROM EXPOSURE TO LEAD?

no

ARE THERE ANY RECOMMENDED SPECIAL PROTECTIVE MEASURES TO BE PROVIDED TO THE EMPLOYEE, OR LIMITATIONS TO BE PLACED UPON THE EMPLOYEE'S EXPOSURE TO LEAD?

no

IS THERE ANY RECOMMENDED LIMITATION UPON THE EMPLOYEE'S USE OF PERSONAL PROTECTIVE EQUIPMENT SUCH AS A RESPIRATOR.?

*moderate protective airway device
OK to use*

SIGNED *[Signature]* M.D.

HAZARDOUS WORKER EXAMINATION

EMPLOYEE NAME John Christakis
SS# 304-72-5252

DATE 10/15/93

IN THE OPINION OF THE PHYSICIAN, DOES THIS EMPLOYEE HAVE ANY DETECTED MEDICAL CONDITION THAT WOULD PLACE THE EMPLOYEE AT AN INCREASED RISK OF MATERIAL HEALTH IMPAIRMENT FROM EXPOSURE TO LEAD?

no

ARE THERE ANY RECOMMENDED SPECIAL PROTECTIVE MEASURES TO BE PROVIDED TO THE EMPLOYEE, OR LIMITATIONS TO BE PLACED UPON THE EMPLOYEE'S EXPOSURE TO LEAD?

no

IS THERE ANY RECOMMENDED LIMITATION UPON THE EMPLOYEE'S USE OF PERSONAL PROTECTIVE EQUIPMENT SUCH AS A RESPIRATOR.?

no

SIGNED D.R. Bury my M.D.

[Handwritten mark]

HAZARDOUS WORKER EXAMINATION

EMPLOYEE NAME Daniel Higgins

SS# _____

DATE 10/16/93

IN THE OPINION OF THE PHYSICIAN, DOES THIS EMPLOYEE HAVE ANY DETECTED MEDICAL CONDITION THAT WOULD PLACE THE EMPLOYEE AT AN INCREASED RISK OF MATERIAL HEALTH IMPAIRMENT FROM EXPOSURE TO LEAD?

no

ARE THERE ANY RECOMMENDED SPECIAL PROTECTIVE MEASURES TO BE PROVIDED TO THE EMPLOYEE, OR LIMITATIONS TO BE PLACED UPON THE EMPLOYEE'S EXPOSURE TO LEAD?

no

IS THERE ANY RECOMMENDED LIMITATION UPON THE EMPLOYEE'S USE OF PERSONAL PROTECTIVE EQUIPMENT SUCH AS A RESPIRATOR.?

no

SIGNED D.R. Fryman M.D.

HAZARDOUS
ASBESTOS WORKER EXAMINATION

EMPLOYEE'S NAME: Chris Kohler
SOCIAL SECURITY NUMBER: 205-40-5266
DATE: 1/29/93

IN THE OPINION OF THIS PHYSICIAN, DOES THIS EMPLOYEE HAVE ANY DETECTED MEDICAL CONDITION THAT WOULD PLACE THE EMPLOYEE AT AN INCREASED RISK OF MATERIAL HEALTH IMPAIRMENT FROM EXPOSURE TO ASBESTOS, TREMOLITE, ANTHOPHYLLITE OR ACTINOLITE?

no

ARE THERE ANY RECOMMENDED LIMITATIONS ON THE EMPLOYEE, OR ON THE USE OF PERSONAL PROTECTIVE EQUIPMENT SUCH AS RESPIRATORS?

none

HAS THE EMPLOYEE BEEN INFORMED BY THE PHYSICIAN OF THE RESULTS OF THIS MEDICAL EXAMINATION, AND OF ANY MEDICAL CONDITION THAT MAY RESULT FROM ASBESTOS, TREMOLITE, ANTHOPHYLLITE, OR ACTINOLITE EXPOSURE?

no

HAS THE EMPLOYEE BEEN INFORMED BY THE PHYSICIAN OF THE INCREASED RISK OF LUNG CANCER, ATTRIBUTABLE TO THE COMBINED EFFECT OF SMOKING AND ASBESTOS EXPOSURE?

yes

SIGNED: D.P. Frum M.D.

HAZARDOUS WORKER EXAMINATION

EMPLOYEE NAME ARTHUR BENDER

SS# 164-32-8813

DATE 10-16-93

IN THE OPINION OF THE PHYSICIAN, DOES THIS EMPLOYEE HAVE ANY DETECTED MEDICAL CONDITION THAT WOULD PLACE THE EMPLOYEE AT AN INCREASED RISK OF MATERIAL HEALTH IMPAIRMENT FROM EXPOSURE TO LEAD?

NO

ARE THERE ANY RECOMMENDED SPECIAL PROTECTIVE MEASURES TO BE PROVIDED TO THE EMPLOYEE, OR LIMITATIONS TO BE PLACED UPON THE EMPLOYEE'S EXPOSURE TO LEAD?

NO —

IS THERE ANY RECOMMENDED LIMITATION UPON THE EMPLOYEE'S USE OF PERSONAL PROTECTIVE EQUIPMENT SUCH AS A RESPIRATOR.?

NO, mild obstructive air way disease
OK to wear Respirator

SIGNED [Signature] M.D.

Y
N
I
S
P
E
A



PROMPTCARE
PHYSICIANS CLINIC, INC.

West Clinic

3443 West 3rd Street
Bloomington, IN 47404-4851
812-332-3443
FAX: 812-323-8518

East Clinic

888 Auto Mall Road
Bloomington, IN 47401-5430
812-332-6888
FAX: 812-323-8528

December 21, 1993

National Environmental Services, Corp.
243 E. Winslow Rd.
Bloomington, IN. 47401

To whom it may concern;

I have reviewed National Environmental's written Medical Evaluation and Surveillance Program with particular focus on OSHA Regulation, 29 CFR 1926.62. It is my opinion that the written policy is in compliance with the cited OSHA Standard.

Additionally, on the date(s) indicated, I performed a physical examination (including indicated laboratory tests) on the following National Environmental employees:

John Christakis	10/15/93
Art Bender	10/16/93
Imogene S. Myers	10/16/93
Darrell Higgs	10/16/93

The above examinations were conducted according to OSHA 29 CFR 1926.62 guidelines. Although in compliance with OSHA, there were two procedures contained in National Environmental's program that were not completed. Electrocardiogram and Audiology. Promptcare has the capability to perform the Electrocardiogram but cannot complete the Audiology to the level required (8000hz.) Generally we arrange for this type of audiology to be done at Indiana University Speech and Hearing Clinic.

Should you require any additional information, please feel free to contact me.

Sincerely,

Daniel R. Berg M.D.

Appendix F

Confined Space Entry Program

1.0 Introduction

The purpose of this program is to establish written standardized operational guidelines for confined space entry. This program is based on information from:

29 CFR, Part 1910.94
29 CFR, Part 1910.134
29 CFR, Part 1910.146
29 CFR, Part 1910.252
29 CFR, Part 1915.4
29 CFR, Part 1926.21
ANSI Standard Z88.2-1980
ANSI Standard Z117.1-1977
NIOSH Publication 80-106

2.0 Definition

The definition of a confined space is any space that is large enough for an employee to work in but difficult to enter or leave and not intended for full time occupancy. A permit-required confined space is any space that meets one of the following four conditions:

1. Contains or has the potential to contain hazardous atmospheres.
2. Contains a material that has the potential of engulfing the entrant.
3. Has an internal configuration such that an entrant could be trapped or asphixiated.
4. Contains any other serious serious saftey or health hazard.

3.0 Permit Program

If the area is determined to be a permit required space, written documentation (the permit) of the space's safety will be prepared prior to entry. The Site Safety and Health Officer (SSHO) will have the authority to prepare, issue, post, and cancel the permits. A sample permit is included on the following page. The permit includes the following information.

- * identification of the space
- * purpose of entry
- * date and duration of permit
- * list of authorized entrants
- * names of current attendants and supervisors
- * list of hazards in the space
- * list of measures to isolate the permit space and eliminate control hazards
- * explanation of acceptable entry conditions
- * results of tests with the initials of the persons performing the tests
- * rescue and emergency services and means to summon them
- * communication procedures for attendants and entrants
- * list of required equipment (respirators, alarms, communications, lighting, hoists, harnesses, etc.)
- * any other necessary information
- * any additional permits (hot work permits, etc.)

CONFINED SPACE ENTRY PERMIT

Date: _____ Time: _____ a.m./p.m. (circle one)

Location of Space or Vessel: _____

Puposes for Entering Space or Vessel: _____

EMPLOYEES PERFORMING WORK:

Company Employees			Non-Company Employees		
	Time IN	Time OUT		Time IN	Time OUT

PRECAUTIONS	YES	NO
Employee Qualified?	___	___
Safety Observer?	___	___
Space/ Vessel Clean?	___	___
Space/ Vessel's Atmosphere Safe for Entry?	___	___
Periodic/ Continuous Monitoring Required?	___	___
Lines to Vessel Blanked or Disconnected?	___	___
Lock out devices?	___	___
Safety Lights?	___	___
Communication Devices?	___	___
Name of Safety Observer:	___	___
Misc. Precautions? _____		

PROTECTIVE EQUIPMENT	YES	NO
Belt/ Harness/ Life Line?	___	___
Breathing Apparatus?	___	___
Warning Signs?	___	___
Protective Gear?	___	___
Fire Equipment?	___	___
Forced Ventilation?	___	___
Rescue Gear on Hand?	___	___
Misc. Equipment? _____		

ISSUED BY _____
 DATE _____
 Section Manager _____

4.0 Authorized personnel

The SSHO will determine which workers are qualified for confined space entry. Only those people with specific training in confined space entry will be allowed to enter.

4.1 Authorized Entrants

These are the employees authorized to enter the confined space. They must know the hazards, be able to recognize symptoms of overexposure, and understand the consequences. They must know how to communicate with attendants, use needed equipment, and exit the space quickly and safely when ordered or alerted.

4.2 Authorized Attendants

These are the employees stationed outside the space. They are responsible for the safety of the entrants. They must know the hazards and be able to communicate with the entrants. They must be able to recognize behavioral effects of the hazards and monitor conditions in the space.

They have the authority to order the entrants to exit. They have the responsibility to summon rescuers, prevent unauthorized entry, and perform non-entry rescues. While attending the space they may not perform other duties that may distract them from attending the space.

4.3 Entry Supervisors

Management personnel responsible for determining if safe entry conditions exist, authorize, oversee, and terminate entry. They must know the hazards, verify tests, and ensure that all procedures and equipment are in place. They will verify that rescue services are available. They will prepare and sign the written permits.

5.0 Evaluation of Hazards

Principal health and safety problems to consider during a confined space entry are physical hazards, oxygen deficiency, explosive atmospheres, and toxic gases or vapors.

5.1 Physical Hazards

- * Mechanical Equipment (agitators, pumps, stirrers or unibar blenders)
- * Entry of fluids into the vessel
- * Tools or equipment taken into the confined space

5.2 Oxygen Deficiency

Both OSHA and NIOSH recommend that confined spaces have a minimum oxygen level of 19.5 percent by volume. A direct reading unit will be used since they provide instrumentation and continuous monitoring.

The oxygen deficiency may be caused by several factors depending on the situation. Examples are: rusting of the tank's interior causing the oxygen to be consumed, displacement by an inert gas such as argon or nitrogen, or displacement of oxygen by carbon dioxide created by a fermentation reaction in the tanks.

5.3 Explosive Atmospheres

Explosive atmospheres may result from flammable liquids or gases which were contained in or were generated by the process. In order for an explosion to occur the vapors must be present with the well-defined concentration limits. The lowest concentration at which there is sufficient vapors to cause an explosion is called the Lower Explosion Limit (LEL). The concentration at which there is too much vapor (too rich) for an explosion to occur is called the Upper Explosion Limit (UEL). These limits are usually expressed in percent by volume. ENTRY MUST NEVER BE MADE INTO SPACES CONTAINING MORE THAN 10 PERCENT OF THE LEL.

Since most combustible gas meters use the hot wire filament detection principle, a low oxygen level may cause erroneous combustible gas readings. Therefore, always check the oxygen content first.

5.4 Toxic Air Contaminants

Combustible gas indicators may indicate that the atmosphere is "safe" from an explosion but the concentration of compounds may still pose a serious health risk. When entering a confined space, a few basic questions will be asked:

1. What was in the space?
2. What could have formed in the space?
3. What work is going to be done in the space?

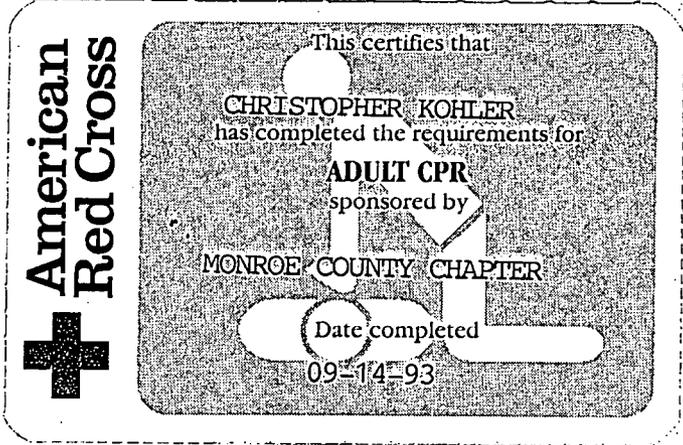
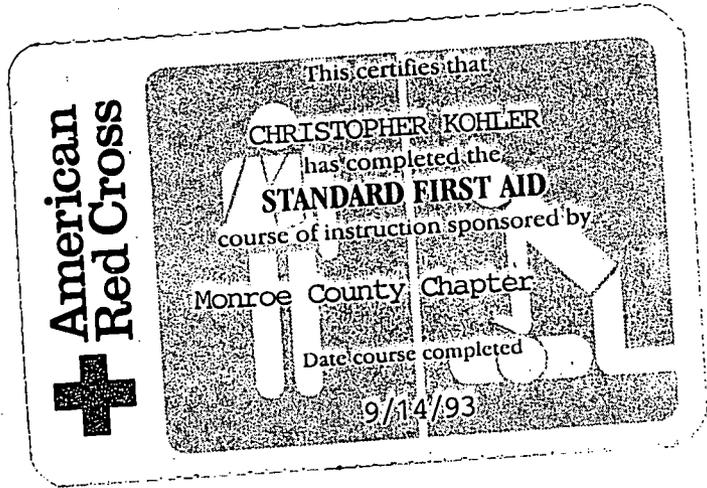
6.0 Monitoring Equipment

To obtain information about the confined space, personnel will use an instrument to evaluate the atmosphere. Instruments that may be used include:

- * Colormetric Indicator Tubes
- * Combustible Gas Indicators
- * Portable Gas Chromatographs
- * Organic Vapor Analyzers (OVA), Photoionization Detector (PID) or Flame Ionization Detector (FID)

Readings will be taken daily before entry and continually monitored during entry. Instruments will be routinely calibrated and all workers trained in the use and limitations of the equipment.

Appendix G





This certifies that
Darrell Higgins
has completed the
STANDARD FIRST AID
course of instruction sponsored by
*American Red Cross of
Monroe County*
Date course completed
October 30, 1993



This certifies that
Darrell Higgins
has completed the requirements for
ADULT CPR
sponsored by
*American Red Cross of
Monroe County*
Date completed
October 30, 1993



This certifies that
Sue Myers
has completed the
STANDARD FIRST AID
course of instruction sponsored by
*American Red Cross of
Monroe County*
Date course completed
October 30, 1993



This certifies that
Sue Myers
has completed the requirements for
ADULT CPR
sponsored by
*American Red Cross of
Monroe County*
Date completed
October 30, 1993



This certifies that

John Christakis
has completed the

STANDARD FIRST AID

course of instruction sponsored by
American Red Cross of
Monroe County

Date course completed

October 30, 1993



This certifies that

John Christakis

has completed the requirements for

ADULT CPR

sponsored by

American Red Cross of
Monroe County

Date completed

October 30, 1993



This certifies that
Arthur Bender

has completed the
STANDARD FIRST AID
course of instruction sponsored by
*American Red Cross of
Monroe County*

Date course completed
October 30, 1993



This certifies that
Arthur Bender

has completed the requirements for
ADULT CPR
sponsored by
*American Red Cross of
Monroe County*

Date completed
October 30, 1993

Appendix H

DRUG, ALCOHOL, AND NARCOTICS POLICY:

It is the policy of the Company to maintain a work place that is free from the effects of drug and alcohol abuse.

Employees are prohibited from the use, sale, dispensing, distribution, possession, or manufacture of illegal drugs and narcotics or alcoholic beverages on Company premises or work sites. In addition, employees are prohibited from the off-premises use of alcohol and possession, use, or sale of illegal drugs when such activities adversely affect job performance, job safety, or the Company's reputation in the community.

The Company requires that every newly hired employee be free of alcohol or drug abuse. Each offer of employment shall be conditioned upon the passing of a drug and alcohol test. The Company will not hire any applicant who fails to pass the pre-employment alcohol and drug test or who refuses to take such a test.

Employees will be subject to disciplinary action, up to and including termination, for violations of this policy. Such violations include, but are not limited to, possessing illegal or non-prescribed drugs and narcotics or alcoholic beverages at work; being under the influence of such substances while working; using them while working; or dispensing, distributing, or illegally manufacturing or selling them on Company premises and work sites. Employees, their possessions, and Company-issued equipment and containers under their control are subject to search and surveillance at all times while on Company premises or while conducting Company business.

Employees will be required to take a test to determine the presence of drugs, narcotics, or alcohol under certain circumstances. These include, but are not limited, to the following:

- Whenever the Company has reason to believe the employee's work performance or on-the-job behavior may have been affected in any way by alcohol or drug use as determined from performance problems, behavioral observation or other evidence.
- Whenever the Company's standard policy requires an employee to undergo a physical exam.
- Whenever the Company determines that an employee may have contributed to an accident involving a fatality,

bodily injury, or substantial damage to property.
"Substantial damage to property" is defined as proposed damage greater than \$200.00.

- Whenever the Company determines that an employee was involved in a "near miss" incident. A "near miss" incident is considered to be an occurrence which potentially could have resulted in an injury to personnel, damage to equipment, material or product or fire.

Employees may be required to take an alcohol and drug test at any time, unless such tests are prohibited by law. Testing positive for drugs or alcohol, or refusing to take a drug test is a violation of this policy and will subject the employee to disciplinary action, up to and including termination.

All positive results will require a confirmation by GCMS (Gas Chromatography/Mass Spectrometry), a medically reliable and very sensitive test. Prior to taking any disciplinary action, the Company will give all applicants and employees who test positive for alcohol or drugs the opportunity to explain the test results. The medical laboratory will report all positive alcohol or drug tests to the Human Resources Representative and other management officials solely on a need-to-know basis.

Employees who are convicted of any criminal drug violation must report such conviction to the Human Resource Representative within five (5) days.

Supervisors should report immediately to the Human Resources Representative any action by an employee who demonstrates an unusual behavior pattern. The Human Resources Representative, in consultation with management, will determine whether the employee should be examined by a physician or clinic and/or tested for drugs and alcohol. Employees believed to be under the influence of drugs, narcotics, or alcohol will be required to leave the premises. The supervisor will arrange safe transit.

Employees who must use prescribed drugs or narcotics during work must report this fact to their supervisor along with acceptable medical documentation. A determination will then be made as to whether the employee should be able to perform his job safely and properly.

Employees experiencing work-related problems resulting from drug, narcotic, or alcohol abuse or dependency may request, or be required to seek, counseling help. Company-sponsored or required counseling is to be kept confidential and is to have no influence on performance appraisals. Job performance

alone, not the fact that an employee seeks counseling, is to be the basis of all performance appraisals.

Any employee who is abusing drugs or alcohol may be granted a leave of absence to undergo rehabilitation treatment. The employee will not be permitted to return to work until certification is presented to the Human Resources Representative that the employee is capable of performing his or her job. Failure to cooperate with an agreed-upon treatment plan may result in discipline, up to and including termination. Participation in a treatment program does not insulate an employee from the imposition of discipline for violations of this or other Company policies.

The Company will, to the extent feasible, provide continuing education to the work force about the ill effects of drug and alcohol abuse.

Appendix I

TABLE 1. Examples of Permissible Heat Exposure Threshold Limit Values [Values are given in °C and (°F) WBGT]*

Work — Rest Regimen	Work Load		
	Light	Moderate	Heavy
Continuous work	30.0 (86)	26.7 (80)	25.0 (77)
75% Work — 25% Rest, each hour	30.6 (87)	28.0 (82)	25.9 (78)
50% Work — 50% Rest, each hour	31.4 (89)	29.4 (85)	27.9 (82)
25% Work — 75% Rest, each hour	32.2 (90)	31.1 (88)	30.0 (86)

* As workload increases, the heat stress impact on an unacclimatized worker is exacerbated (see Figure 1). For unacclimatized workers performing a moderate level of work, the permissible heat exposure TLV should be reduced by approximately 2.5°C.

Appendix J

TABLE 3. Threshold Limit Values Work/Warm-up Schedule for Four-Hour Shift*

Air Temperature—Sunny Sky		No Noticeable Wind		5 mph Wind		10 mph Wind		15 mph Wind		20 mph Wind	
°C (approx.)	°F (approx.)	Max. Work Period	No. of Breaks								
-26° to -28°	-15° to -19°	(Norm. Breaks)	1	(Norm. Breaks)	1	75 min	2	55 min	3	40 min	4
-29° to -31°	-20° to -24°	(Norm. Breaks)	1	75 min	2	55 min	3	40 min	4	30 min	5
-32° to -34°	-25° to -29°	75 min	2	55 min	3	40 min	4	30 min	5	Non-emergency work should cease	
-35° to -37°	-30° to -34°	55 min	3	40 min	4	30 min	5	Non-emergency work should cease			
-38° to -39°	-35° to -39°	40 min	4	30 min	5	Non-emergency work should cease					
-40° to -42°	-40° to -44°	30 min	5	Non-emergency work should cease							
-43° & below	-45° & below	Non-emergency work should cease		Non-emergency work should cease							

Notes for Table 3:

- Schedule applies to moderate to heavy work activity with warm-up breaks of ten (10) minutes in a warm location. For Light-to-Moderate Work (limited physical movement): apply the schedule one step lower. For example, at -35°C (-30°F) with no noticeable wind (Step 4), a worker at a job with little physical movement should have a maximum work period of 40 minutes with 4 breaks in a 4-hour period (Step 5).
- The following is suggested as a guide for estimating wind velocity if accurate information is not available:
5 mph: light flag moves; 10 mph: light flag fully extended; 15 mph: raises newspaper sheet; 20 mph: blowing and drifting snow.
- If only the wind chill cooling rate is available, a rough rule of thumb for applying it rather than the temperature and wind velocity factors given above would be: 1) special warm-up breaks should be initiated at a wind chill cooling rate of about 1750 W/m²; 2) all non-emergency work should have ceased at or before a wind chill of 2250 W/m². In general the warm-up schedule provided above slightly under-compensates for the wind at the warmer temperatures, assuming acclimatization and clothing appropriate for winter work. On the other hand, the chart slightly over-compensates for the actual temperatures in the colder ranges, since windy conditions rarely prevail at extremely low temperatures.
- TLVs apply only for workers in dry clothing.

Appendix K

Exposure Control Plan

On March 6, 1992 the Occupational Safety and Health Administration (OSHA) initiated the Bloodborne Pathogens Standard governing occupational exposure to bloodborne pathogens in the workplace. An integral part of the standard (29 CFR 1910.1030) is the "Exposure Control Plan."

This document represents the Exposure Control Plan for _____ All personnel who could come in contact with blood or other potentially infectious bodily fluids during the course of their employment must know and follow the procedures outlined in this plan. Additionally, each employee is expected to develop safe personal work habits aimed at the reduction of exposure to infectious agents, to themselves and to co-workers.

This document was developed to comply with paragraph (c)(1)(i) of the referenced standard. As stipulated by the standard, an "Exposure Control Officer" (ECO) must be designated. This individual will be responsible for the overall management and support of the Facility Bloodborne Pathogen Compliance Program. The designated "Exposure Control Officer" for this plan is _____.

The "Exposure Control Plan" will be reviewed, evaluated and updated at least annually if required. The plan will be maintained by the Exposure Control Officer and will be made readily available to all employees and any representative of the Occupational Safety Health Administration.

Purpose of the Plan

The purpose of 29 CFR 1910.1030 Bloodborne Pathogen Standard is to reduce occupational exposure to infectious agents via contact with bodily fluids. _____ has implemented this "Exposure Control Plan to meet the letter and intent of the referenced standard. The objective of this plan is twofold:

- To protect our employees from the health hazards associated with exposure to bloodborne pathogens;
- To provide appropriate treatment and counseling should an employee be exposed to bloodborne pathogens.

General Program Management

There are three major "Categories of Responsibility" essential to the effective implementation of the plan:

- The "Exposure Control Officer"
- Management
- Employees

The "Exposure Control Officer" will be responsible for overall management and support of the Bloodborne Pathogens Compliance Program. The ECO's responsibilities will include but not be limited to the following:

- Overall responsibility for implementing and managing the Exposure Control Plan.
- Working with management, employees and Safety Department.
- Maintaining adequate first-aid and exposure control equipment supplies.
- Maintaining a current understanding with regards to CFR 1910.1030 and any applicable bloodborne pathogen health and safety information pertaining to it.
- Serve a liaison during OSHA inspections with regards to the Bloodborne Pathogen Program.
- Conduct required bloodborne pathogen training in accordance with the Exposure Control Plan.
- Ensure all required documentation is up-to-date and complete.

All management and employees will work directly with the Exposure Control Officer to ensure that proper exposure control measures are followed in accordance with this Plan.

Copies of the Exposure Control Plan will be maintained in all areas designed by the Exposure Control Officer. Additionally, the Plan will be made available to all employees at any time upon request. A copy will also be posted for review.

The ECO will review the Plan on an annual basis to determine if modifications are necessary. In addition, should any procedures change or new equipment become available that would impact the Plan, the ECO will immediately affect the necessary modification.

Exposure Determination

Due to the nature of our work the following represents the primary exposure routes to potential bloodborne pathogens and other infectious agents:

- Injured personnel resulting in minor to severe bleeding or the need to resuscitate.
- Janitorial work involving the cleaning and sanitizing of restroom facility or maintenance work conducted on restroom facilities.

The injured personnel aspects could conceivably involve all personnel while rendering initial first-aid or assistance to the injured individual.

The janitorial and maintenance aspects on restroom facilities will result in limited involvement to personnel. These individuals will be designated by the Exposure Control Officer who will ensure proper protective measures are utilized.

Methods of Compliance

As a means to effectively eliminate or minimize exposure to bloodborne pathogens, the following precautionary measure will be utilized:

- Universal Precautions
- Work Practice Controls
- Personal Protective Equipment
- Housekeeping

Universal Precautions

This is to simply treat all human blood and bodily fluids as if they are infectious.

Work Practices

The ECO will ensure that the following work practice controls are utilized:

All employees utilize proper protective equipment when rendering first-aid, if practical at the time.

The ECO will ensure that all employees, who have been involved in an injury person incident or who have performed restroom janitorial and maintenance services, immediately wash their hands and other exposed skin areas.

The ECO will ensure that all contaminated disposable equipment is properly packaged and disposed. Additionally, all reusable equipment must be properly decontaminated and sanitized prior to placement back into service.

The ECO will ensure that all surfaces which have been contaminated are cleaned and sanitized with all resulting liquids properly disposed.

Personal Protective Equipment

1. The ECO will ensure that whenever feasible, proper PPE is used when rendering first-aid.
2. The ECO will ensure that an adequate supply of PPE is maintained and readily accessible. The equipment will include but not be limited to the following:
 - Gloves

- Masks
 - Goggles
 - Mouthpieces
 - Pocket Masks
3. This equipment will be added to existing first-aid supplies and kept readily available in the first-aid equipment storage areas.
 4. The ECO will ensure that all employees are trained in the proper use of PPE as required.

Housekeeping

1. The ECO will ensure that all restroom facilities are maintained in a clean and sanitary manner.
2. The ECO will ensure that all surfaces contaminated with blood or other bodily fluids are thoroughly cleaned and sanitized.

Hepatitis B Vaccination Program

A Hepatitis B Vaccination Program will be made available to all affected personnel at no cost.

All vaccinations will be performed under the supervision of a licensed physician or other health care professional.

The vaccination program will consist of a series of three (3) inoculations over a six (6) month period.

Participation in the vaccination program is on a voluntary basis only. Employees who decline to take part will be required to sign the "Vaccination Declination Form" attached.

Post Exposure Evaluation

In the event that an exposure to potential bloodborne pathogens or other infectious agents occurs, the ECO will ensure that the following measures are taken:

- An investigation of the incident and circumstances regarding the exposure.
- The ECO will complete the "Exposure Incident Investigation Form" attached. The form will be retained on file at the facility and a copy will be forwarded to the Corporate Safety Department for review.
- Following the investigation, the ECO will review the findings with the exposed individual or individuals.

- If possible, the ECO will make arrangements to have the injured person's blood tested for pathogenic infectivity. If obtained, this information will be made available to the exposed individual as well as the consulting health care professional.
- The ECO will also make arrangements to have the exposed individuals blood tested if desired.
- The exposed individual will then be afforded the opportunity to have consultation with a health care professional regarding the exposure. The ECO will supply the health care professional with the following:
 1. A copy of the "Exposure Investigation Form"
 2. Results of blood tests if obtainable
 3. Any other pertinent information requested

All information, test results, etc., will be kept under the strictest confidentiality. Testing results and the health professional consultative opinions, findings and conclusions will be released only to the exposed individual.

A written opinion will be obtained from the health professional, however, only the following information will be requested

1. Is the need for a Hepatitis B Vaccination indicated?
2. Has the employee received the vaccination?
3. Has the employee been informed of all results stemming from the evaluation?
4. Has the employee been informed of any potential or actual medical condition resulting from the exposure incident which require further evaluation or treatment?

This written opinion will be placed in the exposed individual's file and a copy forwarded to the Safety Department.

All other findings, test results and diagnoses will remain confidential between the health care professional, and the exposed employee.

Employee Information and Training

In addition to training received as part of the on-going Company Training Program, all personnel will receive annual training specific to the Bloodborne Pathogen Program. This training will include but not be limited to the following:

- The contents of OSHA 29 CFR 1910.1030 Bloodborne Pathogen Standard

- The epidemiology and symptoms of bloodborne diseases
- Modes of transmission regarding bloodborne pathogens
- Review of the Exposure Control Plan
- Proper selection and use of protective equipment
- Review of Hepatitis B Vaccination Program
- Exposure incident reporting
- Provisions for post exposure evaluation and consultation

The ECO will ensure that all employees receive their training and information on an annual basis. All training is to be documented in accordance with the Company Training Program.

The ECO will ensure that all new employees receive this training as part of their initial Trainee Qualification. Additionally, all new employees will sign the attached "Training Acknowledgment Form" which will be placed in their permanent training file. This form will be completed once at the time of initial training. All subsequent training documentation will be in accordance with the Company Training Program.

Exposure Control Plan

Bloodborne Pathogen Training Certification

I have received Bloodborne Pathogen Training as described in 29 CFR 1910.1030 and the Exposure Control Plan.

The training was conducted on

(Date)

(Employee Signature)

(Social Security Number)

(Work Area)

I hereby certify that the above named employee has been provided with Bloodborne Pathogen Training on

(Date)

(Instructor's Signature)

EXPOSURE INCIDENT INVESTIGATION FORM

DATE OF INCIDENT: _____ TIME OF INCIDENT: _____

LOCATION: _____

POTENTIALLY INFECTIOUS MATERIALS INVOLVED:

TYPE: _____ SOURCE: _____

CIRCUMSTANCES (work being performed, etc.)

HOW INCIDENT WAS CAUSED (accident, equipment malfunction, etc.)

PERSONAL PROTECTIVE EQUIPMENT BEING USED:

ACTIONS TAKEN (decontamination, clean-up, reporting, etc.):

RECOMMENDATIONS FOR AVOIDING REPETITION:

Exposure Control Plan

VACCINATION DECLINATION FORM

Date: _____

EMPLOYEE

NAME:

EMPLOYEE

ID#:

I understand that due to my occupational exposure to blood or other potential infectious materials I may be at risk of acquiring Hepatitis B virus (HBV) infection. I have been given the opportunity to be vaccinated with Hepatitis B vaccine, at no charge to myself. However, I decline the Hepatitis B vaccination at this time. I understand that by declining this vaccine, I continue to be at risk of acquiring Hepatitis B, a serious disease. If, in the future, I continue to have occupational exposure to blood or other potentially infectious materials and I want to be vaccinated with Hepatitis B vaccine, I can receive the vaccination series at no charge to me.

(Employee Signature)

(Date)

(Facility Representative Signature)

(Date)

XI. The Standard**General Industry**

Part 1910 of title 29 of the Code of Federal Regulations is amended as follows:

PART 1910—[AMENDED]**Subpart Z—[Amended]**

1. The general authority citation for subpart Z of 29 CFR part 1910 continues to read as follows and a new citation for § 1910.1030 is added:

Authority: Secs. 8 and 9, Occupational Safety and Health Act, 29 U.S.C. 655, 657, Secretary of Labor's Orders Nos. 12-71 (39 FR 8754), 8-76 (41 FR 25059), or 9-83 (48 FR 35736), as applicable; and 29 CFR part 1911.

Section 1910.1030 also issued under 29 U.S.C. 653.

2. Section 1910.1030 is added to read as follows:

§ 1910.1030 Bloodborne Pathogens.

(a) *Scope and Application.* This section applies to all occupational exposure to blood or other potentially infectious materials as defined by paragraph (b) of this section.

(b) *Definitions.* For purposes of this section, the following shall apply:

Assistant Secretary means the Assistant Secretary of Labor for Occupational Safety and Health, or designated representative.

Blood means human blood, human blood components, and products made from human blood.

Bloodborne Pathogens means pathogenic microorganisms that are present in human blood and can cause disease in humans. These pathogens include, but are not limited to, hepatitis B virus (HBV) and human immunodeficiency virus (HIV).

Clinical Laboratory means a workplace where diagnostic or other screening procedures are performed on blood or other potentially infectious materials.

Contaminated means the presence or the reasonably anticipated presence of blood or other potentially infectious materials on an item or surface.

Contaminated Laundry means laundry which has been soiled with blood or other potentially infectious materials or may contain sharps.

Contaminated Sharps means any contaminated object that can penetrate the skin including, but not limited to, needles, scalpels, broken glass, broken capillary tubes, and exposed ends of dental wires.

Decontamination means the use of physical or chemical means to remove,

inactivate, or destroy bloodborne pathogens on a surface or item to the point where they are no longer capable of transmitting infectious particles and the surface or item is rendered safe for handling, use, or disposal.

Director means the Director of the National Institute for Occupational Safety and Health, U.S. Department of Health and Human Services, or designated representative.

Engineering Controls means controls (e.g., sharps disposal containers, self-sheathing needles) that isolate or remove the bloodborne pathogens hazard from the workplace.

Exposure Incident means a specific eye, mouth, other mucous membrane, non-intact skin, or parenteral contact with blood or other potentially infectious materials that results from the performance of an employee's duties.

Handwashing Facilities means a facility providing an adequate supply of running potable water, soap and single use towels or hot air drying machines.

Licensed Healthcare Professional is a person whose legally permitted scope of practice allows him or her to independently perform the activities required by paragraph (f) Hepatitis B Vaccination and Post-exposure Evaluation and Follow-up.

HBV means hepatitis B virus.

HIV means human immunodeficiency virus.

Occupational Exposure means reasonably anticipated skin, eye, mucous membrane, or parenteral contact with blood or other potentially infectious materials that may result from the performance of an employee's duties.

Other Potentially Infectious Materials means

(1) The following human body fluids: semen, vaginal secretions, cerebrospinal fluid, synovial fluid, pleural fluid, pericardial fluid, peritoneal fluid, amniotic fluid, saliva in dental procedures, any body fluid that is visibly contaminated with blood, and all body fluids in situations where it is difficult or impossible to differentiate between body fluids;

(2) Any unfixed tissue or organ (other than intact skin) from a human (living or dead); and

(3) HIV-containing cell or tissue cultures, organ cultures, and HIV- or HBV-containing culture medium or other solutions; and blood, organs, or other tissues from experimental animals infected with HIV or HBV.

Parenteral means piercing mucous membranes or the skin barrier through such events as needlesticks, human bites, cuts, and abrasions.

Personal Protective Equipment is specialized clothing or equipment worn by an employee for protection against a hazard. General work clothes (e.g., uniforms, pants, shirts or blouses) not intended to function as protection against a hazard are not considered to be personal protective equipment.

Production Facility means a facility engaged in industrial-scale, large-volume or high concentration production of HIV or HBV.

Regulated Waste means liquid or semi-liquid blood or other potentially infectious materials; contaminated items that would release blood or other potentially infectious materials in a liquid or semi-liquid state if compressed; items that are caked with dried blood or other potentially infectious materials and are capable of releasing those materials during handling; contaminated sharps; and pathological and microbiological wastes containing blood or other potentially infectious materials.

Research Laboratory means a laboratory producing or using research-laboratory-scale amounts of HIV or HBV. Research laboratories may produce high concentrations of HIV or HBV but not in the volume found in production facilities.

Source Individual means any individual, living or dead, whose blood or other potentially infectious materials may be a source of occupational exposure to the employee. Examples include, but are not limited to, hospital and clinic patients; clients in institutions for the developmentally disabled; trauma victims; clients of drug and alcohol treatment facilities; residents of hospices and nursing homes; human remains; and individuals who donate or sell blood or blood components.

Sterilize means the use of a physical or chemical procedure to destroy all microbial life including highly resistant bacterial endospores.

Universal Precautions is an approach to infection control. According to the concept of Universal Precautions, all human blood and certain human body fluids are treated as if known to be infectious for HIV, HBV, and other bloodborne pathogens.

Work Practice Controls means controls that reduce the likelihood of exposure by altering the manner in which a task is performed (e.g., prohibiting recapping of needles by a two-handed technique).

(c) *Exposure control*—(1) *Exposure Control Plan.* (i) Each employer having an employee(s) with occupational exposure as defined by paragraph (b) of this section shall establish a written Exposure Control Plan designed to

eliminate or minimize employee exposure.

(ii) The Exposure Control Plan shall contain at least the following elements:

(A) The exposure determination required by paragraph (c)(2).

(B) The schedule and method of implementation for paragraphs (d) Methods of Compliance, (e) HIV and HBV Research Laboratories and Production Facilities, (f) Hepatitis B Vaccination and Post-Exposure Evaluation and Follow-up, (g) Communication of Hazards to Employees, and (h) Recordkeeping, of this standard, and

(C) The procedure for the evaluation of circumstances surrounding exposure incidents as required by paragraph (f)(3)(i) of this standard.

(iii) Each employer shall ensure that a copy of the Exposure Control Plan is accessible to employees in accordance with 29 CFR 1910.20(e).

(iv) The Exposure Control Plan shall be reviewed and updated at least annually and whenever necessary to reflect new or modified tasks and procedures which affect occupational exposure and to reflect new or revised employee positions with occupational exposure.

(v) The Exposure Control Plan shall be made available to the Assistant Secretary and the Director upon request for examination and copying.

(2) *Exposure determination.* (i) Each employer who has an employee(s) with occupational exposure as defined by paragraph (b) of this section shall prepare an exposure determination. This exposure determination shall contain the following:

(A) A list of all job classifications in which all employees in those job classifications have occupational exposure;

(B) A list of job classifications in which some employees have occupational exposure, and

(C) A list of all tasks and procedures or groups of closely related task and procedures in which occupational exposure occurs and that are performed by employees in job classifications listed in accordance with the provisions of paragraph (c)(2)(i)(B) of this standard.

(ii) This exposure determination shall be made without regard to the use of personal protective equipment.

(d) *Methods of compliance—(1)*

General—Universal precautions shall be observed to prevent contact with blood or other potentially infectious materials. Under circumstances in which differentiation between body fluid types is difficult or impossible, all body fluids shall be considered potentially infectious materials.

(2) *Engineering and work practice controls.* (i) Engineering and work practice controls shall be used to eliminate or minimize employee exposure. Where occupational exposure remains after institution of these controls, personal protective equipment shall also be used.

(ii) Engineering controls shall be examined and maintained or replaced on a regular schedule to ensure their effectiveness.

(iii) Employers shall provide handwashing facilities which are readily accessible to employees.

(iv) When provision of handwashing facilities is not feasible, the employer shall provide either an appropriate antiseptic hand cleanser in conjunction with clean cloth/paper towels or antiseptic towelettes. When antiseptic hand cleansers or towelettes are used, hands shall be washed with soap and running water as soon as feasible.

(v) Employers shall ensure that employees wash their hands immediately or as soon as feasible after removal of gloves or other personal protective equipment.

(vi) Employers shall ensure that employees wash hands and any other skin with soap and water, or flush mucous membranes with water immediately or as soon as feasible following contact of such body areas with blood or other potentially infectious materials.

(vii) Contaminated needles and other contaminated sharps shall not be bent, recapped, or removed except as noted in paragraphs (d)(2)(vii)(A) and (d)(2)(vii)(B) below. Shearing or breaking of contaminated needles is prohibited.

(A) Contaminated needles and other contaminated sharps shall not be recapped or removed unless the employer can demonstrate that no alternative is feasible or that such action is required by a specific medical procedure.

(B) Such recapping or needle removal must be accomplished through the use of a mechanical device or a one-handed technique.

(viii) Immediately or as soon as possible after use, contaminated reusable sharps shall be placed in appropriate containers until properly reprocessed. These containers shall be:

(A) Puncture resistant;

(B) Labeled or color-coded in accordance with this standard;

(C) Leakproof on the sides and bottom; and

(D) In accordance with the requirements set forth in paragraph (d)(4)(ii)(E) for reusable sharps.

(ix) Eating, drinking, smoking, applying cosmetics or lip balm, and handling contact lenses are prohibited in work areas where there is a reasonable likelihood of occupational exposure.

(x) Food and drink shall not be kept in refrigerators, freezers, shelves, cabinets or on countertops or benches where blood or other potentially infectious materials are present.

(xi) All procedures involving blood or other potentially infectious materials shall be performed in such a manner as to minimize splashing, spraying, spattering, and generation of droplets of these substances.

(xii) Mouth pipetting/suctioning of blood or other potentially infectious materials is prohibited.

(xiii) Specimens of blood or other potentially infectious materials shall be placed in a container which prevents leakage during collection, handling, processing, storage, transport, or shipping.

(A) The container for storage, transport, or shipping shall be labeled or color-coded according to paragraph (g)(1)(i) and closed prior to being stored, transported, or shipped. When a facility utilizes Universal Precautions in the handling of all specimens, the labeling/color-coding of specimens is not necessary provided containers are recognizable as containing specimens. This exemption only applies while such specimens/containers remain within the facility. Labeling or color-coding in accordance with paragraph (g)(1)(i) is required when such specimens/containers leave the facility.

(B) If outside contamination of the primary container occurs, the primary container shall be placed within a second container which prevents leakage during handling, processing, storage, transport, or shipping and is labeled or color-coded according to the requirements of this standard.

(C) If the specimen could puncture the primary container, the primary container shall be placed within a secondary container which is puncture-resistant in addition to the above characteristics.

(xiv) Equipment which may become contaminated with blood or other potentially infectious materials shall be examined prior to servicing or shipping and shall be decontaminated as necessary, unless the employer can demonstrate that decontamination of such equipment or portions of such equipment is not feasible.

(A) A readily observable label in accordance with paragraph (g)(1)(i)(H) shall be attached to the equipment stating which portions remain contaminated.

(B) The employer shall ensure that this information is conveyed to all affected employees, the servicing representative, and/or the manufacturer, as appropriate, prior to handling, servicing, or shipping so that appropriate precautions will be taken.

(3) Personal protective equipment—(i) Provision. When there is occupational exposure, the employer shall provide, at no cost to the employee, appropriate personal protective equipment such as, but not limited to, gloves, gowns, laboratory coats, face shields or masks and eye protection, and mouthpieces, resuscitation bags, pocket masks, or other ventilation devices. Personal protective equipment will be considered "appropriate" only if it does not permit blood or other potentially infectious materials to pass through to or reach the employee's work clothes, street clothes, undergarments, skin, eyes, mouth, or other mucous membranes under normal conditions of use and for the duration of time which the protective equipment will be used.

(ii) Use. The employer shall ensure that the employee uses appropriate personal protective equipment unless the employer shows that the employee temporarily and briefly declined to use personal protective equipment when, under rare and extraordinary circumstances, it was the employee's professional judgment that in the specific instance its use would have prevented the delivery of health care or public safety services or would have posed an increased hazard to the safety of the worker or co-worker. When the employee makes this judgment, the circumstances shall be investigated and documented in order to determine whether changes can be instituted to prevent such occurrences in the future.

(iii) Accessibility. The employer shall ensure that appropriate personal protective equipment in the appropriate sizes is readily accessible at the worksite or is issued to employees. Hypoallergenic gloves, glove liners, powderless gloves, or other similar alternatives shall be readily accessible to those employees who are allergic to the gloves normally provided.

(iv) Cleaning, Laundering, and Disposal. The employer shall clean, launder, and dispose of personal protective equipment required by paragraphs (d) and (e) of this standard, at no cost to the employee.

(v) Repair and Replacement. The employer shall repair or replace personal protective equipment as needed to maintain its effectiveness, at no cost to the employee.

(vi) If a garment(s) is penetrated by blood or other potentially infectious

materials, the garment(s) shall be removed immediately or as soon as feasible.

(vii) All personal protective equipment shall be removed prior to leaving the work area.

(viii) When personal protective equipment is removed it shall be placed in an appropriately designated area or container for storage, washing, decontamination or disposal.

(ix) Gloves. Gloves shall be worn when it can be reasonably anticipated that the employee may have hand contact with blood, other potentially infectious materials, mucous membranes, and non-intact skin: when performing vascular access procedures except as specified in paragraph (d)(3)(ix)(D); and when handling or touching contaminated items or surfaces.

(A) Disposable (single use) gloves such as surgical or examination gloves, shall be replaced as soon as practical when contaminated or as soon as feasible if they are torn, punctured, or when their ability to function as a barrier is compromised.

(B) Disposable (single use) gloves shall not be washed or decontaminated for re-use.

(C) Utility gloves may be decontaminated for re-use if the integrity of the glove is not compromised. However, they must be discarded if they are cracked, peeling, torn, punctured, or exhibit other signs of deterioration or when their ability to function as a barrier is compromised.

(D) If an employer in a volunteer blood donation center judges that routine gloving for all phlebotomies is not necessary then the employer shall:

(1) Periodically reevaluate this policy;

(2) Make gloves available to all employees who wish to use them for phlebotomy;

(3) Not discourage the use of gloves for phlebotomy; and

(4) Require that gloves be used for phlebotomy in the following circumstances:

(i) When the employee has cuts, scratches, or other breaks in his or her skin;

(ii) When the employee judges that hand contamination with blood may occur, for example, when performing phlebotomy on an uncooperative source individual; and

(iii) When the employee is receiving training in phlebotomy.

(x) Masks, Eye Protection, and Face Shields. Masks in combination with eye protection devices, such as goggles or glasses with solid side shields, or chin-length face shields, shall be worn whenever splashes, spray, spatter, or

droplets of blood or other potentially infectious materials may be generated and eye, nose, or mouth contamination can be reasonably anticipated.

(xi) Gowns, Aprons, and Other Protective Body Clothing. Appropriate protective clothing such as, but not limited to, gowns, aprons, lab coats, clinic jackets, or similar outer garments shall be worn in occupational exposure situations. The type and characteristics will depend upon the task and degree of exposure anticipated.

(xii) Surgical caps or hoods and/or shoe covers or boots shall be worn in instances when gross contamination can reasonably be anticipated (e.g., autopsies, orthopaedic surgery).

(4) Housekeeping. (i) General. Employers shall ensure that the worksite is maintained in a clean and sanitary condition. The employer shall determine and implement an appropriate written schedule for cleaning and method of decontamination based upon the location within the facility, type of surface to be cleaned, type of soil present, and tasks or procedures being performed in the area.

(ii) All equipment and environmental and working surfaces shall be cleaned and decontaminated after contact with blood or other potentially infectious materials.

(A) Contaminated work surfaces shall be decontaminated with an appropriate disinfectant after completion of procedures; immediately or as soon as feasible when surfaces are overtly contaminated or after any spill of blood or other potentially infectious materials; and at the end of the work shift if the surface may have become contaminated since the last cleaning.

(B) Protective coverings, such as plastic wrap, aluminum foil, or imperviously-backed absorbent paper used to cover equipment and environmental surfaces, shall be removed and replaced as soon as feasible when they become overtly contaminated or at the end of the workshift if they may have become contaminated during the shift.

(C) All bins, pails, cans, and similar receptacles intended for reuse which have a reasonable likelihood for becoming contaminated with blood or other potentially infectious materials shall be inspected and decontaminated on a regularly scheduled basis and cleaned and decontaminated immediately or as soon as feasible upon visible contamination.

(D) Broken glassware which may be contaminated shall not be picked up directly with the hands. It shall be cleaned up using mechanical means.

such as a brush and dust pan, tongs, or forceps.

(E) Reusable sharps that are contaminated with blood or other potentially infectious materials shall not be stored or processed in a manner that requires employees to reach by hand into the containers where these sharps have been placed.

(iii) Regulated Waste.

(A) Contaminated Sharps Discarding and Containment. (1) Contaminated sharps shall be discarded immediately or as soon as feasible in containers that are:

(i) Closable;

(ii) Puncture resistant;

(iii) Leakproof on sides and bottom; and

(iv) Labeled or color-coded in accordance with paragraph (g)(1)(i) of this standard.

(2) During use, containers for contaminated sharps shall be:

(i) Easily accessible to personnel and located as close as is feasible to the immediate area where sharps are used or can be reasonably anticipated to be found (e.g., laundries);

(ii) Maintained upright throughout use; and

(iii) Replaced routinely and not be allowed to overfill.

(3) When moving containers of contaminated sharps from the area of use, the containers shall be:

(i) Closed immediately prior to removal or replacement to prevent spillage or protrusion of contents during handling, storage, transport, or shipping;

(ii) Placed in a secondary container if leakage is possible. The second container shall be:

(A) Closable;

(B) Constructed to contain all contents and prevent leakage during handling, storage, transport, or shipping; and

(C) Labeled or color-coded according to paragraph (g)(1)(i) of this standard.

(4) Reusable containers shall not be opened, emptied, or cleaned manually or in any other manner which would expose employees to the risk of percutaneous injury.

(B) Other Regulated Waste

Containment. (1) Regulated waste shall be placed in containers which are:

(i) Closable;

(ii) Constructed to contain all contents and prevent leakage of fluids during handling, storage, transport or shipping;

(iii) Labeled or color-coded in accordance with paragraph (g)(1)(i) this standard; and

(iv) Closed prior to removal to prevent spillage or protrusion of contents during handling, storage, transport, or shipping.

(2) If outside contamination of the regulated waste container occurs, it

shall be placed in a second container. The second container shall be:

(i) Closable;

(ii) Constructed to contain all contents and prevent leakage of fluids during handling, storage, transport or shipping;

(iii) Labeled or color-coded in accordance with paragraph (g)(1)(i) of this standard; and

(iv) Closed prior to removal to prevent spillage or protrusion of contents during handling, storage, transport, or shipping.

(C) Disposal of all regulated waste shall be in accordance with applicable regulations of the United States, States and Territories, and political subdivisions of States and Territories.

(iv) Laundry.

(A) Contaminated laundry shall be handled as little as possible with a minimum of agitation. (1) Contaminated laundry shall be bagged or containerized at the location where it was used and shall not be sorted or rinsed in the location of use.

(2) Contaminated laundry shall be placed and transported in bags or containers labeled or color-coded in accordance with paragraph (g)(1)(i) of this standard. When a facility utilizes Universal Precautions in the handling of all soiled laundry, alternative labeling or color-coding is sufficient if it permits all employees to recognize the containers as requiring compliance with Universal Precautions.

(3) Whenever contaminated laundry is wet and presents a reasonable likelihood of soak-through or leakage from the bag or container, the laundry shall be placed and transported in bags or containers which prevent soak-through and/or leakage of fluids to the exterior.

(B) The employer shall ensure that employees who have contact with contaminated laundry wear protective gloves and other appropriate personal protective equipment.

(C) When a facility ships contaminated laundry off-site to a second facility which does not utilize Universal Precautions in the handling of all laundry, the facility generating the contaminated laundry must place such laundry in bags or containers which are labeled or color-coded in accordance with paragraph (g)(1)(i).

(e) HIV and HBV Research Laboratories and Production Facilities.

(1) This paragraph applies to research laboratories and production facilities engaged in the culture, production, concentration, experimentation, and manipulation of HIV and HBV. It does not apply to clinical or diagnostic laboratories engaged solely in the analysis of blood, tissues, or organs.

These requirements apply in addition to the other requirements of the standard.

(2) Research laboratories and production facilities shall meet the following criteria:

(i) Standard microbiological practices. All regulated waste shall either be incinerated or decontaminated by a method such as autoclaving known to effectively destroy bloodborne pathogens.

(ii) Special practices.

(A) Laboratory doors shall be kept closed when work involving HIV or HBV is in progress.

(B) Contaminated materials that are to be decontaminated at a site away from the work area shall be placed in a durable, leakproof, labeled or color-coded container that is closed before being removed from the work area.

(C) Access to the work area shall be limited to authorized persons. Written policies and procedures shall be established whereby only persons who have been advised of the potential biohazard, who meet any specific entry requirements, and who comply with all entry and exit procedures shall be allowed to enter the work areas and animal rooms.

(D) When other potentially infectious materials or infected animals are present in the work area or containment module, a hazard warning sign incorporating the universal biohazard symbol shall be posted on all access doors. The hazard warning sign shall comply with paragraph (g)(1)(ii) of this standard.

(E) All activities involving other potentially infectious materials shall be conducted in biological safety cabinets or other physical-containment devices within the containment module. No work with these other potentially infectious materials shall be conducted on the open bench.

(F) Laboratory coats, gowns, smocks, uniforms, or other appropriate protective clothing shall be used in the work area and animal rooms. Protective clothing shall not be worn outside of the work area and shall be decontaminated before being laundered.

(G) Special care shall be taken to avoid skin contact with other potentially infectious materials. Gloves shall be worn when handling infected animals and when making hand contact with other potentially infectious materials is unavoidable.

(H) Before disposal all waste from work areas and from animal rooms shall either be incinerated or decontaminated by a method such as autoclaving known to effectively destroy bloodborne pathogens.

(I) Vacuum lines shall be protected with liquid disinfectant traps and high-efficiency particulate air (HEPA) filters or filters of equivalent or superior efficiency and which are checked routinely and maintained or replaced as necessary.

(J) Hypodermic needles and syringes shall be used only for parenteral injection and aspiration of fluids from laboratory animals and diaphragm bottles. Only needle-locking syringes or disposable syringe-needle units (i.e., the needle is integral to the syringe) shall be used for the injection or aspiration of other potentially infectious materials. Extreme caution shall be used when handling needles and syringes. A needle shall not be bent, sheared, replaced in the sheath or guard, or removed from the syringe following use. The needle and syringe shall be promptly placed in a puncture-resistant container and autoclaved or decontaminated before reuse or disposal.

(K) All spills shall be immediately contained and cleaned up by appropriate professional staff or others properly trained and equipped to work with potentially concentrated infectious materials.

(L) A spill or accident that results in an exposure incident shall be immediately reported to the laboratory director or other responsible person.

(M) A biosafety manual shall be prepared or adopted and periodically reviewed and updated at least annually or more often if necessary. Personnel shall be advised of potential hazards, shall be required to read instructions on practices and procedures, and shall be required to follow them.

(iii) Containment equipment. (A) Certified biological safety cabinets (Class I, II, or III) or other appropriate combinations of personal protection or physical containment devices, such as special protective clothing, respirators, centrifuge safety cups, sealed centrifuge rotors, and containment caging for animals, shall be used for all activities with other potentially infectious materials that pose a threat of exposure to droplets, splashes, spills, or aerosols.

(B) Biological safety cabinets shall be certified when installed, whenever they are moved and at least annually.

(3) HIV and HBV research laboratories shall meet the following criteria:

(i) Each laboratory shall contain a facility for hand washing and an eye wash facility which is readily available within the work area.

(ii) An autoclave for decontamination of regulated waste shall be available.

(4) HIV and HBV production facilities shall meet the following criteria:

(i) The work areas shall be separated from areas that are open to unrestricted traffic flow within the building. Passage through two sets of doors shall be the basic requirement for entry into the work area from access corridors or other contiguous areas. Physical separation of the high-containment work area from access corridors or other areas or activities may also be provided by a double-doored clothes-change room (showers may be included), airlock, or other access facility that requires passing through two sets of doors before entering the work area.

(ii) The surfaces of doors, walls, floors and ceilings in the work area shall be water resistant so that they can be easily cleaned. Penetrations in these surfaces shall be sealed or capable of being sealed to facilitate decontamination.

(iii) Each work area shall contain a sink for washing hands and a readily available eye wash facility. The sink shall be foot, elbow, or automatically operated and shall be located near the exit door of the work area.

(iv) Access doors to the work area or containment module shall be self-closing.

(v) An autoclave for decontamination of regulated waste shall be available within or as near as possible to the work area.

(vi) A ducted exhaust-air ventilation system shall be provided. This system shall create directional airflow that draws air into the work area through the entry area. The exhaust air shall not be recirculated to any other area of the building, shall be discharged to the outside, and shall be dispersed away from occupied areas and air intakes. The proper direction of the airflow shall be verified (i.e., into the work area).

(5) *Training Requirements.* Additional training requirements for employees in HIV and HBV research laboratories and HIV and HBV production facilities are specified in paragraph (g)(2)(ix).

(f) *Hepatitis B vaccination and post-exposure evaluation and follow-up—(1) General.* (i) The employer shall make available the hepatitis B vaccine and vaccination series to all employees who have occupational exposure, and post-exposure evaluation and follow-up to all employees who have had an exposure incident.

(ii) The employer shall ensure that all medical evaluations and procedures including the hepatitis B vaccine and vaccination series and post-exposure evaluation and follow-up, including prophylaxis, are:

(A) Made available at no cost to the employee;

(B) Made available to the employee at a reasonable time and place;

(C) Performed by or under the supervision of a licensed physician or by or under the supervision of another licensed healthcare professional; and

(D) Provided according to recommendations of the U.S. Public Health Service current at the time these evaluations and procedures take place, except as specified by this paragraph (f).

(iii) The employer shall ensure that all laboratory tests are conducted by an accredited laboratory at no cost to the employee.

(2) *Hepatitis B Vaccination.* (i) Hepatitis B vaccination shall be made available after the employee has received the training required in paragraph (g)(2)(vii)(I) and within 10 working days of initial assignment to all employees who have occupational exposure unless the employee has previously received the complete hepatitis B vaccination series, antibody testing has revealed that the employee is immune, or the vaccine is contraindicated for medical reasons.

(ii) The employer shall not make participation in a prescreening program a prerequisite for receiving hepatitis B vaccination.

(iii) If the employee initially declines hepatitis B vaccination but at a later date while still covered under the standard decides to accept the vaccination, the employer shall make available hepatitis B vaccination at that time.

(iv) The employer shall assure that employees who decline to accept hepatitis B vaccination offered by the employer sign the statement in appendix A.

(v) If a routine booster dose(s) of hepatitis B vaccine is recommended by the U.S. Public Health Service at a future date, such booster dose(s) shall be made available in accordance with section (f)(1)(ii).

(3) *Post-exposure Evaluation and Follow-up.* Following a report of an exposure incident, the employer shall make immediately available to the exposed employee a confidential medical evaluation and follow-up, including at least the following elements:

(i) Documentation of the route(s) of exposure, and the circumstances under which the exposure incident occurred;

(ii) Identification and documentation of the source individual, unless the employer can establish that identification is infeasible or prohibited by state or local law;

(A) The source individual's blood shall be tested as soon as feasible and

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after consent is obtained in order to determine HBV and HIV infectivity. If consent is not obtained, the employer shall establish that legally required consent cannot be obtained. When the source individual's consent is not required by law, the source individual's blood, if available, shall be tested and the results documented.

(B) When the source individual is already known to be infected with HBV or HIV, testing for the source individual's known HBV or HIV status need not be repeated.

(C) Results of the source individual's testing shall be made available to the exposed employee, and the employee shall be informed of applicable laws and regulations concerning disclosure of the identity and infectious status of the source individual.

(iii) Collection and testing of blood for HBV and HIV serological status;

(A) The exposed employee's blood shall be collected as soon as feasible and tested after consent is obtained.

(B) If the employee consents to baseline blood collection, but does not give consent at that time for HIV serologic testing, the sample shall be preserved for at least 90 days. If, within 90 days of the exposure incident, the employee elects to have the baseline sample tested, such testing shall be done as soon as feasible.

(iv) Post-exposure prophylaxis, when medically indicated, as recommended by the U.S. Public Health Service;

(v) Counseling; and

(vi) Evaluation of reported illnesses.

(4) *Information Provided to the Healthcare Professional.* (i) The employer shall ensure that the healthcare professional responsible for the employee's Hepatitis B vaccination is provided a copy of this regulation.

(ii) The employer shall ensure that the healthcare professional evaluating an employee after an exposure incident is provided the following information:

(A) A copy of this regulation;

(B) A description of the exposed employee's duties as they relate to the exposure incident;

(C) Documentation of the route(s) of exposure and circumstances under which exposure occurred;

(D) Results of the source individual's blood testing, if available; and

(E) All medical records relevant to the appropriate treatment of the employee including vaccination status which are the employer's responsibility to maintain.

(5) *Healthcare Professional's Written Opinion.* The employer shall obtain and provide the employee with a copy of the evaluating healthcare professional's

written opinion within 15 days of the completion of the evaluation.

(i) The healthcare professional's written opinion for Hepatitis B vaccination shall be limited to whether Hepatitis B vaccination is indicated for an employee, and if the employee has received such vaccination.

(ii) The healthcare professional's written opinion for post-exposure evaluation and follow-up shall be limited to the following information:

(A) That the employee has been informed of the results of the evaluation; and

(B) That the employee has been told about any medical conditions resulting from exposure to blood or other potentially infectious materials which require further evaluation or treatment.

(iii) All other findings or diagnoses shall remain confidential and shall not be included in the written report.

(6) *Medical recordkeeping.* Medical records required by this standard shall be maintained in accordance with paragraph (h)(1) of this section.

(g) *Communication of hazards to employees—* (1) *Labels and signs.* (i) Labels. (A) Warning labels shall be affixed to containers of regulated waste, refrigerators and freezers containing blood or other potentially infectious material; and other containers used to store, transport or ship blood or other potentially infectious materials, except as provided in paragraph (g)(1)(i)(E), (F) and (G).

(B) Labels required by this section shall include the following legend:



BIOHAZARD

BIOHAZARD

(C) These labels shall be fluorescent orange or orange-red or predominantly so, with lettering or symbols in a contrasting color.

(D) Labels required by affixed as close as feasible to the container by string, wire, adhesive, or other method that prevents their loss or unintentional removal.

(E) Red bags or red containers may be substituted for labels.

(F) Containers of blood, blood components, or blood products that are labeled as to their contents and have been released for transfusion or other

clinical use are exempted from the labeling requirements of paragraph (g).

(C) Individual containers of blood or other potentially infectious materials that are placed in a labeled container during storage, transport, shipment or disposal are exempted from the labeling requirement.

(H) Labels required for contaminated equipment shall be in accordance with this paragraph and shall also state which portions of the equipment remain contaminated.

(I) Regulated waste that has been decontaminated need not be labeled or color-coded.

(ii) *Signs.* (A) The employer shall post signs at the entrance to work areas specified in paragraph (e), HIV and HBV Research Laboratory and Production Facilities, which shall bear the following legend:



BIOHAZARD

BIOHAZARD

(Name of the Infectious Agent)
(Special requirements for entering the area)
(Name, telephone number of the laboratory director or other responsible person.)

(B) These signs shall be fluorescent orange-red or predominantly so, with lettering or symbols in a contrasting color.

(2) *Information and Training.* (i) Employers shall ensure that all employees with occupational exposure participate in a training program which must be provided at no cost to the employee and during working hours.

(ii) Training shall be provided as follows:

(A) At the time of initial assignment to tasks where occupational exposure may take place;

(B) Within 90 days after the effective date of the standard; and

(C) At least annually thereafter.

(iii) For employees who have received training on bloodborne pathogens in the year preceding the effective date of the standard, only training with respect to the provisions of the standard which were not included need be provided.

(iv) Annual training for all employees shall be provided within one year of their previous training.

(v) Employers shall provide additional training when changes such as modification of tasks or procedures or institution of new tasks or procedures affect the employee's occupational exposure. The additional training may be limited to addressing the new exposures created.

(vi) Material appropriate in content and vocabulary to educational level, literacy, and language of employees shall be used.

(vii) The training program shall contain at a minimum the following elements:

(A) An accessible copy of the regulatory text of this standard and an explanation of its contents;

(B) A general explanation of the epidemiology and symptoms of bloodborne diseases;

(C) An explanation of the modes of transmission of bloodborne pathogens;

(D) An explanation of the employer's exposure control plan and the means by which the employee can obtain a copy of the written plan;

(E) An explanation of the appropriate methods for recognizing tasks and other activities that may involve exposure to blood and other potentially infectious materials;

(F) An explanation of the use and limitations of methods that will prevent or reduce exposure including appropriate engineering controls, work practices, and personal protective equipment;

(G) Information on the types, proper use, location, removal, handling, decontamination and disposal of personal protective equipment;

(H) An explanation of the basis for selection of personal protective equipment;

(I) Information on the hepatitis B vaccine, including information on its efficacy, safety, method of administration, the benefits of being vaccinated, and that the vaccine and vaccination will be offered free of charge;

(J) Information on the appropriate actions to take and persons to contact in an emergency involving blood or other potentially infectious materials;

(K) An explanation of the procedure to follow if an exposure incident occurs, including the method of reporting the incident and the medical follow-up that will be made available;

(L) Information on the post-exposure evaluation and follow-up that the employer is required to provide for the employee following an exposure incident;

(M) An explanation of the signs and labels and/or color coding required by paragraph (g)(1); and

(N) An opportunity for interactive questions and answers with the person conducting the training session.

(viii) The person conducting the training shall be knowledgeable in the subject matter covered by the elements contained in the training program as it relates to the workplace that the training will address.

(ix) Additional Initial Training for Employees in HIV and HBV Laboratories and Production Facilities. Employees in HIV or HBV research laboratories and HIV or HBV production facilities shall receive the following initial training in addition to the above training requirements.

(A) The employer shall assure that employees demonstrate proficiency in standard microbiological practices and techniques and in the practices and operations specific to the facility before being allowed to work with HIV or HBV.

(B) The employer shall assure that employees have prior experience in the handling of human pathogens or tissue cultures before working with HIV or HBV.

(C) The employer shall provide a training program to employees who have no prior experience in handling human pathogens. Initial work activities shall not include the handling of infectious agents. A progression of work activities shall be assigned as techniques are learned and proficiency is developed. The employer shall assure that employees participate in work activities involving infectious agents only after proficiency has been demonstrated.

(h) *Recordkeeping—(1) Medical Records.* (i) The employer shall establish and maintain an accurate record for each employee with occupational exposure. In accordance with 29 CFR 1910.20.

(ii) This record shall include:

(A) The name and social security number of the employee;

(B) A copy of the employee's hepatitis B vaccination status including the dates of all the hepatitis B vaccinations and any medical records relative to the employee's ability to receive vaccination as required by paragraph (f)(2);

(C) A copy of all results of examinations, medical testing, and follow-up procedures as required by paragraph (f)(3);

(D) The employer's copy of the healthcare professional's written opinion as required by paragraph (f)(5); and

(E) A copy of the information provided to the healthcare professional as required by paragraphs (f)(4)(ii)(B)(C) and (D).

(iii) Confidentiality. The employer shall ensure that employee medical records required by paragraph (h)(1) are:

(A) Kept confidential; and

(B) Are not disclosed or reported without the employee's express written consent to any person within or outside the workplace except as required by this section or as may be required by law.

(iv) The employer shall maintain the records required by paragraph (h) for at least the duration of employment plus 30 years in accordance with 29 CFR 1910.20.

(2) *Training Records.* (i) *Training records shall include the following information:*

(A) The dates of the training sessions;

(B) The contents or a summary of the training sessions;

(C) The names and qualifications of persons conducting the training; and

(D) The names and job titles of all persons attending the training sessions.

(ii) Training records shall be maintained for 3 years from the date on which the training occurred.

(3) *Availability.* (i) The employer shall ensure that all records required to be maintained by this section shall be made available upon request to the Assistant Secretary and the Director for examination and copying.

(ii) Employee training records required by this paragraph shall be provided upon request for examination and copying to employees, to employee representatives, to the Director, and to the Assistant Secretary in accordance with 29 CFR 1910.20.

(iii) Employee medical records required by this paragraph shall be provided upon request for examination and copying to the subject employee, to anyone having written consent of the subject employee, to the Director, and to the Assistant Secretary in accordance with 29 CFR 1910.20.

(4) *Transfer of Records.* (i) The employer shall comply with the requirements involving transfer of records set forth in 29 CFR 1910.20(h).

(ii) If the employer ceases to do business and there is no successor employer to receive and retain the records for the prescribed period, the employer shall notify the Director, at least three months prior to their disposal and transmit them to the Director, if required by the Director to do so, within that three month period.

(i) *Dates—(1) Effective Date.* The standard shall become effective on March 6, 1992.

(2) The Exposure Control Plan required by paragraph (c)(2) of this section shall be completed on or before May 5, 1992.

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(3) Paragraph (g)(2) Information and Training and (h) Recordkeeping shall take effect on or before June 4, 1992.

(4) Paragraphs (d)(2) Engineering and Work Practice Controls, (d)(3) Personal Protective Equipment, (d)(4) Housekeeping, (e) HIV and HBV Research Laboratories and Production Facilities, (f) Hepatitis B Vaccination and Post-Exposure Evaluation and

Follow-up, and (g) (1) Labels and Signs, shall take effect July 6, 1992.

Appendix A to Section 1910.1030—Hepatitis B Vaccine Declination (Mandatory)

I understand that due to my occupational exposure to blood or other potentially infectious materials I may be at risk of acquiring hepatitis B virus (HBV) infection. I have been given the opportunity to be vaccinated with hepatitis B vaccine, at no charge to myself. However, I decline hepatitis

B vaccination at this time. I understand that by declining this vaccine, I continue to be at risk of acquiring hepatitis B, a serious disease. If in the future I continue to have occupational exposure to blood or other potentially infectious materials and I want to be vaccinated with hepatitis B vaccine, I can receive the vaccination series at no charge to me.

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Dated: April 7, 1992.

Arthur J. Hill,

Assistant Secretary for Housing—Federal
Housing Commissioner.

[FR Doc. 92-8529 Filed 4-10-92; 8:45 am]

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DEPARTMENT OF LABOR

Occupational Safety and Health Administration

29 CFR Part 1910

Occupational Exposure to Bloodborne Pathogens; Approval of Information Collection Requirements

AGENCY: Occupational Safety and
Health Administration; Labor.

ACTION: Final rule; approval of
information collection requirements.

SUMMARY: On December 6, 1991, OSHA published a final standard governing occupational exposure to bloodborne pathogens (56 FR 64004). The standard is designed to eliminate or minimize occupational exposure to Hepatitis B Virus (HBV), Human Immunodeficiency Virus (HIV) and other bloodborne pathogens. At that time OSHA submitted the information collection requirements to the Office of Management and Budget (OMB) for review under section 3504(h) of the Paperwork Reduction Act (PRA) of 1980. Public reporting burden for this collection of information was estimated to average five minutes per employer response to an OSHA compliance officer's request for access to the employer's records.

OMB reviewed the collection of information requirements for occupational exposure to bloodborne pathogens in accordance with the PRA, 44 U.S.C. 3501 *et seq.*, and 5 CFR part 1320. OMB approved all information requirements contained in 29 CFR 1910.1030 under OMB clearance number 1218-0180. The OMB clearance expires on February 28, 1995. This document will also amend the December 6, 1991 rule to properly display the OMB control number.

EFFECTIVE DATE: OMB's approval of information requirements becomes effective March 8, 1992.

FOR FURTHER INFORMATION CONTACT:
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Occupational Safety and Health
Administration, 200 Constitution
Avenue NW., room N3637, Washington,
DC 20210; Telephone (202) 523-8151.

SUPPLEMENTARY INFORMATION: The PRA provisions on information collection are

triggered when an OSHA compliance officer asks an employer to produce certain records and, in some circumstances, when an employer goes out of business. The Occupational Exposure to Bloodborne Pathogens standard requires that OSHA have access to the employer's Exposure Control Plan (1910.1030(c)(1)(v)), as well as the employer's training and medical records (1910.1030(h)(3) (ii) and (iii)). If an employer goes out of business and there is no successor employer to receive these records, the employer is required to notify the Director of the National Institute of Occupational Safety and Health three months prior to destroying the records and transmit the records to the Director if he or she requests them (1910.1030(h)(4)).

On February 7, 1992, OMB approved the information collection provisions for three years, the maximum period authorized by the Paperwork Reduction Act.

Authority and Signature

This document was prepared under the direction of Dorothy L. Strunk, Acting Assistant Secretary of Labor for Occupational Safety and Health, U.S. Department of Labor, 200 Constitution Avenue, NW., Washington, DC 20210.

This action is being taken pursuant to sections 4(b), 6(b) and 8(c) of the Occupational Safety and Health Act of 1970 (29 U.S.C. 653, 655, 657), Section 4 of the Administration Procedure Act, 5 U.S.C. 553(d)(3), Secretary of Labor's Order No. 1-90 (55 FR 9033) and 29 CFR part 1911.

Signed at Washington, DC this 7th day of April, 1992.

Dorothy L. Strunk,
Acting Assistant Secretary for Occupational
Safety and Health.

Part 1910 of title 29 of the Code of Federal Regulations is amended as follows:

PART 1910—[AMENDED]

§ 1910.1030 [Amended]

In § 1910.1030, by adding a parenthetical, as follows, at the end of the regulatory text:

(Approved by the Office of Management and Budget under control number 1210-0180)

[FR Doc. 92-8383 Filed 4-10-92; 8:45 am]
BILLING CODE 4510-26-M

DEPARTMENT OF THE INTERIOR

Office of Surface Mining Reclamation and Enforcement

30 CFR Part 916

Kansas Abandoned Mine Land Reclamation Plan

AGENCY: Office of Surface Mining
Reclamation and Enforcement (OSM),
Interior.

ACTION: Final rule, approval of
amendment.

SUMMARY: OSM is announcing the approval of a proposed amendment to the Kansas Abandoned Mine Land Reclamation (AMLR) Plan (hereinafter referred to as the Kansas Plan) under the Surface Mining Control and Reclamation Act of 1977 (SMCRA). The amendment proposes editorial changes and other minor revisions to improve the operational efficiency of the Kansas program. The amendment is approved.

EFFECTIVE DATE: April 13, 1992.

FOR FURTHER INFORMATION CONTACT:
Jerry R. Ennis, Telephone: (810) 374-
6405.

SUPPLEMENTARY INFORMATION:

I. Background on the Kansas Plan

The Secretary of the Interior conditionally approved the Kansas AMLR program on February 1, 1982. Information pertinent to the general background, revisions, and amendments to the initial program submission, as well as the Secretary's findings and disposition of comments can be found in the February 1, 1982, Federal Register (47 FR 4513). Deficiencies that resulted in the conditional approval were corrected by the State, and on June 3, 1983, all conditions of approval were removed by the Secretary Federal Register (48 FR 24874). Subsequent actions concerning the Kansas Plan and amendments to the Plan can be found at 30 CFR 916.25.

II. Discussion of Proposed Amendment

By letter dated October 25, 1991, and revisions received October 31, 1991, Kansas submitted a reclamation plan amendment to OSM (Administrative Record No. AML-KS-156). The proposed amendment consists of the addition of new language, revised narrative, and editorial changes to the Kansas Administrative Regulations (K.A.R.) at K.A.R. chapter 47, article 16. Substantive changes were made to the following areas of the Plan:

(1) At K.A.R. 47-16-5(b), Entry and consent to reclaim, the proposed

column, then the number in the mg/m³ column is exact. When numerical entries for a substance are in both the ppm and mg/m³ columns, then the number in the ppm column is exact and the number in the mg/m³ column may be rounded off."

22. In § 1910.1000 Table Z-3, the footnote superscript "g" is added after the entry "INERT OR NUISANCE DUST" and Footnote "g" is added in alphabetical order to read "All inert or nuisance dusts, whether mineral, inorganic, or organic, not listed specifically by substance name, are covered by the Particulates Not Otherwise Regulated (PNOR) limit in Table Z-1-A."

Signed at Washington, DC, this 25th day of June, 1992.

Dorothy L. Strunk,

Acting Assistant Secretary of Labor.

[FR Doc. 92-15364 Filed 6-30-92; 8:45 am]

BILLING CODE 4510-29-M

29 CFR Part 1910

[Docket No. H-370]

Occupational Exposure to Bloodborne Pathogens; Correction

AGENCY: Occupational Safety and Health Administration, Labor.

ACTION: Final rule, correction.

SUMMARY: The Occupational Safety and Health Administration is correcting errors in the regulatory text of the final rule for Occupational Exposure to Bloodborne Pathogens which appeared in the Federal Register on December 6, 1991 (56 FR 64004).

EFFECTIVE DATE: July 1, 1992.

FOR FURTHER INFORMATION CONTACT: Mr. James F. Foster, Occupational Safety and Health Administration, Office of Information and Public Affairs, room N-3647, U.S. Department of Labor, 200 Constitution Avenue, NW., Washington, DC 20210, Telephone: (202) 523-8151.

SUPPLEMENTARY INFORMATION:

Background

OSHA has promulgated a standard to eliminate or minimize occupational exposure to Hepatitis B Virus (HBV), Human Immunodeficiency Virus (HIV) and other bloodborne pathogens (56 FR 64004). In the final rule OSHA determined that employees faced a significant health risk as the result of occupational exposure to blood and other potentially infectious materials because they may contain bloodborne pathogens, including hepatitis B virus which causes Hepatitis B, a serious liver

disease, and human immunodeficiency virus, which causes Acquired Immunodeficiency Syndrome (AIDS).

Need for Correction

During the proofreading process of the regulation, technical and typographical errors were discovered. This notice is being published to correct those errors.

Correction of Publication

The following corrections are made in the final rule for Occupational Exposure to Bloodborne Pathogens published in the Federal Register on December 6, 1991 (56 FR 64004).

§ 1910.1030 (Correction)

1. On page 64004, first column, third heading, "29 CFR Part 1910.1030" should be corrected to read "29 CFR part 1910".

2. On page 64176, second column, § 1910.1030(d)(2)(vii)(A) is corrected to read:

"(A) Contaminated needles and other contaminated sharps shall not be bent, recapped or removed unless the employer can demonstrate that no alternative is feasible or that such action is required by a specific medical or dental procedure."

3. On page 64176, second column, § 1910.1030(d)(2)(vii)(B) is corrected to read:

"(B) Such bending, recapping or needle removal must be accomplished through the use of a mechanical device or a one-handed technique."

4.-5. On page 64180, second column, § 1910.1030(g)(1)(i)(B), remove the second "BIOHAZARD" term which appears in this paragraph, immediately above § 1910.1030(g)(1)(i)(C).

6. On page 64180, second column, § 1910.1030(g)(1)(i)(C), third line, is corrected to read "so, with lettering and symbols in a".

7. On page 64180, second column, § 1910.1030(g)(1)(i)(D), is corrected to read:

"(D) Labels shall be affixed as close as feasible to the container by string, wire, adhesive, or other method that prevents their loss or unintentional removal."

8. On page 64180, third column, § 1910.1030(g)(1)(ii)(A), ninth line, remove the second "BIOHAZARD" term which appears in this paragraph.

9. On page 64180, third column, § 1910.1030(g)(1)(ii)(B), third line, is corrected to read "lettering and symbols in a contrasting".

10. On page 64181, first column, § 1910.1030(g)(2)(vii)(A) is corrected to read:

"(A) An accessible copy of the regulatory text of this standard and an explanation of its contents;"

11. On page 64181, third column, § 1910.1030(h)(1)(iii)(B) is corrected to read:

"(B) Not disclosed or reported without the employee's express written consent to any person within or outside the workplace except as required by this section or as may be required by law."

12. On page 64181, third column, § 1910.1030(h)(3)(ii) is corrected to read:

"(ii) Employee training records required by this paragraph shall be provided upon request for examination and copying to employees, to employee representatives, to the Director (and to the Assistant Secretary)."

13. On page 64181, third column, § 1910.1030(i)(2) is corrected to read:

"(2) The Exposure Control Plan required by paragraph (c) of this section shall be completed on or before May 5, 1992."

Dated: June 25, 1992.

Dorothy L. Strunk,

Acting Assistant Secretary of Labor,

[FR Doc. 92-15363 Filed 6-30-92; 8:46 am]

BILLING CODE 4510-29-M

DEPARTMENT OF DEFENSE

Office of the Secretary

32 CFR Part 169a

[DoD Instruction 4100.33]

Commercial Activities Program Procedures

AGENCY: Office of the Secretary, D. D.

ACTION: Final rule.

SUMMARY: The Department of Defense is revising its rules regarding the Commercial Activities Program Procedures to incorporate changes to Part 169a required by Office of Management and Budget (OMB) interim procedural changes to their Circular A-76, "Performance of Commercial Activities," August 3, 1983, and is implementing the DoD policies established in 32 CFR Part 169. This amendment is designed to provide current instructions to the DoD Commercial Activities Program.

DATE EFFECTIVE: July 8, 1992.

FOR FURTHER INFORMATION CONTACT: Mr. Earl DeHart, telephone 703-756-5841.

SUPPLEMENTARY INFORMATION: In FR Doc 91-30348, appearing in the Federal Register (56 FR 15442) on December 27, 1991, the Office of the Secretary of Defense published part 169a as a proposed rule to incorporate substantive changes to part 169a required by OMB