

**SITE-SPECIFIC
HEALTH AND SAFETY PLAN
FOR
SOIL AND DEBRIS REMOVAL ACTION
CAMP ALLEN LANDFILL, AREA B
NAVAL BASE
NORFOLK, VIRGINIA**

Prepared for:

Department of the Navy
Naval Facilities Engineering Command
Atlantic Division Naval Station
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1.0 INTRODUCTION

OHM Remediation Services Corp. (OHM) is pleased to present this Health and Safety Plan (HASP) which has been developed for United States Navy, LANTDIV. This HASP document is provided for the Delivery Order entitled, Soil and Debris Removal Action, Camp Allen Landfill, Area B, Norfolk Naval Station, located in Norfolk, Virginia. The Delivery Order will be executed per the requirements stated in the Final Statement of Work (SOW) for Service Delivery Order per Contract No. N62470-93-D-3032, Delivery Order 0003, in cooperation with the Navy. This Delivery Order will also be executed in accordance with Naval Facilities Control Plan (NAVFAC) Specification No. 05-93-3124 dated September 27, 1993.

This HASP documents the policies and procedures which protect workers and the public from potential hazards posed by work at this site. OHM considers safety the highest priority during work at a site containing potentially hazardous materials and has established a standard policy of zero exposure which must be upheld on all projects. All project activities will be conducted in a manner that minimizes the probability of injury, accident, or incident occurrence. The Site Safety Plan Acknowledgment (Appendix A) will be signed by all who actively participate at this project.

Although the plan focuses on the specific work activities planned for this site, it must remain flexible because of the nature of this work. Conditions may change and unforeseen situations may arise that require deviations from the original plan. This flexibility allows modification by the OHM supervisors and health and safety officials.

1.1 SITE HISTORY

The Camp Allen Landfill, Area B is located within the Norfolk, Virginia, Naval Station compound. The Landfill was used for multi-purpose disposal of various wastes, rubble, and construction debris. The Landfill debris is buried in trenches and may contain Volatile Organic Compounds (VOCs) that presents a safety and health hazard to workers and an environmental exposure risk to surrounding environments, estuaries, ground water.

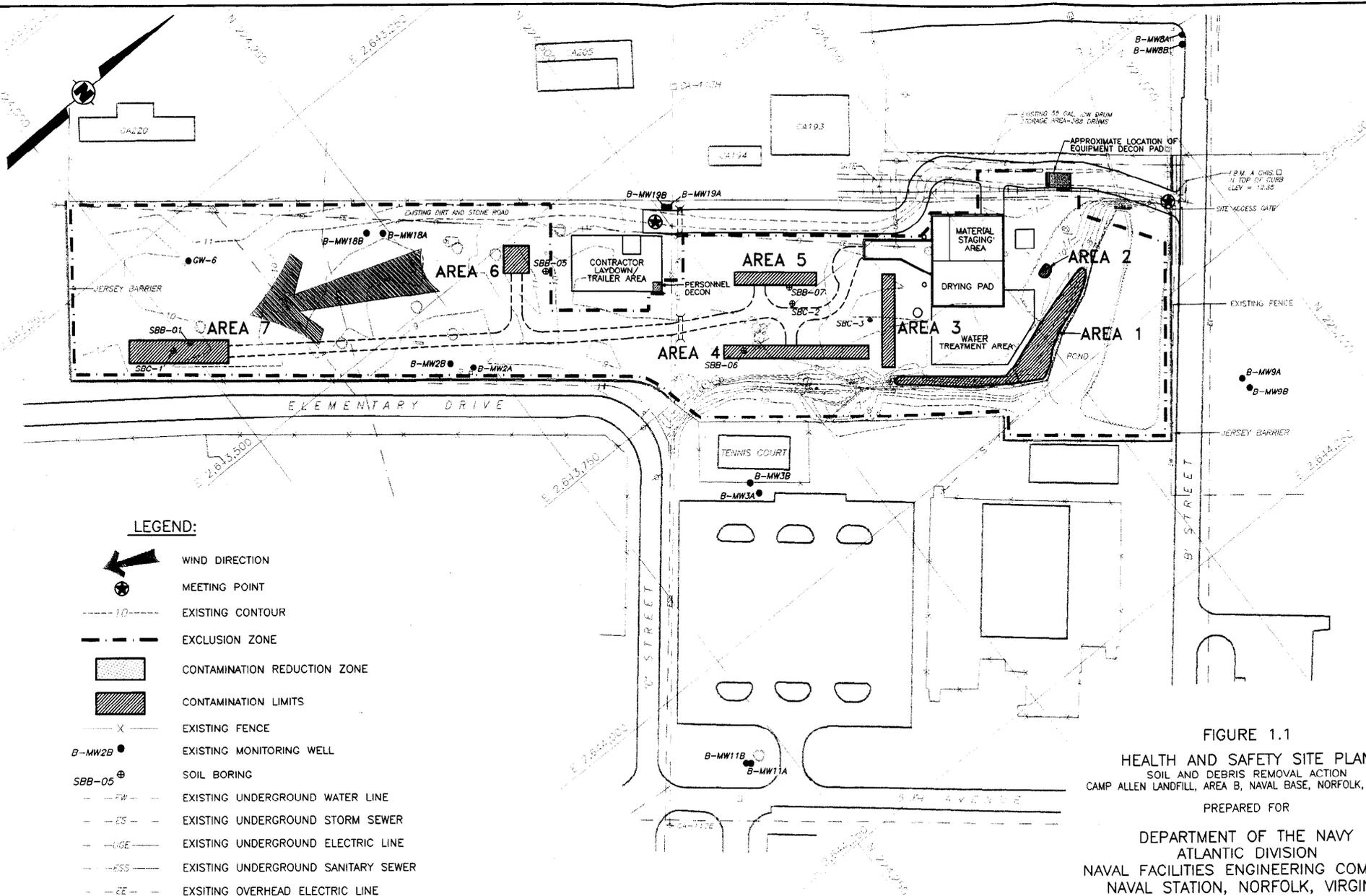
1.2 SCOPE OF WORK

The scope of work includes the following activities:

- Site preparation/access construction
- Pre-removal action sampling
- Surface water management
- Drum handling
- Water treatment system operations
- Excavation of contaminated soil and trench debris
- Excavation trench soil and container sampling

- Monitoring well removal
- Site grading/wetlands restoration
- Transportation of contaminated soil and other waste to off-site disposal facility
- Equipment decontamination

These activities have been analyzed for potential hazards for which hazard control measures are provided in Section 3.4 Task Specific Risk Assessment.



LEGEND:

- WIND DIRECTION
- MEETING POINT
- EXISTING CONTOUR
- EXCLUSION ZONE
- CONTAMINATION REDUCTION ZONE
- CONTAMINATION LIMITS
- EXISTING FENCE
- EXISTING MONITORING WELL
- SOIL BORING
- EXISTING UNDERGROUND WATER LINE
- EXISTING UNDERGROUND STORM SEWER
- EXISTING UNDERGROUND ELECTRIC LINE
- EXISTING UNDERGROUND SANITARY SEWER
- EXISTING OVERHEAD ELECTRIC LINE

FIGURE 1.1
 HEALTH AND SAFETY SITE PLAN
 SOIL AND DEBRIS REMOVAL ACTION
 CAMP ALLEN LANDFILL, AREA B, NAVAL BASE, NORFOLK, VIRGINIA
 PREPARED FOR
 DEPARTMENT OF THE NAVY
 ATLANTIC DIVISION
 NAVAL FACILITIES ENGINEERING COMMAND
 NAVAL STATION, NORFOLK, VIRGINIA



2.0 KEY PERSONNEL AND MANAGEMENT

The Project Manager (PM), Site Supervisor (SS), Certified Industrial Hygienist (CIH) and Site Safety Officer (SSO) are responsible for formulating and enforcing health and safety requirements, and implementing the HASP.

2.1 CERTIFIED INDUSTRIAL HYGIENIST

The CIH should be responsible for the contents of the HASP and should ensure that the HASP complies with all federal, state and local health and safety requirements. If necessary, the CIH can modify specific aspect of the HASP to adjust for on-site changes that affect safety. The CIH will coordinate with the SSO on all modifications to the HASP and will be available for consultation when required. The CIH will not necessarily be on site during OHM activities.

2.2 SITE SAFETY OFFICER

The SSO has responsibility for administering the HASP relative to site activities, and will be in the field full-time while site activities are in progress. The SSO's primary operational responsibilities will be monitoring, including personal and environmental monitoring, personal protective equipment maintenance, and assignment of protection levels. The SSO will be the main contact in any on-site emergency situation. The SSO will direct all field activities involved with safety and be responsible for stopping work when unacceptable health or safety risk exists. The SSO is responsible for assuring that all on-site personnel understand and comply with all safety requirements.

2.3 PROJECT MANAGER

The PM has the overall responsibility for the project and to assure that the goals of the construction remedial action are attained in a manner consistent with the HASP requirements. The PM will coordinate with the SS and the SSO to assure that the remedial action goals are completed in a manner consistent with the HASP.

2.4 SITE SUPERVISOR

The SS is responsible for field implementation of the HASP. The SS will establish and ensure compliance with site control areas and procedures and coordinate these supervisory responsibilities with the site SSO.

2.5 EMPLOYEE SAFETY RESPONSIBILITY

Each employee is responsible for personal safety as well as the safety of others in the area. The employee will use all equipment provided in a safe and responsible manner as directed by the SS. All OHM personnel will follow the policies set forth in OHM's Employee Safety Guide and the OHM Health and Safety Procedures. A copy of these documents will be maintained on site.

2.6 OSHA RECORDS

Required records including the OSHA 200 log are maintained at the OHM Divisional offices.

2.7 KEY SAFETY PERSONNEL

The following individuals share responsibility for health and safety at the site:

- Site Supervisor - (site phone) TBD
- Site Safety Officer - (site phone) TBD
- Project Manager - Joe Colella (office) 412-963-2300
- ER Health and Safety Director - Kevin McMahon, M.S., CIH
(office) 609-588-6375, (pager) 609-421-7523
- Vice President, Health and Safety - Fred Halvorsen, Ph.D., PE, CIH
(office) 800-231-7031.

3.0 JOB HAZARD ANALYSIS

This section outlines the potential chemical and physical hazards which workers may be exposed to during work on this project. Table 3.1 lists significant contaminants identified at the landfill. An MSDS LIST is included with the in Appendix C. Contaminants are identified in the specification as being in subsurface soils. Anticipated VOC levels in air are expected to be below 5 ppm. Sustained levels above 5 ppm require upgrade to Level B protection, unless the substance is positively identified. The most likely source of airborne lead/metals contamination will be soils disturbed by excavation. VOAs and semi-VOAs are most likely present in soils and ground water.

3.1 CHEMICAL HAZARDS

3.1 CHEMICAL HAZARDS			
CHEMICAL	EXPOSURE ROUTES	PEL/ TLV	HEALTH HAZARDS/ PHYSICAL HAZARDS
Arsenic	Skin, eye, inhalation, ingestion	0.2 mg/m ³	A powerful allergen, arsenic will cause burning swelling, and redness in the eyes, nose, throat, and skin A human carcinogen; Long term exposure can cause liver, kidney, and blood damage
			A fire hazard in the form of dust or contact with oxidizers
Barium	Inhalation, ingestion	0.5 mg/m ³	Insoluble salts are skin, eye, and respiratory irritants; a nuisance dust; water soluble compounds are highly toxic by ingestion; abdominal pain, vomiting, diarrhea, convulsions, muscular spasms, internal hemorrhage
			Insoluble compounds are largely non-reactive; thermal decomposition can release toxic gases
Benzene	Skin, eye, inhalation, ingestion	1 ppm	Irritation of eyes, nose, throat, giddiness, headache, nausea, staggered walking; fatigue, lack of appetite, dermatitis, anemia; a carcinogen
			Flammable; reacts with strong oxidizers, acids

3.1 CHEMICAL HAZARDS			
CHEMICAL	EXPOSURE ROUTES	PEL/ TLV	HEALTH HAZARDS/ PHYSICAL HAZARDS
Cadmium	Inhalation, ingestion	0.05 mg/m ³	A probable carcinogen; skin, eye, respiratory irritation; mild flu and fever symptoms (metal fume fever); pneumonitis, pulmonary edema
			Reacts violently with ammonium nitrate; finely divided cadmium metal can become pyrophoric; avoid heat, flame, causes cadmium fume formation
Chlordane (pesticide)	Skin, eye, inhalation, ingestion	0.5 mg/m ³ skin	Tremors, convulsions, excitement, loss of coordination (ataxia), gastritis, respiratory collapse; a suspected carcinogen
			Decomposition of chlordane produces chlorine fumes
Chromium	Inhalation, ingestion	1.0 mg/m ³	Scarring of lung tissue
			Reacts with strong oxidizers, alkalis
1,2 Dichloroethene	Skin, eye, inhalation, ingestion	793 mg/m ³	Irritation from skin contact; headache, nausea, vomiting, dizziness, and central nervous system depression; Long term exposure can effect the kidneys and liver
			Flammable liquid, keep away from sources of ignition. Will liberate toxic phosgene gas and hydrogen chloride when heated; Avoid contact with strong oxidizers and bases, aluminum, ammonia, and nitric acid
Ethyl Benzene	Skin, eye, inhalation, ingestion	100 ppm	Irritation of eyes, nose, throat; headache, dermatitis, dizziness, sleepiness
			Reacts with strong oxidizers, flammable
Lead	Inhalation, ingestion	0.05 mg/m ³	Weakness, insomnia; loss of appetite, loss of weight, abdominal pain; anemia; tremors; weakness of wrists/ ankles; kidney damage; low blood pressure
Petroleum Distillates	Skin, eye, inhalation, ingestion	100 ppm	Mucous membrane irritant; headache, dizziness, euphoria, unconsciousness; a CNS depressant; pulmonary edema from aspiration
			Reacts violently with oxidizers and oxidizing acids; emits toxic smoke and gas during combustion

3.1 CHEMICAL HAZARDS			
CHEMICAL	EXPOSURE ROUTES	PEL/ TLV	HEALTH HAZARDS/ PHYSICAL HAZARDS
Polychlorinated Biphenyls	Skin, eye, inhalation, ingestion	0.5 mg/m ³	Irritation of eyes, skin; acne-form dermatitis; potential carcinogen; liver damage
			Reacts with strong oxidizers
Toluene	Skin, eye, inhalation, ingestion	100 ppm	Fatigue, weakness, confusion, euphoria, dizziness, headache, dilated pupils, insomnia, numbness/tingling in hands, feet, dermatitis
			Reacts with strong oxidizers; flammable
Trichloroethylene	Skin, eye, inhalation, ingestion	269 mg/m ³	A skin and eye irritant; not suspected as a human carcinogen
			A dangerous fire hazard, will emit toxic phosgene gas when heated
Vinyl Chloride	Skin, eye, inhalation, ingestion	1 ppm	A carcinogen; headache, vertigo, narcosis, collapse; affects CNS; skin and eye irritation
			A severe fire and explosion hazard; reacts with copper, aluminum, and hydroquinone; forms toxic decomposition products when involved with fires or heat; HCl, carbon monoxide, and phosgene
Xylene	Skin, eye, inhalation, ingestion	100 ppm	Dizziness, excitement, drowsiness, incoherent, staggering walking; eye, nose, throat irritation; nausea, vomiting, dermatitis
			Flammable; reacts with strong oxidizers
Zinc	Inhalation, ingestion	10.0 mg/m ³	A skin, eye, and respiratory irritant; a nuisance dust; health effects primarily from fume inhalation, metal fume fever; chromates of zinc are human carcinogens
			Zinc salts are incompatible with reactive cyanides and sulfides;

Personnel will be removed from the work site and placed under observation immediately if the following initial symptoms persist:

- Dizziness or stupor
- Nausea, headaches, or cramps
- Irritation of the eyes, nose, or throat
- Euphoria
- Chest pains and coughing
- Rashes or burns

3.2 PHYSICAL HAZARDS

To minimize physical hazards, OHM has developed standard safety protocols which will be followed at all times. Failure to follow safety protocols will result in expulsion of a crew member from the site.

All OHM personnel are familiar with the field activities which will be conducted at the site. They are trained to work safely under various field conditions. The SS and SSO will observe the general work practices of each crew member and equipment operator, and enforce safe procedures to minimize physical hazards. Also, hard hats, safety glasses, and steel-toe safety boots are required in all areas of the site.

3.3 ENVIRONMENTAL HAZARDS

Environmental factors such as weather, wild animals, insects, and irritant plants always pose a hazard when performing outdoor tasks. The SSO and SS will make every effort to alleviate these hazards should they arise.

3.3.1 Heat Stress

The combination of warm ambient temperature and protective clothing increases the potential for heat stress. These include:

- Heat rash
- Heat cramps
- Heat exhaustion
- Heat stroke

Heat stress is covered in detail during our 40-hour OSHA 29 CFR 1910.120 approved pre-employment course. In addition, this information is discussed during safety meetings before each workday. Workers are encouraged to increase consumption of water and electrolyte-containing beverages such as Gatorade.

At a minimum, workers will break every 2 hours for 10- to 15-minute rest periods. In addition, workers are encouraged to take rests whenever they feel any adverse effects that may be heat-related. The frequency of breaks may need to be increased upon worker recommendation to the SSO and SS.

A work/rest schedule can be calculated based on heat stress monitoring results. Monitoring consists of taking the radial pulse of a worker for 30 seconds immediately after exiting the work area. The frequency of monitoring is provided herein.

AMBIENT TEMPERATURE	LEVEL D PPE	LEVEL C PPE/ MODIFIED LEVEL D
90° F or above	After 45 minutes of work	After 15 minutes of work
87.5 F-90 F	After 60 minutes of work	After 30 minutes of work
82.5-87.5 F	After 90 minutes of work	After 60 minutes of work
77.5-82.5 F	After 120 minutes of work	After 90 minutes of work
72.5-77.5 F	After 150 minutes of work	After 120 minutes of work

If the heart rate exceeds 110 beats per minute at the beginning of the rest period, shorten the next work cycle by 1/3 and keep the rest period the same. If the heart rate still exceeds 110 beats per minute at the next rest period, increase the following rest period by 1/3. The initial rest period should be at least 5 minutes.

Monitoring for heat stress will begin when the ambient temperature reaches or exceeds 70 degrees Fahrenheit, when wearing Level C PPE, or 80 degrees Fahrenheit for site activities performed in Level D.

3.3.2 Biological Hazards

- POISON IVY (Rhus Radicans)

Poison Ivy may be found at the site. It is highly recommended that all personnel entering into an area with poison ivy wear a minimum of a paper tyvek, to avoid skin contact.

Contact with poisonous plants:

Characteristic reactions

The majority of skin reactions following contact with offending plants are allergic in nature and characterized by:

- General symptoms of headache and fever
- Itching
- Redness
- A rash

Some of the most common and most severe allergic reactions result from contact with plants of the poison ivy group, including poison oak and poison sumac. Such plants produce severe rash characterized by redness, blisters, swelling, and intense burning and itching. The victim may develop a high fever and feel very ill. Ordinarily, the rash begins within a few hours after exposure, but may be delayed 24 to 48 hours.

Distinguishing Features of Poison Ivy Group Plants

The most distinctive features of poison ivy and poison oak are their leaves, which are composed of three leaflets each. Both plants have greenish-white flowers and berries that grow in clusters.

First Aid

- a. Remove contaminated clothing; wash all exposed areas thoroughly with soap and water, followed by rubbing alcohol.
 - b. Apply calamine or other soothing lotion if rash is mild.
 - c. Seek medical advice if a severe reaction occurs, or if there is a known history of previous sensitivity.
- TICKS

Heavily vegetated areas of a site may have ticks. It is highly recommended that all personnel walking through such areas wear a minimum of a paper tyvek and latex boot covers. The ticks will stand out against the light colors. A tick or insect repellent containing DEET is also suggested.

Ticks can transmit several diseases, including Rocky Mountain spotted fever, a disease that occurs in the eastern portion of the United States as well as the western portion, and Lyme disease. Ticks adhere tenaciously to the skin or scalp. There is some evidence that the longer an infected tick remains attached, the greater is the chance that it will transmit disease.

The SSO and SS will discuss tick activity as a part of daily safety meetings. Topics will include: tick activity, self-inspection, personal protective equipment, insect repellents and what to do if a tick is found. Medical Advise has suggested to OHM that the insect be retained to promote early diagnosis and treatment of Lyme's Disease, if the insect is infected.

First Aid

- a. Cover the tick with heavy oil (mineral, salad, or machine) to close its breathing pores. The tick may disengage at once; if not, allow oil to remain in place for a half hour. Carefully (slowly and gently) remove the tick with tweezers, taking care that all parts are removed.
- b. With soap and water, thoroughly, but gently, scrub the area from which the tick has been removed, because disease germs may be present on the skin; also wipe the bite area with an antiseptic. Although use of tweezers for the removal of the tick and application of heat to the tick's body often have been attempted, these methods may leave tick parts in the wound or may injure the skin.
- c. If you have been bitten, place the tick in a jar labeled with the date, location of the bite, and the location acquired. If any symptom appears, such as an expanding red rash, contact a physician immediately.

• LYME DISEASE

Lyme disease may cause a number of medical conditions, including arthritis, that can be treated if you recognize the symptoms early and see your doctor. Early signs may include a flu-like illness, an expanding skin rash and joint pain. If left untreated, Lyme disease can cause serious nerve and heart problems as well as a disabling type of arthritis.

You are more likely to spot early signs of Lyme disease rather than see the tick or its bite. This is because the tick is so small (about the size of the head of a common pin or a period on this page and a little larger after they fill with blood), you may miss it or signs of a bite. However, it is also easy to miss the early symptoms of Lyme disease.

In its early stage, Lyme disease may be a mild illness with symptoms like the flu. It can include a stiff neck, chills, fever, sore throat, headache, fatigue, and joint pain. But this flu-like illness is usually out of season, commonly happening between May and October when ticks bite.

Most people develop a large, expanding skin rash around the area of the bite. Some people may get more than one rash. The rash may feel hot to the touch and may be painful. Rashes vary in size, shape, and color, but often look like a red ring with a clear center. The outer edges expand in size. Its easy to miss the rash and the connection

between the rash and the tick bite. The rash develops from three days to as long as a month after the tick bite. Almost one third of those with Lyme disease never get the rash.

Joint or muscle pain may be another early sign of Lyme disease. These aches and pains may be easy to confuse with the pain that comes from other types of arthritis. However, unlike many other types of arthritis, this pain seems to move or travel from joint to joint.

In later stages, Lyme disease may be confused with other medical problems. These problems can develop months to years after the first tick bite.

Early treatment of Lyme disease symptoms with antibiotics can prevent the more serious medical problems of later stages. If you suspect that you have symptoms of Lyme disease, contact your doctor.

Lyme disease can cause problems with the nervous system that look like other diseases. These include symptoms of stiff neck, severe headache, and fatigue usually linked to meningitis. They may also include pain and drooping of the muscles on the face, called Bell's Palsy. Lyme disease can also mimic symptoms of multiple sclerosis or other types of paralysis.

Lyme disease can also cause serious but reversible heart problems, such as irregular heart beat. Finally, Lyme disease can result in a disabling, chronic type of arthritis that most often affects the knees. Treatment is more difficult and less successful in later stages. Researchers think these more serious problems may be linked to how the body's defence or immune system responds to the infection.

3.3.3 Noise

Hearing protection is required for workers operating heavy equipment as well as personnel working around heavy equipment. The SSO will determine the need for and appropriate testing procedures, i. e., sound level meter and/or dosimeter for noise measurement.

3.4 TASK-SPECIFIC RISK ASSESSMENT

3.4.1 ACTIVITY HAZARD ANALYSIS FOR SITE PREPARATION/ACCESS CONSTRUCTION		
TASK BREAKDOWN	POTENTIAL HAZARDS	HAZARD CONTROL MEASURES
Road Construction	Slips, Trips & Falls	<ul style="list-style-type: none"> • Clear walkways work areas of equipment, tools, debris, excavated material, vegetation • Mark, identify, or barricade other obstructions
	Struck by, Against Heavy Equipment, Flying Debris, Protruding Objects	<ul style="list-style-type: none"> • Use reflective warning vests when exposed to vehicular traffic • Avoid equipment swing areas • Make eye contact with operators before approaching equipment • Barricade or enclose the work area • Restrict entry to the work area to authorized personnel during construction activities • Wear hard hats, safety glasses with side shields, face shields and goggles and steel-toe safety boots at all times • Understand and review hand signals
	Fire	<ul style="list-style-type: none"> • Eliminate sources of ignition from the work area • Prohibit Smoking • Provide ABC (or equivalent) fire extinguishers for all work, flammable storage areas, fuel powered generators and compressors • Store flammable liquids in well ventilated areas • Post "NO SMOKING" signs • Shut-off vehicles, equipment during refueling • Use grounding and bonding during refueling • Store combustible materials away from flammables • Separate Flammables and Oxidizers by 20 feet
	Sharp Objects	<ul style="list-style-type: none"> • Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects • Maintain all hand and power tools in a safe condition • Keep guards in place during use

3.4.1 ACTIVITY HAZARD ANALYSIS FOR SITE PREPARATION/ACCESS CONSTRUCTION		
TASK BREAKDOWN	POTENTIAL HAZARDS	HAZARD CONTROL MEASURES
Road Construction (Continued)	High Noise Levels	<ul style="list-style-type: none"> • Use hearing protection when exposed to excessive noise levels (greater than 85 dBA over an 8-hour work period)
Asphalt Pad Formation	Slips, Trips & Falls	<ul style="list-style-type: none"> • Clear walkways, work areas of equipment, tools, debris, and excavated material, paving stone • Mark, identify, or barricade other obstructions
	Struck by, Against Heavy Equipment, Flying Debris, Protruding Objects	<ul style="list-style-type: none"> • Use reflective warning vests when exposed to vehicular traffic • Avoid equipment swing areas • Avoid areas under suspended loads • Make eye contact with operators before approaching equipment • Barricade or enclose the work area • Restrict entry to the work area to authorized personnel during concrete pouring activities • Wear hard hats, safety glasses with side shields, and steel-toe safety boots at all times • Understand and review hand signals
	Inhalation and Contact with Dust	<ul style="list-style-type: none"> • Provide workers proper skin, eye and respiratory protection based on the exposure hazards present • Review contaminant MSDSs with workers before operations begin
	High Ambient Temperature	<ul style="list-style-type: none"> • Monitor for Heat stress in accordance with OHM Health and Safety Procedures Manual

3.4.2 ACTIVITY HAZARD ANALYSIS FOR SURFACE WATER MANAGEMENT PROCEDURES		
TASK BREAKDOWN	POTENTIAL HAZARDS	HAZARD CONTROL MEASURES
System Set-up	Handling Heavy Objects	<ul style="list-style-type: none"> • Observe proper lifting techniques • Obey sensible lifting limits • Use mechanical lifting equipment (hand cart, truck) to move large awkward loads
	Sharp Objects	<ul style="list-style-type: none"> • Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects • maintain all hand and power tools in a safe condition • Keep guards in place during use
	High Noise Levels	<ul style="list-style-type: none"> • Use hearing protection when exposed to excessive noise levels (greater than 85 dBA over an 8-hour work period)
	Caught In/ Between Moving Parts	<ul style="list-style-type: none"> • Provide and use proper work gloves when the possibility of crush, pinch, or other injury may be caused by moving/stationary edges or objects • Maintain all equipment in a safe condition • Keep all guards in place during use • De-energize and lock-out machinery before maintenance or service
	Struck By/ Against Vehicles & Equipment	<ul style="list-style-type: none"> • Avoid equipment swing areas • Make eye contact with operators before approaching equipment • Understand and review posted hand signals • Avoid areas under suspended loads
	Slips, Trips, & Falls	<ul style="list-style-type: none"> • Clear walkways of equipment, ground debris, & other materials • Mark, identify, or barricade other obstructions
	High Ambient Temperature	<ul style="list-style-type: none"> • Monitor for heat stress in accordance with OHM Health & Safety Procedures Manual

3.4.2 ACTIVITY HAZARD ANALYSIS FOR SURFACE WATER MANAGEMENT PROCEDURES		
TASK BREAKDOWN	POTENTIAL HAZARDS	HAZARD CONTROL MEASURES
System Operation & Maintenance	Electrical Shock	<ul style="list-style-type: none"> • De-energize or shut off utility lines at their source before work begins • Use double insulated or properly grounded electric power-operated tools • Maintain tools in a safe condition • Provide an equipment-grounding conductor program or employ ground-fault circuit interrupters • Use qualified electricians to hook up electrical circuits • Inspect all extension cords daily for structural integrity, ground continuity, and damaged insulation • Cover or elevate electric wire or flexible cord passing through work areas to protect from damage • Keep all plugs and receptacles out of water • Use approved water-proof, weather-proof type if exposure is likely • Inspect all electrical power circuits prior to commencing work • Follow Lockout-Tagout procedures in accordance with OHM Health and Safety Procedures Manual
	Caught In/ Between Moving Parts	<ul style="list-style-type: none"> • Provide and use proper work gloves when the possibility of crush, pinch, or other injury may be caused by moving/stationary edges or objects • Maintain all equipment in a safe condition • Keep all guards in place during use • De-energize and lock-out machinery before maintenance or service

3.4.2 ACTIVITY HAZARD ANALYSIS FOR SURFACE WATER MANAGEMENT PROCEDURES		
TASK BREAKDOWN	POTENTIAL HAZARDS	HAZARD CONTROL MEASURES
System Operation & Maintenance (Continued)	Fires	<ul style="list-style-type: none"> • Eliminate sources of ignition from the work area • Smoking is prohibited • Provide ABC (or equivalent) fire extinguishers in all work and flammable storage areas • Store flammable liquids in well ventilated areas • Post "NO SMOKING" signs • Store combustible materials away from flammables • Store all compressed gas cylinders upright, caps in place when not in use • Separate Flammables and Oxidizers by 20 feet
	Slips, Trips, & Falls	<ul style="list-style-type: none"> • Clear walkways of equipment, ground debris, & other materials • Mark, identify, or barricade other obstructions
	High Ambient Temperature	<ul style="list-style-type: none"> • Monitor for heat stress in accordance with OHM Health & Safety Procedures Manual
System Breakdown & Decontamination	Handling Heavy Objects	<ul style="list-style-type: none"> • Observe proper lifting techniques • Obey sensible lifting limits • Use mechanical lifting equipment (hand cart, truck) to move large awkward loads
	Sharp Objects	<ul style="list-style-type: none"> • Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects • Maintain all hand and power tools in a safe condition • Keep guards in place during use

3.4.2 ACTIVITY HAZARD ANALYSIS FOR SURFACE WATER MANAGEMENT PROCEDURES		
TASK BREAKDOWN	POTENTIAL HAZARDS	HAZARD CONTROL MEASURES
System Breakdown & Decontamination (Continued)	Caught In/ Between Moving Parts	<ul style="list-style-type: none"> • Provide and use proper work gloves when the possibility of crush, pinch, or other injury may be caused by moving/stationary edges or objects • Maintain all equipment in a safe condition • Keep all guards in place during use • De-energize and lock-out machinery before maintenance or service
	Struck By/ Against Vehicles & Equipment	<ul style="list-style-type: none"> • Avoid equipment swing areas • Make eye contact with operators before approaching equipment • Understand and review posted hand signals • Avoid areas under suspended loads
	High Noise Levels	<ul style="list-style-type: none"> • Use hearing protection when exposed to excessive noise levels (greater than 85 dBA over an 8-hour work period)
	High Ambient Temperature	<ul style="list-style-type: none"> • Monitor for heat stress in accordance with OHM Health & Safety Procedures Manual

3.4.3 ACTIVITY HAZARD ANALYSIS FOR DRUM HANDLING		
TASK BREAKDOWN	POTENTIAL HAZARDS	HAZARD CONTROL MEASURES
Staging/Overpacking Drums	Handling Heavy Objects	<ul style="list-style-type: none"> • Observe proper lifting techniques • Obey sensible lifting limits • Use mechanical lifting equipment (hand carts, trucks) to move large, awkward loads
	Slips, Trips, Falls	<ul style="list-style-type: none"> • Clear walkways, work areas of equipment, vegetation, excavated material, tools, and debris • Mark, identify, or barricade other obstructions
	Fire/ Explosion	<ul style="list-style-type: none"> • Eliminate sources of ignition from the work area • Prohibit smoking in work areas • Provide ABC (or equivalent) fire extinguishers for all work, flammable storage areas; fuel powered generators and compressors • Store flammable liquids in well ventilated areas • Post "NO SMOKING" signs • Shut-off vehicles, equipment before refueling • Use grounding and bonding during refueling • Store combustible materials away from flammables • Store, all compressed gas cylinders upright, caps in place when not in use • Separate Flammables and Oxidizers by 20 feet
	Sharp Objects	<ul style="list-style-type: none"> • Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects • Maintain all hand and power tools in a safe condition • Keep guards in place during use
	Struck by, Against Heavy Equipment, Protruding Objects	<ul style="list-style-type: none"> • Use reflective warning vests worn when exposed to vehicular traffic • Avoid equipment swing areas • Make eye contact with operators before approaching equipment • Understand and review hand signals

3.4.3 ACTIVITY HAZARD ANALYSIS FOR DRUM HANDLING		
TASK BREAKDOWN	POTENTIAL HAZARDS	HAZARD CONTROL MEASURES
Staging/Overpacking Drums (Continued)	Inhalation and Contact with Hazardous Substances	<ul style="list-style-type: none"> • Provide workers proper skin, eye and respiratory protection based on the exposure hazards present (see section 5 for Level [A,B,C,D] protection) • Review contaminant chemical MSDSs with workers before operations begin
	High Ambient Temperature	<ul style="list-style-type: none"> • Monitor for Heat stress in accordance with OHM Health and Safety Procedures Manual

3.4.4 ACTIVITY HAZARD ANALYSIS FOR WATER TREATMENT OPERATIONS		
TASK BREAKDOWN	POTENTIAL HAZARDS	HAZARD CONTROL MEASURES
System Set-up	Handling Heavy Objects	<ul style="list-style-type: none"> • Observe proper lifting techniques • Obey sensible lifting limits • Use mechanical lifting equipment (hand cart, truck) to move large awkward loads
	Sharp Objects	<ul style="list-style-type: none"> • Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects • maintain all hand and power tools in a safe condition • Keep guards in place during use
	High Noise Levels	<ul style="list-style-type: none"> • Use hearing protection when exposed to excessive noise levels (greater than 85 dBA over an 8-hour work period)
	Caught In/ Between Moving Parts	<ul style="list-style-type: none"> • Provide and use proper work gloves when the possibility of crush, pinch, or other injury may be caused by moving/stationary edges or objects • Maintain all equipment in a safe condition • Keep all guards in place during use • De-energize and lock-out machinery before maintenance or service
	Struck By/ Against Vehicles & Equipment	<ul style="list-style-type: none"> • Avoid equipment swing areas • Make eye contact with operators before approaching equipment • Understand and review hand signals • Avoid areas under suspended loads
	Slips, Trips, & Falls	<ul style="list-style-type: none"> • Clear walkways, work areas of equipment, ground debris, tools, and other materials • Mark, identify, or barricade other obstructions
	High Ambient Temperature	<ul style="list-style-type: none"> • Monitor for heat stress in accordance with OHM Health & Safety Procedures Manual

3.4.4 ACTIVITY HAZARD ANALYSIS FOR WATER TREATMENT OPERATIONS		
TASK BREAKDOWN	POTENTIAL HAZARDS	HAZARD CONTROL MEASURES
System Operation & Maintenance	Inhalation & Contact with Hazardous Substances	<ul style="list-style-type: none"> • Provide workers proper skin, eye, respiratory & splash protection based on the exposure hazards present • Review water treatment chemical MSDSs with workers before treatment operations begin
	Electrical Shock	<ul style="list-style-type: none"> • De-energize or shut off utility lines at their source before work begins • Use double insulated or properly grounded electric power-operated tools • Maintain tools in a safe condition • Provide an equipment-grounding conductor program or employ ground-fault circuit interrupters • Use qualified electricians to hook up electrical circuits • Inspect all extension cords daily for structural integrity, ground continuity, and damaged insulation • Cover or elevate electric wire or flexible cord passing through work areas to protect from damage • Keep all plugs and receptacles out of water • Use approved water-proof, weather-proof type if exposure to moisture is likely • Inspect all electrical power circuits prior to commencing work • Follow Lockout-Tagout procedures in accordance with OHM Health and Safety Procedures Manual
	Caught In/ Between Moving Parts	<ul style="list-style-type: none"> • Provide and use proper work gloves when the possibility of crush, pinch, or other injury may be caused by moving/stationary edges or objects • Maintain all equipment in a safe condition • Keep all guards in place during use • De-energize and lock-out machinery before maintenance or service

3.4.4 ACTIVITY HAZARD ANALYSIS FOR WATER TREATMENT OPERATIONS		
TASK BREAKDOWN	POTENTIAL HAZARDS	HAZARD CONTROL MEASURES
System Operation & Maintenance (Continued)	Fires	<ul style="list-style-type: none"> • Eliminate sources of ignition from the work area • Smoking is prohibited • Provide ABC (or equivalent) fire extinguishers for all work and flammable storage areas, fuel powered generators and compressors • Store flammable liquids in well ventilated areas • Post "NO SMOKING" signs • Shut-off vehicles and equipment during refueling • Use grounding and bonding during refueling • Store combustible materials away from flammables • Store all compressed gas cylinders upright, secure, caps in place when not in use • Separate Flammables and Oxidizers by 20 feet
	Oxygen Deficient Flammable, Toxic, Atmospheres	<ul style="list-style-type: none"> • Test vessel atmosphere for oxygen deficiency and flammable/toxic vapors • Review contaminant MSDS before starting work • Wear proper level of PPE for the type of atmospheric contaminants • Use body harness, safety belt with tripod wench for possible rescue • Obtain Confined Space Entry Permit signed by Supervisor/Safety Officer • De-energize, lock-out and tag all energized equipment • Provide safety observer outside vessel • Provide written rescue plan • Review emergency procedures before work commences
	Slips, Trips, & Falls	<ul style="list-style-type: none"> • Clear walkways of equipment, ground debris, tools, and other materials • Mark, identify, or barricade other obstructions
	High Ambient Temperature	<ul style="list-style-type: none"> • Monitor for Heat stress in accordance with OHM Health & Safety Procedures Manual

3.4.4 ACTIVITY HAZARD ANALYSIS FOR WATER TREATMENT OPERATIONS		
TASK BREAKDOWN	POTENTIAL HAZARDS	HAZARD CONTROL MEASURES
Treatment Chemical Handling	Inhalation & Contact with Hazardous Substances	<ul style="list-style-type: none"> • Provide workers proper skin, eye, respiratory & splash protection based on the exposure hazards present • Review water treatment chemical MSDSs with workers before treatment operations begin
	Handling Heavy Objects	<ul style="list-style-type: none"> • Observe proper lifting techniques • Obey sensible lifting limits • Use mechanical lifting equipment (hand cart, truck) to move large awkward loads
	Fires	<ul style="list-style-type: none"> • Eliminate sources of ignition from the work area • Prohibit smoking in work areas • Provide ABC (or equivalent) fire extinguishers in all work and flammable storage areas, fuel powered generators and compressors • Store flammable liquids in well ventilated areas • Post "NO SMOKING" signs • Shut-off vehicles, equipment before refueling • Use grounding and bonding during refueling • Store combustible materials away from flammables • Store all compressed gas cylinders upright, caps in place when not in use • Separate Flammables and Oxidizers by 20 feet
	Caught In/ Between Moving Parts	<ul style="list-style-type: none"> • Provide and use proper work gloves when the possibility of crush, pinch, or other injury may be caused by moving/stationary edges or objects • Maintain all equipment in a safe condition • Keep all guards in place during use • De-energize and lock-out machinery before maintenance or service

3.4.4 ACTIVITY HAZARD ANALYSIS FOR WATER TREATMENT OPERATIONS		
TASK BREAKDOWN	POTENTIAL HAZARDS	HAZARD CONTROL MEASURES
Treatment Chemical Handling (Continued)	Sharp Objects	<ul style="list-style-type: none"> • Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects • Maintain all hand and power tools in a safe condition • Keep guards in place during use
System Breakdown & Decontamination	Handling Heavy Objects	<ul style="list-style-type: none"> • Observe proper lifting techniques • Obey sensible lifting limits • Use mechanical lifting equipment (hand cart, truck) to move large awkward loads
	Sharp Objects	<ul style="list-style-type: none"> • Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects • Maintain all hand and power tools in a safe condition • Keep guards in place during use
	Caught In/ Between Moving Parts	<ul style="list-style-type: none"> • Provide and use proper work gloves when the possibility of crush, pinch, or other injury may be caused by moving/stationary edges or objects • Maintain all equipment in a safe condition • Keep all guards in place during use • De-energize and lock-out machinery before maintenance or service
	Struck By/ Against Vehicles & Equipment	<ul style="list-style-type: none"> • Avoid equipment swing areas • Make eye contact with operators before approaching equipment • Understand and review hand signals • Avoid areas under suspended loads
	Inhalation & Contact with Hazardous Substances	<ul style="list-style-type: none"> • Provide workers proper skin, eye, respiratory & splash protection based on the exposure hazards present • Review contaminant MSDS before starting work

3.4.4 ACTIVITY HAZARD ANALYSIS FOR WATER TREATMENT OPERATIONS		
TASK BREAKDOWN	POTENTIAL HAZARDS	HAZARD CONTROL MEASURES
System Breakdown & Decontamination (Continued)	Oxygen Deficient Flammable, Toxic, Atmospheres	<ul style="list-style-type: none"> • Test vessel atmosphere for oxygen deficiency and flammable/toxic vapors • Review contaminant MSDS before work begins • Wear proper level of PPE for the type of atmospheric contaminants • Use body harness, safety belt with tripod wench for possible rescue • Obtain Confined Space Entry Permit signed by Supervisor/Safety Officer • De-energize, lock-out and tag all energized equipment • Provide safety observer outside vessel • Provide written rescue plan • Review emergency procedures before work commences
	High Noise Levels	<ul style="list-style-type: none"> • Use hearing protection when exposed to excessive noise levels (greater than 85 dBA over an 8-hour work period)
	High Ambient Temperature	<ul style="list-style-type: none"> • Monitor for heat stress in accordance with OHM Health & Safety Procedures Manual

3.4.5 ACTIVITY HAZARD ANALYSIS FOR SOIL, DEBRIS EXCAVATION		
TASK BREAKDOWN	POTENTIAL HAZARDS	HAZARD CONTROL MEASURES
Clearing/Grubbing	Struck By/ Against Heavy Equipment	<ul style="list-style-type: none"> • Use reflective warning vests worn when exposed to vehicular traffic • Avoid equipment swing areas • Make eye contact with operators before approaching equipment • Understand and review hand signals
	Slips, Trips, Falls	<ul style="list-style-type: none"> • Clear, walkways of equipment, vegetation, excavated material, tools and debris • Mark, identify, or barricade other obstructions
	Handling Heavy Objects	<ul style="list-style-type: none"> • Observe proper lifting techniques • Obey sensible lifting limits • Use mechanical lifting equipment (hand carts, trucks) to move large, awkward loads
	Sharp Objects	<ul style="list-style-type: none"> • Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects • Maintain all hand and power tools in a safe condition • Keep guards in place during use
	Contact Dermatitis	<ul style="list-style-type: none"> • Wear PPE to avoid skin contact with contaminated soil, plants, or other skin irritants • Identify and review poisonous plants with workers
	High Noise Levels	<ul style="list-style-type: none"> • Use hearing protection when exposed to excessive noise levels (greater than 85 dBA over an 8-hour work period)
	High Ambient Temperature	<ul style="list-style-type: none"> • Monitor for Heat stress in accordance with OHM Health and Safety Procedures Manual
Excavation of Soil	Underground Utilities	<ul style="list-style-type: none"> • Identify all underground utilities around the excavation site before work commences • Cease work immediately if unknown utility markers are uncovered

3.4.5 ACTIVITY HAZARD ANALYSIS FOR SOIL, DEBRIS EXCAVATION		
TASK BREAKDOWN	POTENTIAL HAZARDS	HAZARD CONTROL MEASURES
Excavation of Soil (Continued)	Struck By/ Against Heavy Equipment	<ul style="list-style-type: none"> • Use reflective warning vests when exposed to vehicular traffic • Avoid equipment swing areas • Make eye contact with operators before approaching equipment • Understand and review hand signals
	Sharp Objects	<ul style="list-style-type: none"> • Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects • Maintain all hand and power tools in a safe condition • Keep guards in place during use
	High Noise Levels	<ul style="list-style-type: none"> • Use hearing protection when exposed to excessive noise levels (greater than 85 dBA over an 8-hour work period)
	Excavation Wall Collapse	<ul style="list-style-type: none"> • Construct diversion ditches or dikes to prevent surface water from entering excavation • Provide good drainage of area adjacent to excavation • Collect ground water/rain water from excavation and dispose of properly • Store excavated material at least 2 feet from the edge of the excavation; prevent excessive loading of the excavation face • Provide sufficient stairs, ladders, or ramps when workers enter excavations over 4 feet in depth • Place ladders no more than 25 feet apart laterally • Treat excavations over 4 feet deep as confined spaces • Complete confined space permit entry procedure (where applicable) • Monitor atmosphere for flammable/toxic vapors, and oxygen deficiency • Slope, bench, shore, or sheet excavations over 5 feet deep if worker entry is required • Assign a competent person to decide soil classification, proper sloping, the correct shoring, or sheeting • Provide at least two means of exit for personnel working in excavations

3.4.5 ACTIVITY HAZARD ANALYSIS FOR SOIL, DEBRIS EXCAVATION		
TASK BREAKDOWN	POTENTIAL HAZARDS	HAZARD CONTROL MEASURES
Excavation of Soil (Continued)	Slips, Trips, Falls	<ul style="list-style-type: none"> • Clear walkways, work areas of equipment, vegetation, excavated material, tools, and debris • Mark, identify, or barricade other obstructions
	Handling Heavy Objects	<ul style="list-style-type: none"> • Observe proper lifting techniques • Obey sensible lifting limits • Use mechanical lifting equipment (hand carts, trucks) to move large, awkward loads
	Inhalation and Contact with Hazardous Substances	<ul style="list-style-type: none"> • Provide workers proper skin, eye and respiratory protection based on the exposure hazards present. • Review contaminant chemical MSDSs with workers before operations begin
	High Ambient Temperature	<ul style="list-style-type: none"> • Monitor for Heat stress in accordance with OHM Health and Safety Procedures Manual
Backfilling	Slips, Trips, Falls	<ul style="list-style-type: none"> • Clear walkways, work areas of equipment, vegetation, excavated material, tools, and debris • Mark, identify, or barricade other obstructions
	Struck By/ Against Heavy Equipment	<ul style="list-style-type: none"> • Use reflective warning vests worn when exposed to vehicular traffic • Avoid equipment swing areas • Make eye contact with operators before approaching equipment • Understand and review hand signals
	Sharp Objects	<ul style="list-style-type: none"> • Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects • Maintain all hand and power tools in a safe condition • Keep guards in place during use

3.4.6 ACTIVITY HAZARD ANALYSIS FOR EXCAVATION TRENCH SOIL AND CONTAINER SAMPLING		
TASK BREAKDOWN	POTENTIAL HAZARDS	HAZARD CONTROL MEASURES
Excavation and Container Sampling	Sharp Objects	<ul style="list-style-type: none"> • Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects • Maintain all hand and power tools in a safe condition • Keep guards in place during use
	Handling Heavy Objects	<ul style="list-style-type: none"> • Observe proper lifting techniques • Obey sensible lifting limits • Use mechanical lifting equipment (hand carts, trucks) to move large, awkward loads
	Slips, Trips, Falls	<ul style="list-style-type: none"> • Clear walkways, work areas of equipment, tools, vegetation, excavated material, and debris • Mark, identify, or barricade other obstructions
	Inhalation and Contact with Hazardous Substances	<ul style="list-style-type: none"> • Provide workers proper skin, eye and respiratory protection based on the exposure hazards present • Review contaminant chemical MSDSs with workers before operations begin
	Oxygen Deficient Flammable, Toxic, Atmospheres	<ul style="list-style-type: none"> • Test excavation atmosphere for oxygen deficiency and flammable/toxic vapors • Review contaminant MSDS before work begins • Wear proper level of PPE for the type of atmospheric contaminants • Obtain Confined Space Entry Permit signed by Supervisor/Safety Officer • Provide safety observer outside excavation • Provide written rescue plan • Review emergency procedures before work commences

3.4.6 ACTIVITY HAZARD ANALYSIS FOR EXCAVATION TRENCH SOIL AND CONTAINER SAMPLING		
TASK BREAKDOWN	POTENTIAL HAZARDS	HAZARD CONTROL MEASURES
Excavation and Container Sampling (Continued)	Excavation Wall Collapse	<ul style="list-style-type: none"> • Construct diversion ditches or dikes to prevent surface water from entering excavation • Provide good drainage of area adjacent to excavation • Collect ground water/rain water from excavation and dispose of properly • Store excavated material at least 2 feet from the edge of the excavation; prevent excessive loading of the excavation face • Assign a competent person to decide soil classification, proper sloping, the correct shoring, or sheeting • Inspect excavation daily; any time soil destabilizing conditions occur • Prohibit entry when dewatering equipment is not operating • Provide sufficient stairs, ladders, or ramps when workers enter excavations over 4 feet in depth • Place ladders no more than 25 feet apart laterally • Treat excavations over 4 feet deep as confined spaces • Complete confined space permit entry procedure (where applicable) • Monitor atmosphere for flammable/toxic vapors, and oxygen deficiency • Slope, bench, shore, or sheet excavations over 5 feet deep if worker entry is required • Provide at least two means of exit for personnel working in excavations
	High Ambient Temperature	<ul style="list-style-type: none"> • Monitor for Heat stress in accordance with OHM Health and Safety Procedures Manual

3.4.7 ACTIVITY HAZARD ANALYSIS FOR MONITORING WELL REMOVAL		
TASK BREAKDOWN	POTENTIAL HAZARDS	HAZARD CONTROL MEASURES
Well removal	Struck by, Against Heavy Equipment, Flying Debris, Protruding Objects	<ul style="list-style-type: none"> • Use reflective warning vests when exposed to vehicular traffic • Avoid equipment swing areas • Make eye contact with operators before approaching equipment • Barricade or enclose the demolition area • Restrict entry to the work area to heavy equipment operator(s) and signaler(s) during demolition • Wear hard hats, safety glasses with side shields, and steel-toe safety boots • Understand and review hand signals • Cease operations for electrical storms, high winds
	Slips, Trips, Falls	<ul style="list-style-type: none"> • Clear, walkways of equipment, vegetation, excavated material, tools and debris • Mark, identify, or barricade other obstructions
	Handling Heavy Objects	<ul style="list-style-type: none"> • Observe proper lifting techniques • Obey sensible lifting limits • Use mechanical lifting equipment (hand carts, trucks) to move large, awkward loads
	Electrical Shock	<ul style="list-style-type: none"> • De-energize or shut off utility lines at their source before work begins • Use double insulated or properly grounded electric power-operated tools • Maintain tools in a safe condition • Provide an equipment-grounding conductor program or employ ground-fault circuit interrupters • Use qualified electricians to hook up electrical circuits

3.4.7 ACTIVITY HAZARD ANALYSIS FOR MONITORING WELL REMOVAL		
TASK BREAKDOWN	POTENTIAL HAZARDS	HAZARD CONTROL MEASURES
Well Removal (Continued)	Electrical Shock (Continued)	<ul style="list-style-type: none"> • Inspect all extension cords daily for structural integrity, ground continuity, and damaged insulation • Cover or elevate electric wire or flexible cord passing through work areas to protect from damage • Keep all plugs and receptacles out of water • Use approved water-proof, weather-proof type if exposure to moisture is likely • Inspect all electrical power circuits prior to commencing work • Follow Lockout-Tagout procedures in accordance with OHM Health and Safety Procedures Manual
	Sharp Objects	<ul style="list-style-type: none"> • Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects • Maintain all hand and power tools in a safe condition • Keep guards in place during use
	High Noise Levels	<ul style="list-style-type: none"> • Use hearing protection when exposed to excessive noise levels (greater than 85 dBA over an 8-hour work period)
	Caught In/ Between Moving Parts	<ul style="list-style-type: none"> • Provide and use proper work gloves when the possibility of crush, pinch, or other injury may be caused by moving/stationary edges or objects • Maintain all equipment in a safe condition • Keep all guards in place during use • De-energize and lock-out machinery before maintenance or service
	Inhalation and Contact with Hazardous Substances	<ul style="list-style-type: none"> • Provide workers proper skin, eye and respiratory protection based on the exposure hazards present • Review contaminant chemical MSDSs with workers before operations begin

3.4.8 ACTIVITY HAZARD ANALYSIS FOR SITE GRADING, WET LANDS RESTORATION		
TASK BREAKDOWN	POTENTIAL HAZARDS	HAZARD CONTROL MEASURES
Site, Wetlands Restoration	Struck by, Against Heavy Equipment, Flying Debris, Protruding Objects	<ul style="list-style-type: none"> • Use reflective warning vests when exposed to vehicular traffic • Avoid equipment swing areas • Make eye contact with operators before approaching equipment • Barricade or enclose the work area • Restrict entry to the work area to authorized personnel during paving activities • Wear hard hats, safety glasses with side shields, or splash/face shields and goggles, and steel-toe safety boots at all times • Understand and review posted hand signals • Halt roof, exterior scaffold work in high winds, severe weather
	Sharp Objects	<ul style="list-style-type: none"> • Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects • Maintain all hand and power tools in a safe condition • Keep guards in place during use
	High Noise Levels	<ul style="list-style-type: none"> • Use hearing protection when exposed to excessive noise levels (greater than 85 dBA over an 8-hour work period)
	Handling Heavy Objects	<ul style="list-style-type: none"> • Observe proper lifting techniques • Obey sensible lifting limits • Use mechanical lifting equipment (hand carts, trucks) to move large, awkward loads
	Contact Dermatitis	<ul style="list-style-type: none"> • Wear PPE to avoid skin contact with contaminated soil, plants, or other skin irritants • Identify and review poisonous plants with workers
	Slips, Trips, Falls	<ul style="list-style-type: none"> • Clear, walkways of equipment, construction debris, & other materials • Mark, identify, or barricade other obstructions

3.4.9 ACTIVITY HAZARD ANALYSIS FOR EQUIPMENT DECONTAMINATION		
TASK BREAKDOWN	POTENTIAL HAZARDS	HAZARD CONTROL MEASURES
Heavy Equipment & Vehicles	Slips, Trips, Falls	<ul style="list-style-type: none"> • Clear, walkways of equipment, vegetation, tools, excavated material, and debris • Mark, identify, or barricade other obstructions
	Struck by, Against Heavy Equipment, Protruding Objects, & Splashes	<ul style="list-style-type: none"> • Use reflective warning vests when exposed to vehicular traffic • Avoid equipment swing areas • Make eye contact with operators before approaching equipment • Wear hard hats, safety glasses with side shields, or goggles with splash shields and steel-toe safety boots • Understand and review hand signals
	Inhalation and Contact with Hazardous Substances	<ul style="list-style-type: none"> • Provide workers proper skin, eye and respiratory protection based on the exposure hazards present • Review contaminant chemical MSDSs with workers before operations begin
	Burns	<ul style="list-style-type: none"> • Use proper gloves, face shield/safety goggles, shin and toe guards, and splash suits to protect workers from skin burns and injury when operating laser (high pressure washers)
	Handling Heavy Objects	<ul style="list-style-type: none"> • Observe proper lifting techniques • Obey sensible lifting limits • Use mechanical lifting equipment (hand carts, trucks) to move large, awkward loads
	Sharp Objects	<ul style="list-style-type: none"> • Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects • Maintain all hand and power tools in a safe condition • Keep guards in place during use
	High Noise Levels	<ul style="list-style-type: none"> • Use hearing protection when exposed to excessive noise levels (greater than 85 dBA over an 8-hour work period)

3.4.9 ACTIVITY HAZARD ANALYSIS FOR EQUIPMENT DECONTAMINATION		
TASK BREAKDOWN	POTENTIAL HAZARDS	HAZARD CONTROL MEASURES
Heavy Equipment & Vehicles (Continued)	High/Low Ambient Temperature	<ul style="list-style-type: none"> • Monitor for Heat/Cold stress in accordance with OHM Health and Safety Procedures Manual
Roll-offs & Containers	Slips, Trips, Falls	<ul style="list-style-type: none"> • Clear, walkways of equipment, vegetation, tools, excavated material, and debris • Mark, identify, or barricade other obstructions
	Struck by, Against Heavy Equipment, Protruding Objects, & Splashes	<ul style="list-style-type: none"> • Use reflective warning vests when exposed to vehicular traffic • Avoid equipment swing areas • Make eye contact with operators before approaching equipment • Wear hard hats, safety glasses with side shields, or goggles with splash shields and steel-toe safety boots • Understand and review hand signals
	Flammable, Toxic, Oxygen deficient Atmospheres	<ul style="list-style-type: none"> • Test vessel atmosphere for flammable/toxic vapors, and oxygen deficiency • Review contaminant MSDS with workers and observer before starting work • Wear proper level of PPE for the type of atmospheric contaminants • Use body harness, safety belt with tripod wench for possible rescue • Obtain Confined Space Entry Permit signed by Supervisor/Safety Officer
	Inhalation and Contact with Hazardous Substances	<ul style="list-style-type: none"> • Provide workers proper skin, eye and respiratory protection based on the exposure hazards present • Review MSDS information before starting work
	Burns	<ul style="list-style-type: none"> • Use proper gloves, face shield/safety goggles, shin and toe guards, and splash suits to protect workers from skin burns and injury when operating laser (high pressure washers)

3.4.9 ACTIVITY HAZARD ANALYSIS FOR EQUIPMENT DECONTAMINATION		
TASK BREAKDOWN	POTENTIAL HAZARDS	HAZARD CONTROL MEASURES
Roll-offs & Containers (Continued)	Handling Heavy Objects	<ul style="list-style-type: none"> • Observe proper lifting techniques • Obey sensible lifting limits • Use mechanical lifting equipment (hand carts, trucks) to move large, awkward loads
	Sharp Objects	<ul style="list-style-type: none"> • Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects • Maintain all hand and power tools in a safe condition • Keep guards in place during use
	High Noise Levels	<ul style="list-style-type: none"> • Use hearing protection when exposed to excessive noise levels (greater than 85 dBA over an 8-hour work period)
	High/Low Ambient Temperature	<ul style="list-style-type: none"> • Monitor for Heat/Cold stress in accordance with OHM Health and Safety Procedures Manual

4.0 WORK AND SUPPORT AREAS

To prevent migration of contamination caused through tracking by personnel or equipment, work areas and personal protective equipment will be clearly specified prior to beginning operations. OHM has designated work areas or zones as suggested by the NIOSH/OSHA/USCG/EPA'S document titled, "Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities." Each work area will be divided into three zones as follows:

- An Exclusion or "hot" Zone (EZ)
- A Contamination-Reduction Zone (CRZ)
- A Support Zone (SZ)

4.1 EXCLUSION ZONE

The EZ is the area suspected of contamination and presents the greatest potential for worker exposure. Personnel entering the area must wear the mandated level of protection for that area. In certain instances, different levels of protection will be required depending on the tasks and monitoring performed within that zone. The EZ for this project will include all excavated areas and accessways into excavated areas, the stockpile/drying pad area, drum staging area, and other areas where contaminated materials may be exposed.

4.2 CONTAMINATION-REDUCTION ZONE

The CRZ or transition zone will be established between the EZ and SZ. In this area, personnel will begin the sequential decontamination process required to exit the EZ. To prevent off-site migration of contamination and for personnel accountability, all personnel will enter and exit the EZ through the CRZ. The CRZ for this project will include designated decontamination pad locations and specific personnel entrance/exits to the EZ.

4.3 SUPPORT ZONE

The SZ serves as a clean, control area. Operational support facilities are located within the SZ. Normal work clothing and support equipment are appropriate in this zone. Contaminated equipment, or clothing will not be allowed in the SZ. The support facilities should be located upwind of site activities. There will be a clearly marked controlled access point from the SZ into the CRZ and EZ that is monitored closely by the SSO and the SS to ensure proper safety protocols are followed. The SZ will be the crew, office/administrative trailers and site access roads beyond the decontamination stations.

4.4 GENERAL

The following items are requirements to protect the health and safety of workers and will be discussed in the safety briefing prior to initiating work on the site.

- Eating, drinking, chewing gum or tobacco, smoking, or any practice that increases the probability of hand to mouth transfer and ingestion of contamination is prohibited in the EZ and CRZs.
- Hands and face must be washed upon leaving the EZ and before eating, drinking, chewing gum or tobacco and smoking or other activities which may result in ingestion of contamination.
- A buddy system will be used. Hand signals will be established to maintain communication.
- During site operations, each worker will consider himself as a safety backup to his partner. Off-site personnel provide emergency assistance. All personnel will be aware of dangerous situations that may develop.
- Visual contact will be maintained between buddies on site when performing hazardous duties.
- No personnel will be admitted to the site without the proper safety equipment, training, and medical surveillance certification.
- All personnel must comply with established safety procedures. Any staff member who does not comply with safety policy, as established by the SSO or the SS, will be immediately dismissed from the site.
- Proper decontamination procedures must be followed before leaving the site.
- All employees and visitors must sign in and out of the site.

5.0 PROTECTIVE EQUIPMENT

This section addresses the various levels of personal protective equipment (PPE) which are or may be required at this job site. OHM personnel are trained in the use of all PPE utilized.

5.1 ANTICIPATED PROTECTION LEVELS

<i>TASK</i>	<i>PROTECTION LEVEL</i>	<i>COMMENTS/MODIFICATIONS</i>
Site Prep Construction	Level D	Coveralls, work boots, gloves, hard hat, and safety eyewear, hearing protection
Drum Handling	Level B	Surans, nitrile gloves, neoprene boots
Test Pit Excavation	Level C/B	Upgrade to Level B if air monitoring "action levels" in Section 7 are exceeded; Suran suit, tyvek, neoprene boots and gloves, hearing protection
Soil Excavation	Level C	Tyveks, work boots, nitrile gloves, hearing protection
Water Treatment	Level D/C	Upgrade to Level C if air monitoring "action levels" in Section 7 are exceeded; Splash suit, tyvek, work boots and gloves
Well Removal	Level D/C	Upgrade to Level C if air monitoring "action levels" in Section 7 are exceeded; Splash suit, tyvek, work boots and gloves, hearing protection
Site Restoration	Level D/C	Upgrade to Level C if air monitoring "action levels" in Section 7 are exceeded; Splash suit, tyvek, work boots and gloves, hearing protection
CRZ Workers	Level D/C	Upgrade to level C protection for assisting in Level B decontamination
SZ Workers	Level D	

5.2 PROTECTION LEVEL DESCRIPTIONS

This sections lists the minimum requirements for each protection level. Modification to these requirements will be noted above.

5.2.1 Level D

Level D consists of the following:

- Safety glasses with side shields
- Hard hat
- Steel-toed work boots
- Work clothing as prescribed by weather

5.2.2 Modified Level D

Modified Level D consists of the following:

- Safety glasses with side shields
- Hard hat
- Steel-toed work boots
- Nitrile, neoprene, or PVC overboots or vinyl booties
- Outer nitrile, neoprene, or PVC gloves over latex sample gloves
- Face shield (when projectiles or splashes pose a hazard)
- Tyvek coverall [Saranex Tyveks (Sarans) and PVC acid gear will be required when workers have a potential to be exposed to contaminated liquids or sludges.]

5.2.3 Level C

Level C consists of the following:

- Full-face, air-purifying respirator with GMC-H cartridges
- Hooded Tyvek coveralls and Saranex Tyveks (Sarans) (PVC acid gear will be required when workers have a potential to be exposed to contaminated liquids or sludges.)
- Hard hat
- Steel-toed work boots
- Nitrile, neoprene, or PVC overboots

- Nitrile, neoprene, or PVC gloves over latex sample gloves
- Face shield (when projectiles or splashes pose a hazard)

5.2.4 Level B

Level B protection consists of the items required for Level C protection with the exception that an air-supplied respirator is used in place of the air-purifying respirator.

5.2.5 Level A

Level A protection consists of the items required for Level B protection with the addition of a fully-encapsulating, vapor-proof suit capable of maintaining positive pressure.

5.3 SUPPLIED-AIR RESPIRATORS

If air monitoring shows that Level B protection is needed, OHM personnel will wear Survivair 9881-02 Hippack Airline respirators with 5-minute egress bottles. Personnel requiring Level "B" protection and high mobility will wear Survivair Mark 2 SCBA units.

5.4 BREATHING-AIR QUALITY

Code of Federal Regulations 29 CFR 1910.134 states breathing air will meet the requirement of the specification for Grade D breathing air as described in the ANSI/CGA Specification G-7.1-1989. OHM requires a certificate of analysis from vendors of breathing air in order to show that the air meets this standard. Breathing air will be obtained in cylinders exclusively and will be stationed in the exclusion zone (EZ).

5.5 AIR-PURIFYING RESPIRATORS

OHM's air-purifying respirators are the MSA "Ultra-Twin" full-face respirators.

5.6 RESPIRATOR CARTRIDGES

The crew members working in Level C will wear respirators equipped with MSA GMC-H air-purifying cartridges, unless otherwise noted. The GMC-H cartridge holds approval for:

- Organic vapors <1,000 ppm
- Chlorine gas <10 ppm
- Hydrogen chloride <50 ppm
- Sulfur dioxide <50 ppm
- Dusts, fumes and mists with a TWA <0.05 mg/m³
- Asbestos-containing dusts and mists
- Radon daughters
- Radionuclides
- Pesticides

5.7 CARTRIDGE CHANGES

All cartridges will be changed a minimum of once daily. However, water saturation of the HEPA filter or dusty conditions may necessitate more frequent changes. Changes will occur when personnel begin to experience increased inhalation resistance or breakthrough of a chemical warning property.

5.8 INSPECTION AND CLEANING

Respirators are checked periodically by a qualified individual and inspected before each use by the wearer. All respirators and associated equipment will be decontaminated and hygienically cleaned after use.

5.9 FIT TESTING

Annual respirator fit tests are required of all personnel wearing negative-pressure respirators. The test will use isoamyl acetate or irritant smoke. The fit test must be for the style and size of the respirator to be used.

5.10 FACIAL HAIR

No personnel who have facial hair which interferes with the respirator's sealing surface will be permitted to wear a respirator and will not be permitted to work in areas requiring respirator use.

5.11 CORRECTIVE LENSES

Normal eyeglasses cannot be worn under full-face respirators because the temple bars interfere with the respirator's sealing surfaces. For workers requiring corrective lenses, special spectacles designed for use with respirators will be provided.

5.12 CONTACT LENSES

Contact lenses will not be worn with any type of respirator.

5.13 MEDICAL CERTIFICATION

Only workers who have been certified by a physician as being physically capable of respirator usage will be issued a respirator. Personnel unable to pass a respiratory fit test or without medical clearance for respirator use will not be permitted to enter or work in areas on site that require respiratory protection. Employees receive a written physicians opinion that they are fit for general hazardous waste operations as per 29 CFR 1910.120(f)(7).

5.14 SITE-SPECIFIC RESPIRATORY PROTECTION PROGRAM

The OHM Respiratory Protection Program complies with 29 CFR 1910.134. The primary objective of respiratory protection is to protect workers from exposure to airborne contaminants when engineering controls and work practices will not protect the worker without exceeding the exposure limits.

The criteria for determining respirator need are contained in Section 7.0 of this HASP. The GMC-H cartridges will protect employees from the hazardous substances specific to this site. All respirator users are OSHA trained in proper respirator use and maintenance. The SS and SSO will observe workers during respirator use for signs of stress and will monitor air levels of contaminants to ensure that respiratory protection is sufficient. The SS, CIH, and SSO will also evaluate this HASP weekly to determine its continued effectiveness.

All respirators and cartridges used will provide adequate protection against the hazards for which they were designed in accordance with applicable standards. All persons assigned to use respirators will have medical clearance to do so.

6.0 DECONTAMINATION PROCEDURES

This section describes the procedures necessary to ensure that both personnel and equipment are free from contamination when they leave the work site.

6.1 PERSONNEL DECONTAMINATION

Decontamination procedures will ensure that material which workers may have contacted in the EZ does not result in personal exposure and is not spread to clean areas of the site. This sequence describes the anticipated Level C decontamination procedure. The specific stages will vary depending on the site, the task, the protection level, etc.

1. Go to end of EZ
2. Wash outer boots and gloves in detergent solution
3. Rinse outer boots and gloves in water
4. Remove outer boots and let dry
5. Remove/discard outer gloves
6. Cross into CRZ
7. Remove sample gloves and discard
8. Remove and wash respirator
9. Rinse respirator and hang to dry
10. Remove Tyvek and discard
11. Remove booties and discard
12. Remove sample gloves and discard

6.1.1 Suspected Contamination

Any employee suspected of sustaining skin contact with chemical materials will first use the emergency shower. Following a thorough drenching, the worker will proceed to the decontamination facility. Here the worker will remove clothing, shower, don clean clothing, and immediately be taken to the first-aid station.

6.1.2 Personal Hygiene

Before any eating, smoking, or drinking, personnel will wash hands, arms, neck and face.

6.2 EQUIPMENT DECONTAMINATION

All contaminated equipment will be decontaminated before leaving the site. Decontamination procedures will vary depending upon the contaminant involved, but may include sweeping, wiping, scraping, hosing, or steaming the exterior of the equipment. Personnel performing this task will wear the proper PPE as prescribed by the SSO.

6.3 DISPOSAL

All liquids and disposable clothing will be treated as contaminated waste and disposed of properly.

7.0 AIR MONITORING

Air monitoring will be conducted in order to determine airborne contamination levels. This ensures that respiratory protection is adequate to protect personnel against the chemicals that are encountered. The following air monitoring efforts will be used at this site. Additional air monitoring may be conducted at the discretion of the SSO.

The following chart describes the air monitoring required and appropriate action levels.

<i>Monitoring Device</i>	<i>Action Level</i>	<i>Action</i>
LEL/O ₂	>10% LEL <20.8% O ₂	Evacuate area, ventilate, upgrade to Level B if necessary, continue to monitor
PID	(above background) 1-5 ppm unknowns	Level C
	5-500 ppm unknowns	Level B
	>500 ppm unknowns	Level A
Mini-Ram	1.0 mg/m ³	Level C

7.1 LOWER EXPLOSIVE LIMIT/OXYGEN (LEL/O₂) METER

Prior to entering a confined-space area or hot work involving welding, cutting, or other high heat-producing operations where flammable or combustible vapors may be present, LEL/O₂ measurements will be taken.

7.2 PHOTOIONIZATION DETECTOR (PID)

A PID will be used to monitor total ionizable organic content of the ambient air. A PID will prove useful as a direct reading instrument to aid in determining if respiratory protection needs to be upgraded and to define the EZ. The PID uses a 10.2 ev probe.

For known contaminants only, to determine a protection level from PID data, the SSO will multiply the TLV of the known compound by 25. This is the limit for Level C protection for that compound. If PID readings exceed 25 times the TLV, Level B protection will be required. Also, regardless of the TLV, a PID reading of 1,000 ppm or more will indicate that the GMC-H cartridges may become overloaded and will necessitate Level B protection. (Note: PID readings do not always indicate the actual air concentration of a compound. Consult the manual, HNU, or the CIH for clarification.)

The SSO will take measurements before operations begin in an area to determine the amount of organic compounds naturally occurring in the air. This is referred to as a background level.

Levels of volatile organic compounds will be measured in the air at active work sites once every hour and at the support zone once every hour when levels are detected above background in the exclusion zone. If levels exceed background at any time in the support zone, work in the exclusion zone will cease and corrective actions will be taken, e.g., cover soil with polyethylene sheeting, applying vapor-suppressing foam to soil. Work will not resume until levels are below background in the support zone.

7.3 PORTABLE TOTAL DUST MONITOR

A mini-ram will be used to monitor the general respirable dust levels on this site. The air sampling will be performed at designated locations at the site perimeter, upwind and downwind of the active work areas in the (EZ). Site conditions will determine the frequency and duration of dust monitoring. Mini-ram readings will trigger dust abatement actions and PPE upgrades.

7.3.1 Type and Operational Aspects

- Real-Time Aerosol Monitor (Mini Ram Model PDM-3)
 - Principle of Operation
 - Detection of light in the near infrared region back-scattered to a sensor (photovoltaic detector) by airborne particulate in a sensing volume
 - The higher the dust concentration the more back-scattering of light to the sensor, resulting in increased readings
 - Device calibrated at the factory against an air sampling filter/gravimetric analysis reference method

7.3.2 Calibration Methods/Frequencies

There is no calibration method or procedure for calibrating the mini-ram monitor. The mini-ram monitor will be re-zeroed each day. During a zero check, the sampled air passes through the purge air filter and dryer to effect a self-cleaning of the optical chamber.

7.3.3 Preventative Maintenance

Maintenance of the mini-ram consists of replacement of filters and desiccant; battery replacement; and cleaning of the optical detection assembly.

7.4 INTEGRATED AIR MONITORING PROGRAM

Air samples will be collected in the exclusion zone during soil excavation activities to determine if the level of protection is adequate to protect employees and to document that off-site migration of contaminants will not occur. The concentration will be evaluated based on OSHA permissible exposure limits or ACGIH threshold limit values.

TWA sampling will be performed at each active work location. At least one (1) TWA sample will be taken at each location. One (1) sample will be obtained from a personal sampling pump carried by the most "at-risk" individual.

7.4.1 Type and Operational Aspects

- Alpha-1 Constant Flow Air Sampler (or equivalent)
 - Principle of Operation
 - Air sampling pump is calibrated to draw a specified air flow rate (liters per minute) for a designated period of time (usually 8 hours).
 - Volume of air sampled is then calculated as follows:
$$\text{Flow rate (liter/min.)} \times \text{sample time (min.)} = \text{sample volume (liters)}$$
 - Use a bubble meter to calibrate air sampling pump; pump equipped with a rotameter that shows the flow rate during the sampling period.
 - Equipped with a rechargeable battery for 8-hour sampling times; must be recharged for at least 16 hours.
 - Collection Media
 - Filters--particulate
 - Connect collection media/holder to air sampling pump using Tygon tubing; comprises the sampling train that must be assembled to calibrate the pump.

7.4.2 Calibration Methods/Frequencies

Flow rate calibration can be accomplished by using primary standard soap and the Mini-Buck calibrator, Model 5 (or equivalent). The mini-buck calibrator allows rapid flow rate determination with direct read-out on the built-in display.

Simply connect the sampler to the calibrator, press the ON push button, and then push the plunger to start a bubble up the flow cell. The flow rate is automatically calculated and shown on the display. Subsequent readings are averaged with the previous readings. It is recommended that calibration of the sampler be checked prior to the start of and after each sampling period.

7.4.3 Preventative Maintenance

The Alpha-1 constant flow air sampler was designed for both mechanical and electronic reliability. The sampling pump should not require special maintenance or adjustments under normal conditions. However, as with all instruments, the sampling pump does require some basic care. Basic maintenance of the Alpha-1 consists of filter replacement, installing and removing battery packs, storage conditions, and electronic control assembly.

7.5 CALIBRATION REQUIREMENTS

The PID, LEL/O₂ meter and sampling pumps required with fixed-media air sampling will be calibrated daily prior to use. A separate log will be kept detailing date, time, span gas, or other standard, and name of person performing the calibration.

7.6 AIR MONITORING RESULTS

Air monitoring results will be posted for personnel inspection, and will be discussed during morning safety meetings.

8.0 EMERGENCY RESPONSE

8.1 PRE-EMERGENCY PLANNING

Prior to engaging in construction/remediation activities at the site, OHM will plan for possible emergency situations and have available adequate supplies and manpower to respond. In addition site personnel will receive training during the site orientation concerning proper emergency response procedures.

The following situations would warrant implementation of the ERCP:

Fire/Explosion	<ul style="list-style-type: none"> • The potential for human injury exists. • Toxic fumes or vapors are released. • The fire could spread on site or off site and possibly ignite other flammable materials or cause heat-induced explosions. • The use of water and/or chemical fire suppressants could result in contaminated run-off. • An imminent danger of explosion exists.
Spill or Release of Hazardous Materials	<ul style="list-style-type: none"> • The spill could result in the release of flammable liquids or vapors, thus causing a fire or gas explosion hazard. • The spill could cause the release of toxic liquids or fumes in sufficient quantities or in a manner that is hazardous to or could endanger human health.
Spill or Release of High Temperature Liquid or Vapor	<ul style="list-style-type: none"> • The spill can be contained on site, but the potential exists for ground-water contamination. • The spill cannot be contained on site, resulting in off-site soil contamination and/or ground-water or surface water pollution. • The spill quantity is greater than the reportable quantity limit for the material.
Natural Disaster	<ul style="list-style-type: none"> • A rain storm exceeds the flash flood level. • The facility is in a projected tornado path or a tornado has damaged facility property. • Severe wind gusts are forecasted or have occurred and have caused damage to the facility.

Medical Emergency	<ul style="list-style-type: none"> • Overexposure to hazardous materials. • Trauma injuries (broken bones, severe lacerations/bleeding, burns). • Eye/skin contact with hazardous materials. • Loss of consciousness. • Heat stress (Heat stroke). • Cold stress (Hypothermia). • Heart attack. • Respiratory failure. • Allergic reaction.
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The following measures will be taken to assure the availability of adequate equipment and manpower resources:

- Sufficient equipment and materials will be kept on site and dedicated for emergencies only. The inventory will be replenished after each use.
- On-site emergency responders will be current in regards to training and medical surveillance programs. Copies of all applicable certificates will be kept on file for on-site personnel required to respond.
- It will be the responsibility of the emergency coordinator to brief the on-site response team on anticipated hazards at the site. The emergency coordinator shall also be responsible for anticipating and requesting equipment that will be needed for response activities.
- Emergency response activities will be coordinated with the Local Emergency Planning Committee (LEPC) in compliance with SARA Title III requirements.

Communications will be established prior to commencement of any activities at the remediation site. Communication will be established so that all responders on site have availability to all pertinent information to allow them to conduct their activities in a safe and healthful manner. The primary communication device will be two-way radios. Air horns may be used to alert personnel of emergency conditions. A telephone will be located at the command post to summon assistance in an emergency.

Primary communication with local responders in the event of an emergency will be accomplished using commercial telephone lines.

8.2 EMERGENCY RECOGNITION AND PREVENTION

Because unrecognized hazards may result in emergency incidents, it will be the responsibility of the Site Supervisor and Site Safety Officer (SSO), through daily site inspections

and employee feedback (Safety Observation Program, daily safety meetings, and activity hazard analyses) to recognize and identify all hazards that are found at the site. These may include:

Chemical Hazards	<ul style="list-style-type: none"> • Materials at the site • Materials brought to the site
Physical Hazards	<ul style="list-style-type: none"> • Fire/explosion • Slip/trip/fall • Electrocution • Confined space • IDLH atmospheres • Excessive noise
Mechanical Hazards	<ul style="list-style-type: none"> • Heavy equipment • Stored energy system • Pinch points • Electrical equipment • Vehicle traffic
Environmental Hazards	<ul style="list-style-type: none"> • Electrical Storms • High winds • Heavy Rain/Snow • Temperature Extremes (Heat/Cold Stress) • Poisonous Plants/Animals

Once a hazard has been recognized, the Site Supervisor and/or the SSO will take immediate action to prevent the hazard from becoming an emergency. This may be accomplished by the following:

- Daily safety meeting
- Task-specific training prior to commencement of activity
- Lock-out/tag-out
- Personal Protective Equipment (PPE) selection/use
- Written and approved permits for hot work, confined space
- Trenching/shoring procedure
- Air monitoring
- Following all OHM standard operating procedures
- Practice drills for fire, medical emergency, and hazardous substances spills

TABLE 8.1	
EMERGENCY TELEPHONE NUMBERS	
<u>Local Agencies</u> All services	804-444-3333
Fire Department	
Police	
DePaul Medical Center	804-889-5000
Directions: From Gate 2; left onto Taussig Blvd, road becomes Rt 564; take Gramby St Exit; right onto Gramby St; Hospital on Gramby St Rt side	
Regional Poison Control Center	800-552-6337
<u>State Agencies</u>	
Virginia Pollution Response	804-367-0080
<u>Federal Agencies</u>	
EPA Region Branch Response Center	
ATSDR	404/639-6360
NOSCDR/NOSC - Skip Gibson, Code N3A	804/444-1818
U.S. Coast Guard	804-484-8192
National Response Center	800-424-8802
Project Manager	
Director, Health and Safety	
Kevin McMahan	609-588-6375
OHM Corporation (24 hour)	800-537-9540
Additional Phone #'s in Section 2 this HASP	

8.3 PERSONNEL ROLES, LINES OF AUTHORITY, AND COMMUNICATIONS

This section of the ERCP describes the various roles, responsibilities, and communication procedures that will be followed by personnel involved in emergency responses.

The primary emergency coordinator for this site is the Site Supervisor. In the event an emergency occurs and the emergency coordinator is not on site, the Site Safety Officer or the highest ranking employee on site will serve as the emergency coordinator until he arrives. The emergency coordinator will determine the nature of the emergency and take appropriate action as defined by this ERCP.

The emergency coordinator will implement the ERCP immediately as required. The decision to implement the plan will depend upon whether the actual incident threatens human health or the environment. Immediately after being notified of an emergency incident, the emergency coordinator or his designee will evaluate the situation to determine the appropriate action.

8.3.1 Responsibilities and Duties

This section describes the responsibilities and duties assigned to the emergency coordinator.

It is recognized that the structure of the "Incident Command System" will change as additional response organizations are added. OHM will follow procedures as directed by the fire department, LEPC, State and Federal Agencies as required. OHM will defer to the local Fire Department chief to assume the role of Incident Commander upon arriving on site. Additional on-site personnel may be added to the Site Emergency Response Team as required to respond effectively.

8.3.2 On-site Emergency Coordinator Duties

The on-site emergency coordinator is responsible for implementing and directing the emergency procedures. All emergency personnel and their communications will be coordinated through the emergency coordinator. Specific duties are as follows:

- Identify the source and character of the incident, type and quantity of any release. Assess possible hazards to human health or the environment that may result directly from the problem or its control.
- Discontinue operations in the vicinity of the incident if necessary to ensure that fires, explosions, or spills do not recur or spread to other parts of the site. While operations are dormant, monitor for leaks, pressure build-up, gas generation, or ruptures in valves, pipes, or other equipment, where appropriate.
- Notify local Emergency Response Teams if their help is necessary to control the incident. Table 8.1 provides telephone numbers for emergency assistance.
- Direct on-site personnel to control the incident until, if necessary, outside help arrives. Specifically:
 - Ensure that the building or area where the incident occurred and the surrounding area are evacuated and shut off possible ignition sources, if appropriate. The Emergency Response Team is responsible for directing site personnel such that they avoid the area of the incident and leave emergency control procedures unobstructed.
- If fire or explosion is involved, notify local Fire Department.
- Have protected personnel, in appropriate PPE, on standby for rescue.

If the incident may threaten human health or the environment outside of the site, the emergency coordinator should immediately determine whether evacuation of area outside of the site may be necessary and, if so, notify the Police Department and the Office of Emergency Management.

When required, notify the National Response Center. The following information should be provided to the National Response Center:

- Name and telephone number
- Name and address of facility
- Time and type of incident
- Name and quantity of materials involved, if known
- Extent of injuries
- Possible hazards to human health or the environment outside of the facility.

The emergency telephone number for the National Response Center is 800-424-8802.

If hazardous waste has been released or produced through control of the incident, ensure that:

- Waste is collected and contained.
- Containers of waste are removed or isolated from the immediate site of the emergency.
- Treatment or storage of the recovered waste, contaminated soil or surface water, or any other material that results from the incident or its control is provided.
- Ensure that no waste that is incompatible with released material is treated or stored in the facility until cleanup procedures are completed.
- Ensure that all emergency equipment used is decontaminated, recharged, and fit for its intended use before operations are resumed.
- Notify the USEPA Regional Administrator that cleanup procedures have been completed and that all emergency equipment is fit for its intended use before resuming operations in the affected area of the facility. The USEPA Regional Administrator's telephone number is included in the Emergency Contacts.
- Record time, date, and details of the incident, and submit a written report to the USEPA Regional Administrator. Report is due to USEPA within 15 days of the incident.

8.4 SAFE DISTANCES AND PLACES OF REFUGE

The emergency coordinator for all activities will be the Response Manager. No single recommendation can be made for evacuation or safe distances because of the wide variety of emergencies which could occur. Safe distances can only be determined at the time of an emergency based on a combination of site and incident-specific criteria. However, the following measures are established to serve as general guidelines.

In the event of minor hazardous materials releases (small spills of low toxicity), workers in the affected area will report initially to the contamination reduction zone. Small spills or leaks (generally less than 55 gallons) will require initial evacuation of at least 50 feet in all directions to allow for cleanup and to prevent exposure. After initial assessment of the extent of the release

and potential hazards, the emergency coordinator or his designee will determine the specific boundaries for evacuation. Appropriate steps such as caution tape, rope, traffic cones, barricades, or personal monitors will be used to secure the boundaries.

In the event of a major hazardous material release (large spills of high toxicity/greater than 55 gallons), workers will be evacuated from the building/site. Workers will assemble at the entrance to the site for a head count by their foremen and to await further instruction.

If an incident may threaten the health or safety of the surrounding community, the public will be informed and, if necessary, evacuated from the area. The emergency coordinator, or his designee will inform the proper agencies in the event that this is necessary. Telephone numbers are listed in Table 8.1.

Places of refuge will be established prior to the commencement of activities. These areas must be identified for the following incidents:

- Chemical release
- Fire/explosion
- Power loss
- Medical emergency
- Hazardous weather

In general, evacuation will be made to the crew trailers, unless the emergency coordinator determines otherwise. It is the responsibility of the emergency coordinator to determine when it is necessary to evacuate personnel to off-site locations.

In the event of an emergency evacuation, all the employees will gather at the entrance to the site until a head count establishes that all are present and accounted for. No one is to leave the site without notifying the emergency coordinator.

8.5 EVACUATION ROUTES AND PROCEDURES

All emergencies require prompt and deliberate action. In the event of an emergency, it will be necessary to follow an established set of procedures. Such established procedures will be followed as closely as possible. However, in specific emergency situations, the emergency coordinator may deviate from the procedures to provide a more effective plan for bringing the situation under control. The emergency coordinator is responsible for determining which situations require site evacuation.

8.5.1 Evacuation Signals and Routes

Two-way radio communication and an air horn will be used to notify employees of the necessity to evacuate an area or building involved in a release/spill of a hazardous material. Each crew supervisor will have a two way radio. A base station will be installed in the OHM office trailer to monitor for emergencies. Total site evacuation will be initiated only by the emergency coordinator, however, in his absence, decision to preserve the health and safety of employees will take precedence. Evacuation routes will be posted in each outside work area.

Signs inside buildings will be posted on walls or other structural element of a building. Periodic drills will be conducted to familiarize each employee with the proper routes and procedures.

8.5.2 Evacuation Procedures

In the event evacuation is necessary, the following actions will be taken:

- The emergency signal will be activated.
- No further entry of visitors, contractors, or trucks will be permitted. Vehicle traffic within the site will cease in order to allow safe exit of personnel and movement of emergency equipment.
- Shut off all machinery if safe to do so.
- ALL on-site personnel, visitors, and contractors in the support zone will assemble at the entrance to the site for a head count and await further instruction from the emergency coordinator.
- ALL persons in the exclusion zone and contamination reduction zone will be accounted for by their immediate crew leaders (e.g., foreman). Leaders will determine the safest exits for employees and will also choose an alternate exit if the first choice is inaccessible.
- During exit, the crew leader should try to keep the group together. Immediately upon exit, the crew leader will account for all employees in his crew.
- Upon completion of the head count, the crew leader will provide the information to the emergency coordinator.
- Contract personnel and visitors will also be accounted for.
- The names of emergency response team members involved will be reported to the emergency spill control coordinator.
- A final tally of persons will be made by the emergency coordinator or designee. No attempt to find persons not accounted for will involve endangering lives of OHM or other employees by re-entry into emergency areas.
- In all questions of accountability, immediate crew leaders will be held responsible for those persons reporting to them. Visitors will be the responsibility of those employees they are seeing. Contractors and truck drivers are the responsibility of the Site Supervisor. The security guard will aid in accounting for visitors, contractors, and truckers by reference to sign-in sheets available from the guard shack.
- Personnel will be assigned by the emergency coordinator to be available at the main gate to direct and brief emergency responders.

- Re-entry into the site will be made only after clearance is given by the emergency coordinator. At his direction, a signal or other notification will be given for re-entry into the facility.
- Drills will be held periodically to practice all of these procedures and will be treated with the same seriousness as an actual emergency.

8.6 EMERGENCY SPILL RESPONSE PROCEDURES AND EQUIPMENT

In the event of an emergency involving a hazardous material spill or release, the following general procedures will be used for rapid and safe response and control of the situation. Emergency contacts found in Table 8.1 provide a quick reference guide to follow in the event of a major spill.

8.6.1 Notification Procedures

If an employee discovers a chemical spill or process upset resulting in a vapor or material release, he or she will immediately notify the on-site emergency coordinator.

On-site Emergency Coordinator will obtain information pertaining to the following:

- The material spilled or released.
- Location of the release or spillage of hazardous material.
- An estimate of quantity released and the rate at which it is being released.
- The direction in which the spill, vapor or smoke release is heading.
- Any injuries involved.
- Fire and/or explosion or possibility of these events.
- The area and materials involved and the intensity of the fire or explosion.

This information will help the on-site emergency coordinator to assess the magnitude and potential seriousness of the spill or release.

8.6.2 Procedure for Containing/Collecting Spills

The initial response to any spill or discharge will be to protect human health and safety, and then the environment. Identification, containment, treatment, and disposal assessment will be the secondary response.

If for some reason a chemical spill is not contained within a dike or sump area, an area of isolation will be established around the spill. The size of the area will generally depend on the size of the spill and the materials involved. If the spill is large (greater than 55 gallons) and involves a tank or a pipeline rupture, an initial isolation of at least 100 ft. in all directions will be used. Small spills (less than or equal to 55 gallons) or leaks from a tank or pipe will require evacuation of at least 50 ft. in all directions to allow cleanup and repair and to prevent exposure. When any spill occurs, only those persons involved in overseeing or performing emergency operations will be allowed within the designated hazard area. If possible the area will be roped or otherwise blocked off.

If the spill results in the formation of a toxic vapor cloud (by reaction with surrounding materials or by outbreak of fire) and its release (due to high vapor pressures under ambient conditions), further evacuation will be enforced. In general an area at least 500 feet wide and 1,000 feet long will be evacuated downwind if volatile materials are spilled. (Consult the DOT Emergency Response Guide for isolation distances for listed hazardous materials.)

If an incident may threaten the health or safety of the surrounding community, the public will be informed and possibly evacuated from the area. The on-site emergency coordinator will inform the proper agencies in the event this is necessary. (Refer to Table 8.1)

As called for in regulations developed under the Comprehensive Environmental Response Compensation Liability Act of 1980 (Superfund), OHM's practice is to report a spill of a pound or more of any hazardous material for which a reportable quantity has not been established and which is listed under the Solid Waste Disposal Act, Clean Air Act, Clean Water Act, or TSCA. OHM also follows the same practice for any substances not listed in the Acts noted above but which can be classified as a hazardous waste under RCRA.

Clean up personnel will take the following measures:

- Make sure all unnecessary persons are removed from the hazard area.
- Put on protective clothing and equipment.
- If a flammable material is involved, remove all ignition sources, and use spark and explosion proof equipment for recovery of material.
- Remove all surrounding materials that could be especially reactive with materials in the waste. Determine the major components in the waste at the time of the spill.
- If wastes reach a storm sewer, try to dam the outfall by using sand, earth, sandbags, etc. If this is done, pump this material out into a temporary holding tank or drums as soon as possible.
- Place all small quantities of recovered liquid wastes (55 gallons or less) and contaminated soil into drums for incineration or removal to an approved disposal site.
- Spray the spill area with foam, if available, if volatile emissions may occur.
- Apply appropriate spill control media (e.g. clay, sand, lime, etc.) to absorb discharged liquids.
- For large spills, establish diking around leading edge of spill using booms, sand, clay or other appropriate material. If possible, use diaphragm pump to transfer discharged liquid to drums or holding tank.

8.6.3 Emergency Response Equipment

The following equipment will be staged in the support zone and throughout the site, as needed, to provide for safety and first aid during emergency responses.

- ABC-type fire extinguisher
- First-aid kit, industrial size
- Eyewash/safety shower
- Emergency oxygen unit
- Emergency signal horn
- Self contained breathing apparatus (two)
- Stretcher/backboard

In addition to the equipment listed above, OHM maintains direct reading instrumentation that may be used in emergency situations to assess the degree of environmental hazard. This equipment will only be used by the Site Safety Officer or other specially trained personnel. This equipment will be stored, charged and ready for immediate use in evaluating hazardous chemical concentrations. The equipment will be located at the OHM office trailer.

<i>EQUIPMENT NAME</i>	<i>APPLICATION</i>
Portable H-NU Photoionization Meter	Measures selected inorganic and organic chemical concentrations
MSA Oxygen and Combustible Gas Meter	Measures oxygen and combustible gas levels
Draeger Detector Tubes	Assorted detector tubes to measure specific chemical concentrations

8.6.4 Personal Protective Equipment

A supply of two (minimum) SCBAs will be located in the support zone for use in emergency response to hazardous materials releases. They will be inspected at least monthly, according to OSHA requirements. In addition, all emergency response personnel will have respirators available for use with cartridge selection determined by the Site Safety Officer based on the results of direct reading instruments. Emergency response personnel will also be provided with protective clothing as warranted by the nature of the hazardous material and as directed by the Site Safety Officer.

8.6.5 Emergency Spill Response Cleanup Materials and Equipment

A sufficient supply of appropriate emergency response clean-up and personal protective equipment will be inventoried and inspected, visually, on a weekly basis.

The materials listed below will be kept on site for spill control, depending on the types of hazardous materials present on site. The majority of this material will be located in the support

zone, in a supply trailer or storage area. Small amounts will be placed on pallets and located in the active work areas.

- Sand or clay to solidify/absorb liquid spills.
- Lime (calcium oxide), soda ash (sodium carbonate), or baking soda (sodium bicarbonate) for neutralizing acid (pH <7) spills.
- Activated charcoal (carbon) to adsorb organic solvents (hydrocarbons) and to reduce flammable vapors.
- Citric acid for neutralizing caustic (pH >7) spills.
- Vapor-suppressing foam, if required by the Client, for controlling the release of volatile organic compounds.
- Appropriate solvents e.g. CITRIKLEEN, for decontamination of structures or equipment.

The following equipment will be kept on site and dedicated for spill cleanup:

- Plastic shovels for recovering corrosive and flammable materials.
- Sausage-shaped absorbent booms for diking liquid spills, drains, or sewers.
- Sorbent sheets (diapers) for absorbing liquid spills.
- Overpack drums for containerizing leaking drums.
- 55-gallon open-top drums for containerization of waste materials.

*NOTE: All contaminated soils, absorbent materials, solvents and other materials resulting from the clean-up of spilled or discharged substances shall be properly stored, labelled, and disposed of off-site.

8.7 EMERGENCY CONTINGENCY PLAN

This section of the ERCP details the contingency measures OHM will take to prepare for and respond to fires, explosions, spills and releases of hazardous materials, hazardous weather, and medical emergencies.

8.8 MEDICAL EMERGENCY CONTINGENCY MEASURES

The procedures listed below will be used to respond to medical emergencies. The SSO will contact the local hospital and inform them of the site hazards and potential emergency situations.

- Life-Threatening Incident--If an apparent life-threatening condition exists, the crew supervisor will inform the emergency coordinator by radio, and the local Emergency Response Services (EMS) will be immediately called. An on-site person will be appointed who will meet the EMS and have him/her quickly

taken to the victim. Any injury within the EZ will be evacuated by OHM personnel to a clean area for treatment by (EMS) personnel. No one will be able to enter the EZ without showing proof of training, medical surveillance and site orientation.

8.8.1 Response

The nearest workers will immediately assist a person who shows signs of medical distress or who is involved in an accident. The work crew supervisor will be summoned.

The work crew supervisor will immediately make radio contact with the on-site emergency coordinator to alert him of a medical emergency situation. The supervisor will advise the following information:

- Location of the victim at the work site
- Nature of the emergency
- Whether the victim is conscious
- Specific conditions contributing to the emergency, if known

The Emergency Coordinator will notify the Site Safety Officer. The following actions will then be taken depending on the severity of the incident:

- Life-Threatening Incident--If an apparent life-threatening condition exists, the crew supervisor will inform the emergency coordinator by radio, and the local Emergency Response Services (EMS) will be immediately called. An on-site person will be appointed who will meet the EMS and have him/her quickly taken to the victim.
- Non Life-Threatening Incident--If it is determined that no threat to life is present, the Site Safety Officer will direct the injured person through decontamination procedures (see below) appropriate to the nature of the illness or accident. Appropriate first aid or medical attention will then be administered.

*NOTE: The area surrounding an accident site must not be disturbed until the scene has been cleared by the Site Safety Officer.

Any personnel requiring emergency medical attention will be evacuated from exclusion and contamination reduction zones if doing so would not endanger the life of the injured person or otherwise aggravate the injury. Personnel will not enter the area to attempt a rescue if their own lives would be threatened. The decision whether or not to decontaminate a victim prior to evacuation is based on the type and severity of the illness or injury and the nature of the contaminant. For some emergency victims, immediate decontamination may be an essential part of life-saving first aid. For others, decontamination may aggravate the injury or delay life-saving first aid. Decontamination will be performed if it does not interfere with essential treatment.

If decontamination can be performed, observe the following procedures:

- Wash external clothing and cut it away.

If decontamination cannot be performed, observe the following procedures:

- Wrap the victim in blankets or plastic to reduce contamination of other personnel.
- Alert emergency and off-site medical personnel to potential contamination, instruct them about specific decontamination procedures.
- Send site personnel familiar with the incident and chemical safety information, e.g. MSDS, with the affected person.

All injuries, no matter how small, will be reported to the SSO or the Site Supervisor. An accident/injury/illness report will be completely and properly filled out and submitted to the Regional Health and Safety Director/Project CIH, in accordance with OHM's reporting procedures.

A list of emergency telephone numbers is given in Table 8.1.

8.8.2 Notification

The following personnel/agencies will be notified in the event of a medical emergency:

- Local Fire Department or EMS
- On-site Emergency Coordinator
- Workers in the affected areas
- Client Representative

8.8.3 Directions To Hospital

The DePaul Medical Center is the designated emergency facility and is located at:

150 Kingsley Avenue
Norfolk, VA 23503
Telephone (804) 889-5000

Written directions to the hospital and a map to the hospital will be posted in all trailers in the staging area. The map is depicted on Figure 8.1. Directions to the hospital are as follows:

Directions: From Gate 2; right onto Taussig Boulevard, road becomes Route 564; take Gramby Street Exit; right onto Gramby Street; Hospital on Gramby Street, right side.

8.9 FIRE CONTINGENCY MEASURES

Because flammable/combustible materials are present at this site, fire is an ever-present hazard. OHM personnel and subcontractors are not trained professional firefighters. Therefore, if there is any doubt that a fire can be quickly contained and extinguished, personnel will notify the emergency coordinator by radio and vacate the structure or area. The emergency coordinator will immediately notify the local Fire Department.

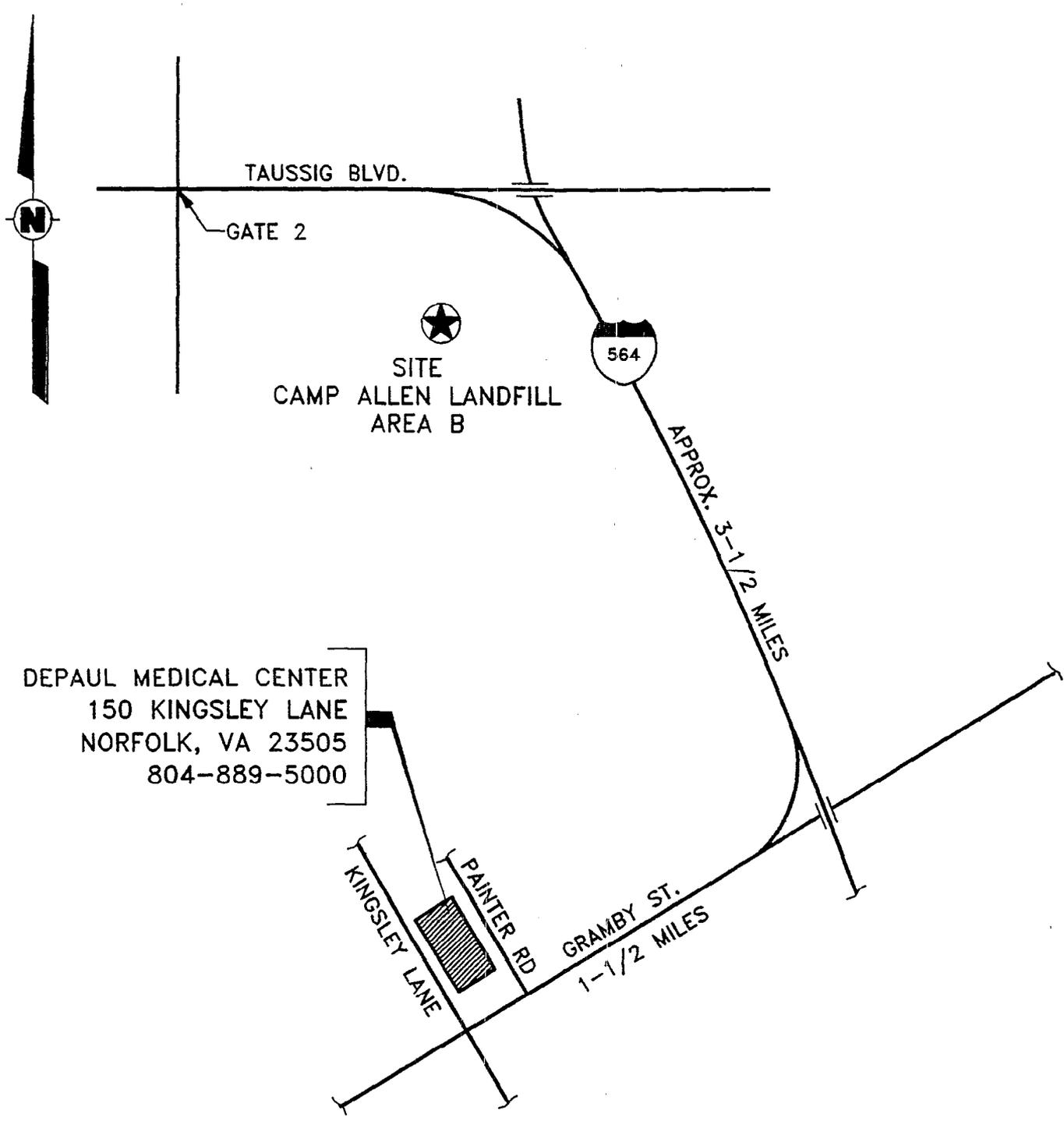
DRAWING NUMBER 15444-A7

APPROVED BY JWC 3-1-94

CHECKED BY JLG 3-11-94

DRAWN BY A. Smith 3-9-94

OHM CORPORATION PITTSBURGH, PA



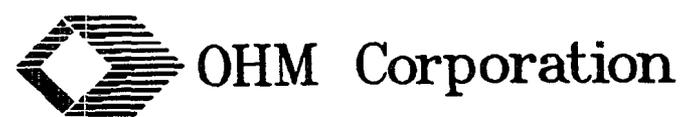
DIRECTIONS:

- FROM GATE NO.2 TURN RIGHT ONTO TAUSSIG BLVD.
- ROAD BECOMES ROUTE 564, TRAVEL EAST ON 564 FOR APPROXIMATELY 3-1/2 MILES.
- TAKE THE GRAMBY STREET EXIT TURN RIGHT ONTO GRAMBY ST.
- TURN RIGHT ONTO PAINTER RD. AND EMERGENCY ROOM IS ON THE LEFT.

FIGURE 8.1

HOSPITAL ROUTE
 SOIL AND DEBRIS REMOVAL ACTION
 CAMP ALLEN LANDFILL, AREA B, NAVAL BASE, NORFOLK, VIRGINIA
 PREPARED FOR

DEPARTMENT OF THE NAVY
 ATLANTIC DIVISION
 NAVAL FACILITIES ENGINEERING COMMAND
 NAVAL STATION, NORFOLK, VIRGINIA



LOT SCALE: 1" = 1"

"THIS DRAWING NOT TO SCALE"

The following procedures will be used to prevent the possibility of fires and resulting injuries:

- Sources of ignition will be kept away from where flammable materials are handled or stored.
- The air will be monitored for explosivity before and during hot work and periodically where flammable materials are present. Hot work permits will be required for all such work.
- “No smoking” signs will be conspicuously posted in areas where flammable materials are present.
- Fire extinguishers will be placed in all areas where a fire hazard may exist.
- Before workers begin operations in an area the foreman will give instruction on egress procedures and assembly points. Egress routes will be posted in work areas and exit points clearly marked.

8.9.1 Response

The following procedures will be used in the event of a fire:

- Anyone who sees a fire will notify their supervisor who will then contact the Emergency Coordinator by radio. The emergency coordinator will activate the emergency air horns and contact the local Fire Department.
- When the emergency siren sounds, workers will disconnect electrical equipment in use (if possible) and proceed to the nearest fire exit.
- Work crews will be comprised of pairs of workers (buddy system) who join each other immediately after hearing the fire alarm and remain together throughout the emergency. Workers will assemble at a predetermined rally point for a head count.
- When a small fire has been extinguished by a worker, the emergency coordinator will be notified.

8.10 HAZARDOUS WEATHER CONTINGENCY MEASURES

Operations will not be started or continued when the following hazardous weather conditions are present:

- Lightning
- Heavy Rains/Snow
- High Winds

8.10.1 Response

- Excavation/soil stock piles will be covered with plastic liner.
- All equipment will be shut down and secured to prevent damage.
- Personnel will be moved to safe refuge, initially crew trailers. The emergency coordinator will determine when it is necessary to evacuate personnel to off-site locations and will coordinate efforts with fire, police and other agencies.

8.10.2 Notification

The emergency coordinator will be responsible for assessing hazardous weather conditions and notifying personnel of specific contingency measures. Notifications will include:

- OHM employees and subcontractors
- Client Representative
- Local Civil Defense Organization

8.11 SPILL/RELEASE CONTINGENCY MEASURES

In the event of release or spill of a hazardous material the following measures will be taken:

8.11.1 Response

Any person observing a spill or release will act to remove and/or protect injured/contaminated persons from any life-threatening situation. First aid and/or decontamination procedures will be implemented as appropriate. First aid will be administered to injured/contaminated personnel. Unsuspecting persons/vehicles will be warned of the hazard. All personnel will act to prevent any unsuspecting persons from coming in contact with spilled materials by alerting other nearby persons. Attempt to stop the spill at the source, if possible. Without taking unnecessary risks, personnel will attempt to stop the spill at the source. This may involve activities such as uprighting a drum, closing a valve or temporarily sealing a hole with a plug.

Utilizing radio communications, the emergency coordinator will be notified of the spill/release, including information on material spilled, quantity, personnel injuries and immediate life threatening hazards. Air monitoring will be implemented by the emergency coordinator and SSO to determine the potential impact on the surrounding community. Notification procedures will be followed to inform on-site personnel and off-site agencies. The emergency coordinator will make a rapid assessment of the spill/release and direct confinement, containment and control measures. Depending upon the nature of the spill, measures may include:

- Construction of a temporary containment berm utilizing on-site clay absorbent earth
- Digging a sump, installing a polyethylene liner

- Diverting the spill material into the sump placing drums under the leak to collect the spilling material before it flows over the ground
- Transferring the material from its original container to another container

The emergency coordinator will notify the Client Representative of the spill and steps taken to institute clean-up. Emergency response personnel will clean-up all spills following the spill clean-up plan developed by the emergency coordinator. Supplies necessary to clean up a spill will be immediately available on-site. Such items may include, but are not limited to:

- Shovel, rake
- Clay absorbent
- Polyethylene liner
- Personal safety equipment
- Steel drums
- Pumps and miscellaneous hand tools

The major supply of material and equipment will be located in the Support Zone. Smaller supplies will kept at active work locations. The emergency coordinator will inspect the spill site to determine that the spill has been cleaned up to the satisfaction of the Client. If necessary, soil, water or air samples may be taken and analyzed to demonstrate the effectiveness of the spill clean-up effort. The emergency coordinator will determine the cause of the spill and determine remedial steps to ensure that recurrence is prevented. The emergency coordinator will review the cause with the Client Representative and obtain his concurrence with the remedial action plan.

9.0 TRAINING REQUIREMENTS

As a prerequisite to employment at OHM, all field employees are required to take a 40-hour training class and pass a written examination. This training covers all forms of personal protective equipment, toxicological effects of various chemicals, handling of unknown tanks and drums confined-space entry procedures, and electrical safety. This course is in full compliance with OSHA requirements in 29 CFR 1910.120. In addition, all employees receive annual 8-hour refresher training and three day on-site training under a trained experienced supervisor. Supervisory personnel receive an additional 8-hour training in handling hazardous waste operations.

All personnel entering the exclusion zone will be trained in the provisions of this site safety plan and be required to sign the Site Safety Plan Acknowledgment in Appendix A.

Site-specific training for the Camp Allen Landfill, Area B which will include potential site contaminants, site physical and environmental hazards, emergency response and evacuation procedures, and emergency telephone numbers will be held at the CAL Area B location by the SS and SSO before any site work activities begin.

10.0 MEDICAL SURVEILLANCE PROGRAM

All OHM personnel participate in a medical and health monitoring program. This program is initiated when the employee starts work with a complete physical and medical history and is continued on a regular basis. A listing of OHM's worker medical profile is shown below. This program was developed in conjunction with a consultant toxicologist and OHM's occupational health physician. Other medical consultants are retained when additional expertise is required.

The medical surveillance program meets the requirements of the OSHA Standard 29 CFR 1910.120 (f).

<i>TABLE 10.1</i>		
<i>WORKER MEDICAL PROFILE</i>		
<i>Item</i>	<i>Initial</i>	<i>Annual</i>
Medical History	X	X
Work History	X	X
Visual Acuity and Tonometry	X	X
Pulmonary Function Tests	X	X
Physical Examination	X	X
Audiometry Tests	X	X
Chest X-Ray	X	X
Complete Blood Counts	X	X
Blood Chem. (SSAC-23 or equivalent)	X	X
Urinalysis	X	X
Dermatology Examination	X	X
Electrocardiogram/Stress Test	X	X (based on age)

Specific Tests (as required):

(PCB blood or fat, urine mercury, urine arsenic, urine phenol, urine halomethanes, blood cyanide, cholinesterase-pseudo-cholinesterase, nerve conduction velocity tests, blood lead, urine lead.)

10.1 EXAMINATION SCHEDULE

Employees are examined initially upon start of employment, annually thereafter, and may be examined upon termination of employment. Unscheduled medical examinations are conducted:

- At employee request after known or suspected exposure to toxic or hazardous materials
- At the discretion of the client, the CIH, SSO, or board-certified occupational physician after known or suspected exposure to toxic or hazardous materials
- At the discretion of the board-certified occupational physician

All nonscheduled medical examinations will include, as a minimum, all items specified above for periodic surveillance examination, with the exception of the chest X-ray, which will be conducted at the discretion of the occupational physician performing the examination.

**APPENDIX
A**

APPENDIX A

HEALTH AND SAFETY PLAN CERTIFICATION

**APPENDIX
B**

APPENDIX B

OHM HAZARD COMMUNICATION PROGRAM

APPENDIX B OHM HAZARD COMMUNICATION PROGRAM

1.0 GENERAL

The following written hazard communication program has been established for OHM Corporation. The purpose of this program is to transmit information about the various Chemical hazards in the work place to the workers using various media. The transmittal of information will be accomplished by means of a comprehensive hazard communication program, which will include container labeling and other forms of warning, material safety data sheets, and employee training in accordance with 29 CFR 1910.1200 and 29 CFR 1926.59.

The program will be available in corporate and regional Health and Safety Departments for reviews by all employees. It will also be available in the corporate library and clearly marked "Employee Right-to-Know" stations located within each individual shop and on each job site. OHM Corporation will accomplish the hazard communication requirements through formal safety training, departmental safety meetings, and job site safety meetings.

2.0 RESPONSIBILITIES

Purpose: Overall responsibility rests with all corporate officers of OHM Corporation. A brief outline of responsibilities for those persons directly involved with the program will follow. These responsibilities are not all inclusive, but are designed to give guidance in initial and long-term program development since each area is different. These responsibilities may vary.

Scope: This program is intended to cover those employees who are directly involved with the handling of hazardous materials or supervision of those activities.

2.1 Health and Safety Department Responsibilities

1. Review operations with supervisors to determine what tasks require hazard communication training.
2. Advise supervisory people as to which materials may need to be considered hazardous initially and eventually to ensure that hazard task determination is being done according to the written policy.
3. Follow up through safety meetings and safety audits to ensure that supervisors are carrying out prescribed company policy.
4. Notify supervisors of any operating changes affecting the hazardous materials being used.

5. Periodically audit the Hazard Communication Program's progress. Initially, this should be done biweekly, but later the audit may be done on a monthly or quarterly basis.

2.2 Training Department Responsibilities

1. Ensure that up-to-date records are maintained on training of all employees required to handle hazardous materials. The supervisor should keep copies of these records and should also send copies of the initial training to the corporate training secretary for the training file.
2. Educate personnel upon initial training to the requirements of the Hazard Communication Standard.

2.3 Supervisor Responsibilities

1. Identify jobs requiring the use of hazardous chemicals and provide lists of those jobs and chemicals to the Health and Safety Department.
2. Provide the training required by the Hazard Communication Standard and document training of employees in the safe handling of hazardous materials.
3. Inspect engineering controls and personal protective equipment before each use. Health and Safety can help determine a suitable inspection plan for each application as needed.
4. Make daily surveys of the work area to ensure that safe practices are being followed. Advise employees of unsafe work practices on the first occasion and consider further violations as disciplinary violations.
5. Ensure required labeling practices are being followed. Labeling should be affixed to the container when it arrives. If the contents are transferred to another container, then all label information (manufacturer, product name, and product number) must also be affixed to the new container, so that all containers of the material, regardless of size, are labeled.
6. Enforce all applicable safety and health standards through periodic audits.
7. Before ordering a material, determine if a Material Safety Data Sheet exist on file. Request an MSDS for any material without one.
8. Send all new MSDSs to the Health and Safety Department after making a copy for the Employee Right-to-Know file.

2.4 Employee Responsibilities

1. Obey established safety rules and regulations
2. Use all safety procedures and personnel protective equipment as required by company procedures
3. Notify supervisor of the following:
 - a. Any symptoms or unusual effects that may be related to the use of hazardous chemicals.
 - b. Any missing or unreadable labels on containers.
 - c. Missing, damaged, or malfunctioning safety equipment.
4. Use approved labels on containers; do not remove labels (labels will be located in the warehouse).
5. Do not use unapproved containers for hazardous materials. (Is material and container compatible?)
6. Know where emergency equipment and first-aid supplies are located before considering a possibly dangerous task.
7. Know location of Material Safety Data Sheets (MSDS). These will be located in the "Employee Right-to-know" station for the respective shop/job site.
8. Know what you are expected to do in case of an emergency. Before the commencement of any task, emergency considerations shall be made.

2.5 Shipping/Receiving Personnel Responsibilities

1. Ensure MSDS are received with initial shipment of a hazardous material; if not, contact purchasing to request the appropriate MSDS and also call the Health and Safety Department to determine if there is an MSDS available until the requested MSDS arrives.
2. Ensure labels are affixed to all containers.
3. Store hazardous materials in designated locations.
4. Use proper personal protective equipment when handling hazardous materials.

5. Report damaged containers or spills to the appropriate Health and Safety Department immediately.
6. Request an MSDS from the manufacturer for any hazardous material that arrives in Findlay from a job. Also, a MSDS shall accompany any hazardous material that is sent to a job.

3.0 HAZARD DETERMINATION

OHM Corporation will rely on Material Safety Data Sheets from hazardous chemical supplies to meet hazard determination requirements. Other relevant data from laboratory analyses, chemical reference materials, and chemical manufacturers', written evaluation procedures will be utilized when warranted. No other method shall be used to determine chemical hazard unless approved by the Health and Safety.

4.0 LABELING

The shipping and receiving supervisors will be responsible for seeing that all containers arriving at OHM Corporation are properly and clearly labeled. Shipping and receiving supervisors shall also check all labels for chemical identity and appropriate hazard warnings. If the hazardous chemical is regulated by OSHA in a substance specific health standard, the supervisor or department manager shall ensure that the labels or other forms of warning used are in accordance with the requirements of that standard. Any container that is not labeled shall be immediately labeled correctly after initial discovery.

Each supervisor or department manager shall be responsible for seeing that all portable containers used in their work area are properly labeled with chemical identity and hazard warning.

Supervisors or department managers shall also ensure that labels on hazardous chemical containers are not removed or defaced unless the container is immediately marked with the required information and that all labels are legible in English and prominently displayed on the container or readily available in the work area throughout each shift.

If any container is found and the contents cannot be identified, the supervisor or manager shall be contacted immediately. When proper identification is made, a label shall be affixed to the container immediately. If it is discovered that no MSDS is available, the manufacturer and the Health and Safety Department shall be contacted to assist in locating the proper MSDS. If there is no way to identify the material in the container, the container should be set aside, away from all personnel until it can be tested by the Health and Safety Department or laboratory personnel. Supervisors and managers shall communicate their findings or awareness of such containers to all personnel in the area and to those who enter later.

5.0 MATERIAL SAFETY DATA SHEETS (MSDS)

Each supervisor or department manager at OHM Corporation will be responsible for maintaining a current MSDS relevant to the hazardous chemicals used in their area. The Health and Safety Department will be responsible for compiling the master MSDS file for the facility and aiding all shops/job sites with the completion and maintenance of their respective MSDS files.

All MSDS will be readily available for review by all employees during each work shift. Each shop/job site will designate a clearly marked "Employee Right-to-know" station where employees can immediately obtain a MSDS and the required information in an emergency.

Although manufacturers are required to provide employers with MSDSs on an initial chemical shipment, OHM Corporation purchasing agents (and supervisors purchasing their own material) shall request MSDSs and updates to MSDS on all purchase orders. Supervisors and department managers that are without proper MSDSs shall be responsible for requesting this information from manufacturers for chemicals. A file of followup letters shall be maintained for all hazardous chemical shipments received without MSDSs.

6.0 EMPLOYEE INFORMATION AND TRAINING

It is the responsibility of the supervisor in charge of each employee to ensure that the employee is properly trained. Training employees on chemical hazards and chemical handling is accomplished at the time of initial employment at OHM Corporation, whenever a new chemical (or physical) hazard is introduced into the work area, and through ongoing formal and informal training programs. Additionally, chemical hazards are communicated to employees through daily, morning, shop specific safety meetings, which shall be documented according to topic, major points discussed, and names of those attending (attendance is mandatory). Also, biweekly hazardous chemical safety meetings will be prepared by the Health and Safety Department using similar documentation for shop areas. Attendance is mandatory for these meetings also. Documentation for shop safety meetings will be available in the respective Employee Right-to-know stations and biweekly safety meeting documentation will be available in the Health and Safety Department to all employees for these meetings also. Documentation for shop safety meetings will be available in the respective Employee Right-to-know stations and biweekly safety meeting documentation will be available in the Health and Safety Department to all employees for further referencing and questioning. Records of all formal training conducted at OHM Corporation is coordinated and maintained by the Training Department secretary.

At a minimum, OHM Corporation will inform employees on the following:

- The requirements of 29 CFR 1910.1200--Hazard Communication--Evaluating the potential hazards of chemicals and communication information concerning hazards and appropriate protective measures to employees. This is accomplished in several different ways including, but no limited to 40-hour OSHA Hazardous Waste Worker Training (29 CFR 1910.120), Shop safety meetings, job site safety meetings, Health and Safety Department safety meetings, and formal and informal training about specific chemical hazards.
- The location and availability of the written hazard communication program, list of hazardous chemicals, and MSDS sheets--Notices will be periodically posted on the employee bulletin boards providing the location of the above material.
- Any operations in their work area where hazardous chemicals are present.
- What the company has done to lessen or prevent workers' exposure to these chemicals.

Employee training shall include at least:

- Methods and observations that may be used to detect the presence or release of a hazardous chemical in the work area, (monitoring instruments, visual appearance or odor), and acute and chronic health effects.
- The physical and health hazards of the chemicals in the work area (accomplished through periodic physical and chemical hazard awareness sessions developed by the Health and Safety Department). These sessions shall serve as chemical hazards refreshers.
- The methods of preventing exposure to hazardous chemicals including the measures OHM Corporation has taken to protect the employees.
- Procedures to follow if OHM Corporation employees are exposed to hazardous chemicals (location of nearest phone, emergency eyewash, and shower will be included). These discussions shall include proper operating procedures for all emergency equipment.
- The details of the hazard communication program developed by OHM Corporation, including an explanation of the labeling system and the Material Safety Data Sheets, and how employees can obtain and use the appropriate hazard information.

- Standard operating procedures within each respective shop. OHM Corporation company policy determines what is considered standard operating procedures.
- Procedures for workers involved in non-routine tasks.

Each supervisor or department manager shall ensure that the above training is emphasized to OHM Corporation employees. The Health and Safety Department will ensure that each shop, department, and job site is properly informing and training all employees through daily group meeting and individual discussions. Whenever a new hazardous chemical is placed into use, the supervisor or department manager shall inform the employees of the hazards said chemical may pose. The supervisor or manager shall also be responsible for obtaining and making available a MSDS for the new chemical.

7.0 HAZARDOUS NON-ROUTINE TASKS

Occasionally, employees at OHM Corporation are required to perform tasks which are considered to be non-routine. All tasks considered to be non-routine shall be carefully discussed among the supervisor and those performing the task. This safety briefing shall include all possible hazards that may be encountered while completing the task, including:

- Hazard recognition
- Chemicals involved and their hazardous properties
- Physical hazards
- Methods of avoiding all hazards (technical instruments, proper personal protective equipment, etc.)

The following is list of some of the non-routine tasks which may occur at OHM Corporation together with some information needed to complete the tasks safely.

- Confined Space Entry
 - Obtain confined space entry procedure/permit from Health and Safety Department and follow all protocol before beginning task. compete and have supervisor sign permit before any work begins.
 - Monitor atmosphere with explosimeter, oxygen meter, and any toxic gas meter as may be appropriate.
 - Discuss specific chemical hazards.

- Discuss protective/safety measures the employee can take (e.g., Personal protective equipment and engineering controls) use of life lines, lock-out/tagout procedures, etc.
- Measures the company has taken to lessen the hazards including ventilation, respirator, presence of another employee, and emergency procedures.
- Excavation, Trenching, and Shoring
 - Obtain guidelines from Health and Safety Department before beginning task.
 - Comply with all requirements set forth for this activity in 29 CFR Subpart P(excavating, trenching, shoring).
 - Discuss specific chemical hazards.
 - Follow confined space entry procedure above if trench is above shoulder height.
 - Discuss protective/safety measures the employee can take.
 - Review appropriate accident prevention steps.
- Decontamination of Equipment
 - Determine possible contaminants and the hazards associated with them.
 - Determine personal protection needed by contacting the Health and Safety Department.
 - Alert all personnel in areas of contamination and decontamination
 - Contain and secure all contaminated materials and decontamination materials.
 - Contact the Health and Safety Department for proper disposal.

It is company policy that no OHM Corporation employee will begin work on any non-routine task without first receiving a safety briefing from their supervisor or a Health and Safety Department representative.

8.0 INFORMING CONTRACTORS

- Hazardous chemicals to which they may be exposed while performing a task including the following:

- Chemical properties
- Physical properties
- Acute/Chronic health effects
- Location of "Employee Right-to Know" station which includes the following:
 - MSDS for work area
 - Hazard Communication Program
 - Other relevant safety material
- Precautionary measures to be taken to protect employees from chemical and physical hazards.
- Location of nearest emergency equipment (fire extinguisher, eyewash, shower, phone, first-aid kit, etc.)
- Procedures to follow in the event of employee exposure.
- Steps OHM Corporation has taken to reduce the risk of exposure to physical and chemical hazards including the following:
 - Safety meetings
 - Hazard Communication Program
 - Proper storage and labeling of hazardous chemicals
 - Health and Safety Department shop audits
- The methods used to label all hazardous chemicals.

The Health and Safety Department shall offer assistance in providing the above information to contractors working at OHM Corporation. On initial visit by a contractor to OHM Corporation, a "Contractor Right-to-Know" release form shall be completed. This form will state that the above information has been communicated to the perspective contractor.

**APPENDIX
C**

APPENDIX C

MSDS LIST

Material Safety Data Sheet

From Genium's Reference Collection
Genium Publishing Corporation
1145 Catalyn Street
Schenectady, NY 12303-1836 USA
(518) 377-8855



GENIUM PUBLISHING CORP.

No. 194

ARSENIC TRIOXIDE

Issued: June 1986

SECTION 1. MATERIAL IDENTIFICATION

MATERIAL NAME: ARSENIC TRIOXIDE

OTHER DESIGNATIONS: Arsenic Oxide, Arsenic Sesquioxide, Arsenous Oxide, Arsenous Acid Anhydride, White Arsenic, As₂O₃, CAS #1327-53-3.

MANUFACTURER/SUPPLIER: Available from several suppliers, including:
Atomergic Chemetals Corp., 100 Fairchild Ave., Plainview, NY 11803;
Telephone: (516) 349-8800
Sharpe Chemicals Co., 1116 S. Varney St., Burbank, CA 91502;
Telephone: (818) 841-7605


HMIS
H 3 Not Found
F 0 R 1
R 0 I 4
PPE* S 2
*See Sect. 8 K 0

SECTION 2. INGREDIENTS AND HAZARDS

	%	HAZARD DATA
Arsenic Pentoxide, CAS #1327-53-3	>99	ACGIH TLV* 8-hr TWA: 0.2 mg/m ³ OSHA PEL** 8-hr TWA: 0.01 mg/m ³ OSHA Action Level*** 8-hr TWA: 0.005 mg/m ³ Man, Oral, LD ₅₀ : 1.43 mg/kg Rat, Oral, LD ₅₀ : 15.1 mg/kg Woman, Oral, TDLo: 600 mg/kg (Reproductive Effect)

* Current (1985-86) ACGIH TLV for arsenic and soluble compounds, as As.

** Current OSHA PEL for inorganic arsenic compounds, as As.

*** Concentration that triggers certain provisions of the OSHA Arsenic Standard (29 CFR 1910.1018).

SECTION 3. PHYSICAL DATA

Melting Point ... 275°F (135°C) (Sublimes)*
Specific Gravity ... 3.865*
Vapor Pressure @ 20°C ... Essentially Zero
Solubility in Water, @ 2°C ... 1.2 g/100cc
@ 100°C ... 11.46 g/100cc
Molecular Weight ... 197.84
Appearance and odor: White amorphous lumps or powder.

* Values are for arsenolite. Amorphous arsenic trioxide melts at 599°F (315°C).

SECTION 4. FIRE AND EXPLOSION DATA

			LOWER	UPPER
Flash Point and Method	Autoignition Temp.	Flammability Limits in Air	Not Found	Not Found
Not Found	Not Found	Not Found	Found	Found

EXTINGUISHING MEDIA: Arsenic trioxide is noncombustible. Use extinguishing agents (dry chemical, CO₂, water spray, or foam) that are suitable for extinguishing the surrounding fire.

UNUSUAL FIRE/EXPLOSION HAZARDS: Highly toxic fumes and gases may be evolved from this material in a fire situation.

SPECIAL FIRE-FIGHTING PROCEDURES: Fire fighters need self-contained positive-pressure breathing apparatus and full protective gear. Minimize the runoff of fire-control water to prevent pollution.

SECTION 5. REACTIVITY DATA

Arsenic trioxide is stable at room temperature. It does not polymerize.

INCOMPATIBILITIES: Arsenic trioxide may react violently on contact with chlorine trifluoride, fluorine, hydrogen fluoride, oxygen difluoride, sodium chlorate, and other strong oxidizers. Arsine gas (arsenic hydride) can be generated when arsenic compounds come in contact with nascent (freshly formed) hydrogen. This can occur by contact of acid, alkalis, or water with arsenic compounds in the presence of an active metal (zinc, aluminum, magnesium, manganese, sodium, iron, etc.). Arsine is an extremely poisonous (lethal) gas with a garlic odor.

HAZARDOUS DECOMPOSITION PRODUCTS: Arsenic trioxide sublimes when heated. Poisonous arsine gas may also form on decomposition.

SECTION 6. HEALTH HAZARD INFORMATION

CARCINOGENIC ASSESSMENT: Exposure to arsenic compounds is associated with skin, lung, and possibly liver cancer. The NTP, IARC, and OSHA have identified arsenic compounds as human carcinogens. **ROUTES OF ENTRY:** Arsenic trioxide can enter the body if it is inhaled or swallowed. **EFFECTS OF OVEREXPOSURE:** Skin contact can cause dermatitis characterized by erythema (abnormal redness of skin caused by capillary congestion) with burning, itching, swelling, and skin eruptions. Chronic skin effects include cracking, thickening, pigmentation, and drying of the skin. Eye contact can cause conjunctivitis and redness, swelling, and pain. Acute inhalation exposure can cause severe nose and respiratory tract irritation and pulmonary edema. Prolonged or repeated exposure can cause necrosis and perforation of the nasal septum. Other effects of chronic arsenic poisoning by inhalation or ingestion may include gastrointestinal disturbances (nausea, vomiting); nervous system effects involving the extremities (numbness, tingling, burning pain, weakness, incoordination); blood disorders (anemia); liver and kidney injury; and skin and lung cancer. Acute ingestion of arsenic trioxide causes burning of the mouth and throat, vomiting, watery or bloody diarrhea, convulsions, paralysis, coma, and death. A dose of 120 mg of arsenic trioxide can be fatal. **FIRST AID: EYE CONTACT:** Flush eyes, including under eyelids, with a gentle flow of running water for at least 15 minutes. Get medical help.* **SKIN CONTACT:** Thoroughly wash affected area with mild soap and water. Prevent further exposure. If irritation or other symptoms persist, get medical help.* **INHALATION:** Remove victim from exposure. Keep him warm and at rest. If breathing has stopped, administer oxygen under low pressure. Get medical help promptly.* **INGESTION:** Immediately give victim a large quantity (2-4 glasses) of water to drink; induce vomiting. Keep him warm and at rest. Get medical help immediately!* (Note: Never give anything by mouth or induce vomiting if victim is unconscious or convulsing.) * **GET MEDICAL ASSISTANCE** - In plant, paramedic, community. Get medical help for further treatment, observation, and support after first aid.

SECTION 7. SPILL, LEAK, AND DISPOSAL PROCEDURES

CLEANUP PROCEDURES: Notify safety/environmental personnel of large arsenic trioxide spills. Ventilate spill area. Cleanup personnel should wear protective clothing (gloves, coveralls, goggles, etc.) and use protective respiratory equipment. Carefully vacuum up spilled material (vacuum must have high-efficiency filters to prevent redispersion of dust). Do not sweep or brush it up. Place the waste into a suitable container for reclamation or disposal. Minimize dust generation and prevent skin/eye contact throughout the cleanup process. Wash spill area to remove all residues from environmental surfaces. Use swipe tests to verify cleanliness. **DISPOSAL:** This material requires disposal as a hazardous (toxic) waste. Contact supplier or a licensed chemical waste disposal contractor for treatment, packaging, and disposal instructions. Follow Federal, state, and local regulations. Reportable Spill Quantity: 5000 lbs (2270 kg) (40 CFR 117.3) EPA Hazardous Waste Number: P012 (40 CFR 261.33)

SECTION 8. SPECIAL PROTECTION INFORMATION

Use local exhaust ventilation when handling this material. Ventilation rates should be sufficient to maintain airborne levels below the PEL. NIOSH-approved respirators should be worn when airborne concentrations exceed the PEL and during nonroutine and emergency operations. Half-mask air-purifying respirators with high-efficiency filters are acceptable for concentrations not greater than 0.1 mg/m³ (0.5 mg/m³ with full facepiece). For concentrations above 0.5 mg/m³, powered air-purifying respirators, positive-pressure-supplied air respirators, or self-contained breathing apparatus are required, depending on the concentration of the material. Respirator usage must be in accordance with appropriate provisions of the OSHA Inorganic Arsenic Standard (29 CFR 1910.1018). Dust/splash-proof safety goggles should be worn when handling this material. Protective clothing and equipment such as coveralls, gloves, hats, and shoes should be worn when airborne levels exceed the PEL or where the possibility of skin and eye contact exist. Provide clean body-covering work clothing weekly to workers who are exposed to above the PEL (daily if exposed to above 0.1 mg/m³) and arrange for special handling and laundering of contaminated clothing. **OTHER CONTROLS:** Changing rooms with separate storage facilities for street and work clothing and showers are required for employees who are exposed to above the PEL. Prevent dust from being transported to the lunchroom through the ventilation system or on contaminated clothing. Consult the OSHA Inorganic Arsenic Standard (29 CFR 1910.1018) for detailed requirements. Eyewash stations, washing facilities, and safety showers should be readily accessible. Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.

SECTION 9. SPECIAL PRECAUTIONS AND COMMENTS

Store arsenic trioxide in a cool, dry location in tightly closed containers away from incompatibles (see sect. 5). Protect containers from physical damage. Keep this material away from food products and feed. Maintain good housekeeping practices to prevent accumulation of arsenic trioxide dust. Use procedures that minimize dust generation such as vacuuming (with appropriate filter) or wet cleanup. Brushing or sweeping should be used only where vacuuming or other relevant methods are ineffective. All handling should be done in a careful manner and with appropriate controls (enclosure, ventilation) to prevent dust generation and dispersion. Practice good personal hygiene. Wash face and hands thoroughly before eating, drinking, and smoking. Showering after the workshift is required for employees exposed to above the PEL. Do not eat, drink, use tobacco, chew gum, or apply cosmetics in the work area. Remove contaminated clothing promptly. Launder it before it is worn again. Do not shake clothing to remove dust; use a vacuum cleaner. Avoid inhalation and skin/eye contact. **DO NOT INGEST THIS MATERIAL!**

DOT Class: Poison B DOT ID No. UN1561 DOT Label: Poison
Data Source(s) Code: 2, 4, 9, 12, 14, 30, 44, 49, 55, 58, 61, 62, 84. CV

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Approvals *J. O. Deenover, 1/87.*

Indust. Hygiene/Safety *DJW 11-86*

Medical Review *[Signature]*

MATERIAL SAFETY DATA SHEET

GENIUM PUBLISHING CORPORATION

1145 CATALYN ST., SCHENECTADY, NY 12303 USA (518) 377-8854



V

MSDS # 132

BARIUM CHLORIDE

Issued: April, 1985

Revised:

From Genium's MSDS Collection, to be used as a reference.

SECTION 1. MATERIAL IDENTIFICATION

MATERIAL NAME: BARIUM CHLORIDE

Other Designations: Barium Dichloride, BaCl₂; CAS # 10361-37-2.

Manufacturer: Available from several suppliers, including:

Ashland Chemical Company

and

J.T. Baker Chemical Company

PO Box 2219

222 Red School Lane

Columbus, OH 43216

Phillipsburg, NJ 08865

(614) 889-3333

(201) 859-2151

SECTION 2. INGREDIENTS AND HAZARDS

BARIUM CHLORIDE

%

HAZARD DATA

ca 99%

8 hr TWA 0.5 mg/m³
(as Ba)*

Human, oral:
LDLo: 11.4 mg/kg

Rat, oral:
LD50: 118 mg/kg

* Current ACGIH (1984-85) TLV and OSHA PEL for soluble barium compounds.

SECTION 3. PHYSICAL DATA

Melting Point, deg C - 963
Boiling Point, deg C - 1560
Solubility in Water, g/100g @ 20°C - 36
Specific Gravity (H₂O = 1) - 3.86
Molecular weight - 208.3

Appearance & Odor: Colorless crystals or white powder. No odor.

SECTION 4. FIRE AND EXPLOSION DATA

			Lower	Upper
Flash Point and Method	Autoignition Temp.	Flammability Limits in Air		
Non-flammable	N/A	N/A		

Extinguishing Media: Use extinguishing agents that are appropriate for the surrounding fire.

Firefighters should wear self-contained breathing apparatus when fighting fires involving this material.

SECTION 5. REACTIVITY DATA

Barium Chloride is stable at room temperature. It does not polymerize.

SECTION 6. HEALTH HAZARD INFORMATION	TLV 0.5 mg/m ³ , as Ba
---	-----------------------------------

Barium Chloride may cause irritation of the eyes, nose, throat, and bronchial tubes. It is highly toxic by ingestion. Acute effects of ingestion include abdominal pain, vomiting, diarrhea, convulsions, muscular spasms and hemorrhage of the stomach, intestines and kidneys. The lethal dose for man is approximately 1 gram BaCl₂.

FIRST AID:
EYE CONTACT: Flush eyes, including under the eyelids, with running water for at least 15 minutes. Seek medical attention.
SKIN CONTACT: Thoroughly wash contaminated area with soap and water.
INGESTION: If person is conscious, induce vomiting. If readily available, give one tablespoon of epsom salt (MgSO₄) in a glass of water (to precipitate barium as the insoluble sulfate). Seek medical attention (In-plant, Paramedics, Community). Never give anything by mouth to an unconscious person.
INHALATION: Remove person to fresh air.
Physician's Note: Acute barium poisoning gives a rapid decrease in blood potassium level. Administration of appropriate potassium salts has been recommended.

SECTION 7. SPILL, LEAK AND DISPOSAL PROCEDURES

Safety personnel should be notified of any large spills. Clean-up personnel should wear protective equipment to prevent eye/skin contact and dust inhalation. Vacuum or carefully scoop material into an appropriate container for recovery or disposal. Minimize dust generation. Dampen with water prior to clean-up if surface area is large.
DISPOSAL: Reclaim for salvage or reuse. Consideration should be given to returning scrap material to supplier for reprocessing. Unsalvagable waste may be disposed of in sealed containers in an approved secured landfill. Follow all applicable local, State and Federal regulations.

EPA Hazardous Waste No: D005 (EP Toxicity, 40 CFR 261).

SECTION 8. SPECIAL PROTECTION INFORMATION

Provide general inhalation and local exhaust ventilation to meet the TLV requirements. Approved respirators for dust and mist protections should be worn in emergency situations and whenever airborne levels exceed the TLV.

Use chemical goggles where dusty conditions occur and when handling solutions. Rubber gloves and protective clothing (aprons, etc.) should be worn when prolonged or repeated contact is likely.

Eyewash stations should be accessible in areas of use.

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

SECTION 9. SPECIAL PRECAUTIONS AND COMMENTS

Store in closed containers in a dry, well-ventilated area. Protect containers from physical damage. Keep containers closed when not in use. Maintain good housekeeping procedures to prevent accumulation and generation of dust. Use procedures that minimize airborne dust levels.

Follow good hygiene practice. After working with this material, always wash hands and face before eating, drinking or smoking.

DO NOT INGEST! Avoid inhalation of dust or of mist from solutions containing barium.

DOT Classification: Barium Compounds N.O.S. ID # UN1564. **LABEL:** POISON

DATA SOURCE(S) CODE (See Glossary) 2, 4, 12, 27, 54, 55,

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(518) 377-8854

Material Safety Data Sheets Collection:

Sheet No. 316
Benzene

Issued: 11/78

Revision: E, 8/90

Section 1. Material Identification

32

Benzene (C₆H₆) Description: Derived by fractional distillation of coal tar, hydrodealkylation of toluene or pyrolysis of gasoline, catalytic reforming of petroleum, and transalkylation of toluene by disproportionation reaction. Used as a fuel; a chemical reagent; a solvent for a large number of materials such as paints, plastics, rubber, inks, oils, and fats; in manufacturing phenol, ethylbenzene (for styrene monomer), nitrobenzene (for aniline), dodecylbenzene (for detergents), cyclohexane (for nylon), chlorobenzene, diphenyl, benzene hexachloride, maleic anhydride, benzene-sulfonic acid, artificial leather, linoleum, oil cloth, varnishes, and lacquers; for printing and lithography; in dry cleaning; in adhesives and coatings; for extraction and rectification; as a degreasing agent; in the tire industry; and in shoe factories. Benzene has been banned as an ingredient in products intended for household use and is no longer used in pesticides.
Other Designations: CAS No. 0071-43-2, benzol, carbon oil, coal naphtha, cyclohexatriene, mineral naphtha, nitration benzene, phene, phenyl hydride, pyrobenzol.
Manufacturer: Contact your supplier or distributor. Consult the latest *Chemicalweek Buyers' Guide*^(TM) for a suppliers list.

R	1	NFPA
I	4	
S	2*	
K	4	
*Skin absorption		
HMIS		
H	3	
F	3	
R	0	
PPG†		
†	Sec. 8	

Cautions: Benzene is a confirmed *human carcinogen* by the IARC. *Chronic low-level exposure may cause cancer (leukemia) and bone marrow damage, with injury to blood-forming tissue.* It is also a dangerous fire hazard when exposed to heat or flame.

Section 2. Ingredients and Occupational Exposure Limits

Benzene, ca 100%*

1989 OSHA PELs
(29 CFR 1910.1000, Table Z-1-A)
8-hr TWA: 1 ppm, 3 mg/m³
15-min STEL: 5 ppm, 15 mg/m³

1989-90 ACGIH
TLV-TWA: 10 ppm, 32 mg/m³

1985-86 Toxicity Data†
Man, oral, LD₅₀: 50 mg/kg; no toxic effect noted
Man, inhalation, TC₅₀: 150 ppm inhaled intermittently over 1 yr in a number of discrete, separate doses affects the blood (other changes) and nutritional and gross metabolism (body temperature increase)
Rabbit, eye: 2 mg administered over 24 hr produces severe irritation

(29 CFR 1910.1000, Table Z-2)
8-hr TWA: 10 ppm
Acceptable Ceiling Concentration: 25 ppm
Acceptable Maximum Peak: 50 ppm (10 min)†

1988 NIOSH RELs
TWA: 0.1 ppm, 0.3 mg/m³
Ceiling: 1 ppm, 3 mg/m³

* OSHA 29 CFR 1910.1000, Subpart Z, states that the final benzene standard in 29 CFR 1910.1028 applies to all occupational exposures to benzene except in some subsegments of industry where exposures are consistently under the action level (i.e., distribution and sale of fuels, sealed containers and pipelines, coke production, oil and gas drilling and production, natural gas processing, and the percentage exclusion for liquid mixtures); for the excepted subsegments, the benzene limits in Table Z-2 apply.

† Acceptable maximum peak above the acceptable ceiling concentration for an 8-hr shift.

‡ See NIOSH, *RTECS* (CY1400000), for additional irritative, mutative, reproductive, tumorigenic, and toxicity data.

Section 3. Physical Data

Boiling Point: 176 °F (80 °C)
Melting Point: 42 °F (5.5 °C)
Vapor Pressure: 100 mm Hg at 79 °F (26.1 °C)
Vapor Density (Air = 1): 2.7
Evaporation Rate (Ether = 1): 2.8

Molecular Weight: 78.11
Specific Gravity (15 °C/4 °C): 0.8787
Water Solubility: Slightly (0.180 g/100 g of H₂O at 25 °C)
% Volatile by Volume: 100
Viscosity: 0.6468 mPa at 20 °C

Appearance and Odor: A colorless liquid with a characteristic sweet, aromatic odor. The odor recognition threshold (100% of panel) is approximately 5 ppm (unfatigued) in air. Odor is *not* an adequate warning of hazard.

Section 4. Fire and Explosion Data

Flash Point: 12 °F (-11.1 °C), CC | **Autoignition Temperature:** 928 °F (498 °C) | **LEL:** 1.3% v/v | **UEL:** 7.1% v/v

Extinguishing Media: Use dry chemical, foam, or carbon dioxide to extinguish benzene fires. Water may be ineffective as an extinguishing agent; since it can scatter and spread the fire. Use water spray to cool fire-exposed containers, flush spills away from exposures, disperse benzene vapor, and protect personnel attempting to stop an unignited benzene leak.

Unusual Fire or Explosion Hazards: Benzene is a Class 1B flammable liquid. A concentration exceeding 3250 ppm is considered a potential fire explosion hazard. Benzene vapor is heavier than air and can collect in low lying areas or travel to an ignition source and flash back. Explosive and flammable benzene vapor-air mixtures can easily form at room temperature. Eliminate all ignition sources where benzene is used, handled, or stored.

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. Structural firefighter's protective clothing provides limited protection. Stay out of low areas. Be aware of runoff from fire control methods. Do not release to sewers or waterways. Runoff to sewer can create pollution, fire, and explosion hazard.

Section 5. Reactivity Data

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

Chemical Incompatibilities: Benzene explodes on contact with diborane, permanganic acid, bromine pentafluoride, peroxodisulfuric acid, and peroxomonosulfuric acid. It ignites on contact with dioxygen difluoride, dioxygen tetrafluoroborate, iodine heptafluoride, and sodium peroxide + water. Benzene forms sensitive, explosive mixture with iodine pentafluoride, ozone, liquid oxygen, silver perchlorate, nitryl perchlorate, nitric acid, and arsenic pentafluoride + potassium methoxide (explodes above 30 °C). A vigorous or incandescent reaction occurs with bromine trifluoride, uranium hexafluoride, and hydrogen + Raney nickel (above 410 °F (210 °C)). Benzene is incompatible with oxidizing materials.
Conditions to Avoid: Avoid heat and ignition sources.

Hazardous Products of Decomposition: Thermal oxidative decomposition of benzene can produce toxic gases and vapors such as carbon monoxide.

Section 6. Health Hazard Data

Carcinogenicity: The ACGIH, OSHA, and IARC list benzene as, respectively, a suspected human carcinogen, a cancer hazard, and, based on sufficient human and animal evidence, a human carcinogen (Group 1).
Summary of Risks: Prolonged skin contact or excessive inhalation of benzene vapor may cause headache, weakness, appetite loss, and fatigue. The most important health hazards are cancer (leukemia) and bone marrow damage with injury to blood-forming tissue from chronic low-level exposure. Higher level exposures may irritate the respiratory tract and cause central nervous system (CNS) depression.
Medical Conditions Aggravated by Long-Term Exposure: Exposure may worsen ailments of the heart, lungs, liver, kidneys, blood, and CNS.
Target Organs: Blood, central nervous system, bone marrow, eyes, upper respiratory tract, and skin.
Primary Entry Routes: Inhalation, skin contact.
Acute Effects: Symptoms of acute overexposure include irritation of the eyes, nose, and respiratory tract, breathlessness, euphoria, nausea, drowsiness, headache, dizziness, and intoxication. Severe exposure may lead to convulsions and unconsciousness. Skin contact may cause a drying rash (dermatitis).
Chronic Effects: Long-term chronic exposure may result in many blood disorders ranging from aplastic anemia (an inability to form blood cells) to leukemia.

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. Immediately rinse with flooding amounts of water for at least 15 min. For reddened or blistered skin, consult a physician. Wash affected area with soap and water.
Inhalation: Remove exposed person to fresh air. Emergency personnel should protect against inhalation exposure. Provide CPR to support breathing or circulation as necessary. Keep awake and transport to a medical facility.
Ingestion: Never give anything by mouth to an unconscious or convulsing person. If ingested, do not induce vomiting since aspiration may be fatal. Call a physician immediately.
After first aid, get appropriate in-plant, paramedic, or community medical support.
Physician's Note: Evaluate chronic exposure with a CBC, peripheral smear, and reticulocyte count for signs of myelotoxicity. Follow up any early indicators of leukemia with a bone marrow biopsy. Urinary phenol conjugates may be used for biological monitoring of recent exposure. Acute management is primarily supportive for CNS depression.

Section 7. Spill, Leak, and Disposal Procedures

Spill/Leak: Design and practice a benzene spill control and countermeasure plan (SCCP). Notify safety personnel, evacuate all unnecessary personnel, eliminate all heat and ignition sources, and provide adequate ventilation. Cleanup personnel should protect against vapor inhalation, eye contact, and skin absorption. Absorb as much benzene as possible with an inert, noncombustible material. For large spills, dike far ahead of spill and contain liquid. Use nonsparking tools to place waste liquid or absorbent into closable containers for disposal. Keep waste out of confined spaces such as sewers, watersheds, and waterways because of explosion danger. 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), Hazardous Waste No. U019
 Listed as a CERCLA Hazardous Substance* (40 CFR 302.4), Reportable Quantity (RQ): 1000 lb (454 kg) [* per Clean Water Act, Sec. 307 (a), 311 (b)(4), 112; and per RCRA, Sec. 3001]
 SARA Extremely Hazardous Substance (40 CFR 355): Not listed
 Listed as SARA Toxic Chemical (40 CFR 372.65)
OSHA Designations
 Listed as an Air Contaminant (29 CFR 1910.1000, Tables Z-1-A and Z-2)

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 explosion-proof ventilation systems to maintain airborne concentrations at least 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.⁽¹⁰⁷⁾
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 away from all heat and ignition sources and incompatible materials. **Caution! Benzene vapor may form explosive mixtures in air.** To prevent static sparks, electrically ground and bond all containers and equipment used in shipping, receiving, or transferring operations in production and storage areas. When opening or closing benzene containers, use nonsparking tools. Keep fire extinguishers readily available.
Engineering Controls: Because OSHA specifically regulates benzene (29 CFR 1910.1028), educate workers about its potential hazards and dangers. Minimize all possible exposures to carcinogens. If possible, substitute less toxic solvents for benzene; use this material with extreme caution and only if absolutely essential. Avoid vapor inhalation and skin and eye contact. Use only with adequate ventilation and appropriate personal protective gear. Institute a respiratory protection program that includes regular training, maintenance, inspection, and evaluation. Designate regulated areas of benzene use (see legend in the box below) and label benzene containers with "DANGER, CONTAINS BENZENE, CANCER HAZARD."
Other Precautions: Provide preplacement and periodic medical examinations with emphasis on a history of blood disease or previous exposure.

Transportation Data (49 CFR 172.101, .102)

DOT Shipping Name: Benzene (benzol)	IMO Shipping Name: Benzene
DOT Hazard Class: Flammable liquid	IMO Hazard Class: 3.2
ID No.: UN1114	ID No.: UN1114
DOT Label: Flammable liquid	IMO Label: Flammable liquid
DOT Packaging Exceptions: 173.118	IMDG Packaging Group: II
DOT Packaging Requirements: 173.119	

<p>DANGER BENZENE CANCER HAZARD FLAMMABLE-NO SMOKING AUTHORIZED PERSONNEL ONLY RESPIRATOR REQUIRED</p>
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Material Safety Data Sheet

from Genium's Reference Collection
Genium Publishing Corporation
1145 Catalyn Street
Schenectady, NY 12303-1836 USA
(518) 377-8855



No. 23

CADMIUM
(Revision C)
Issued: September 1977
Revised: November 1988

SECTION 1. MATERIAL IDENTIFICATION

Material Name: CADMIUM

Description (Origin/Uses): Used in electroplating other metals; in dentistry; in alloys; in nickel-cadmium batteries; and in reactor control rods.

Other Designations: Cd; CAS No. 7440-43-9

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



Genium

HMS		
H	3	R 1
F	1	I 4
R	0	S 1
PPG*		
*See sect. 8	K 4	(Dust)

SECTION 2. INGREDIENTS AND HAZARDS, EXPOSURE LIMITS

Cadmium, CAS No. 7440-43-9, ca 100%
OSHA PEL

8-Hr TWA: 0.1 mg/m³ (Cd Fume)

Ceiling: 0.3 mg/m³ (Cd Fume)

8-Hr TWA: 0.2 mg/m³ (Cd Dust)

Ceiling: 0.6 mg/m³ (Cd Dust)

ACGIH NIC,* 1988-89

TLV-TWA: 0.01 mg/m³ (Cadmium and Compounds, as Cd)

ACGIH A2, Suspected Human Carcinogen

ACGIH TLVs, 1988-89

TLV-TWA: 0.05 mg/m³ (Cadmium Dusts and Salts, as Cd)

TLV-Ceiling: 0.05 mg/m³ (Cadmium Oxide Fume, as Cd)

TLV-TWA: 0.05 mg/m³ (Cadmium Oxide Production)

Toxicity Data**

Human, Inhalation, LC₅₀: 39 mg/m³ (20 Minutes)

*Notice of Intended Changes, Genium reference 116, p. 39.

**See NIOSH, RTECS (EU9800000), for additional data referring to reproductive, tumorigenic, and mutagenic effects.

SECTION 3. PHYSICAL DATA

Boiling Point: 1413°F (767°C)

Melting Point: 610°F (321°C)

Vapor Pressure: 0.095 Torr at 610°F (321°C)

Molecular Weight: 112 Grams/Mole

Solubility in Water (%): Insoluble

Specific Gravity (H₂O = 1): 8.642

Appearance and Odor: A soft, blue white, malleable, lustrous metal that can be cut easily with a knife; odorless.

Comments: Cadmium has a significant vapor pressure of 0.000021 torr (corresponding to 0.12 mg/m³) at 315°F (157°C). Heating this metal without using correct engineering controls and/or personal protective equipment can result in overexposure.

SECTION 4. FIRE AND EXPLOSION DATA

Flash Point and Method*

Autoignition Temperature*

LEL*

UEL*

Extinguishing Media: *Cadmium metal burns readily in air if it is heated. As with most metals, the reactivity/dust-cloud-explosion hazard increases as the cadmium metal becomes more finely divided. In fact, finely divided, powdered cadmium metal can be pyrophoric (it burns spontaneously in air without any source of ignition). Carbon dioxide, dry chemical, or sand are recommended extinguishing agents for cadmium fires. Unusual Fire or Explosion Hazards: Cadmium dust can explode during a fire. Massive cadmium metal does not present this potential explosion hazard; however, certain work operations such as grinding, welding, or cutting, can produce dust made of finely divided cadmium particles. Warning: Do not create a dust cloud of cadmium particles, especially during cutting, grinding, or welding operations. 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

Stability/Polymerization: Cadmium is stable in closed containers during routine operations. Hazardous polymerization cannot occur.

Chemical Incompatibilities: Cadmium reacts dangerously with ammonium nitrate, hydrazoic acid, tellurium, and zinc (Genium ref. 84).

Conditions to Avoid: Avoid all exposure to sources of ignition and to incompatible chemicals. Hazardous Products of Decomposition: When heated, which is likely during fires and work operations such as welding and machining, cadmium metal can decompose into cadmium metal fume and cadmium oxide fume.

SECTION 6. HEALTH HAZARD INFORMATION

Carcinogenicity: The ACGIH classifies cadmium and its compounds as suspected human carcinogens (group A2); the IARC lists them as probable human carcinogens (group 2B); and the NTP classifies them as anticipated human carcinogens (group b). Summary of Risks: Heating cadmium metal produces intensely irritating cadmium metal fume. The acute effects of its excessive inhalation, which include severe tracheobronchitis, pneumonitis, and pulmonary edema, are life threatening and are usually delayed for several hours; their mortality rate is about 20%. Nonfatal pneumonitis has resulted from exposure to 0.5 to 2.5 mg/m³; a fatality has been reported for five hours' exposure at 9 mg/m³ and for 1 hour's exposure at 40 to 50 mg/m³. There is no warning discomfort or immediate irritation from exposure to cadmium fume. Acute gastroenteritis and symptoms of metal fume fever are associated with even lower acute exposure. Symptoms of acute overexposure include excessive salivation, a dry, burning throat; headache; aching muscles; coughing; chest tightness and pain; nausea; chills, and fever chills; and fever. Medical Conditions Aggravated by Long-Term Exposure: None reported. Target Organs: Skin, eyes, respiratory system, kidneys, and blood. Primary Entry: Inhalation, skin contact. Acute Effects: See Summary of Risks, above. Chronic Effects: Long-term, chronic inhalation of cadmium dust, salts, or fume causes chronic cadmium poisoning characterized by a distinctive, nonhypertrophic emphysema with or without renal tubular injury, accompanied by the urinary excretion of a protein with a molecular weight

SECTION 6. HEALTH HAZARD INFORMATION, cont.

of 20,000 to 30,000. This protein is itself a sign of early but reversible chronic poisoning. (Possible chromosomal aberrations and decreased birth weight among babies of women exposed to cadmium have been noted.) **Danger:** Continued overexposure from inhalation causes irreversible renal tubular damage. Cancer, anemia, eosinophilia, anosmia, chronic rhinitis, yellowed teeth, and bone changes have been reported. Bone pain in the ribs, backbone, and femur is common; disorders of calcium metabolism develop; and kidney stones and pulmonary fibrosis have been described. **FIRST AID: Eyes.** Immediately flush eyes, including under the eyelids, gently but thoroughly with flooding amounts of running water for at least 15 minutes. **Skin.** Rinse the affected area with flooding amounts of water, 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 qualified medical personnel administer oxygen as required. **Ingestion.** If a physician is not readily available, give the exposed person 2 to 3 glasses of water to drink and induce vomiting. A physician may administer a gastric lavage followed by saline catharsis. **Comments:** A comprehensive medical program is advised for those who work with cadmium or its compounds. This should include chest X rays and forced-vital-capacity tests. 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:** Chelation therapy may be useful in treatment; calcium disodium edetate and pencillamine are recommended. Dimercaprol (BAL) is not recommended because of reported renal toxicity of the cadmium-BAL complex.

SECTION 7. SPILL, LEAK, AND DISPOSAL PROCEDURES

Spill/Leak: Notify safety personnel, evacuate unnecessary personnel, eliminate all sources of ignition immediately, and provide adequate ventilation. Cleanup procedures must not create dusty conditions. Pick up the spilled material using vacuuming, mopping, or wet-sweeping techniques. Cleanup personnel need protection against inhalation of dust and fume (see sect. 8). **Waste Disposal:** Contact your supplier or a licensed contractor for detailed recommendations. Follow Federal, state, and local regulations. Concentrated solutions of cadmium waste can be precipitated with lime and collected by filtration. Effluent should be treated as needed to reduce the concentration of the cadmium to a level that is within regulatory compliance limits.

OSHA Designations

Listed as an Air Contaminant (29 CFR 1910.1000 Subpart Z).

EPA Designations (40 CFR 302.4)

RCRA Hazardous Waste, No. D006 (40 CFR 261.24 [Characteristic of EP toxicity])

CERCLA Hazardous Substance, Reportable Quantity: 1 lb (0.454 kg), per the Clean Water Act (CWA), § 307 (a).

SECTION 8. SPECIAL PROTECTION INFORMATION

Goggles: Always wear protective eyeglasses or chemical safety goggles. Where splashing of a cadmium solution is possible, wear a full face shield. Follow OSHA eye- and face-protection-regulations (29 CFR 1910.133). **Respirator:** Use a NIOSH-approved respirator per Genium reference 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, to prevent prolonged or repeated skin contact with this material. **Ventilation:** Install and operate general and local maximum explosion-proof ventilation systems powerful enough to maintain airborne levels of cadmium below the OSHA PEL cited in section 2. Local exhaust ventilation is preferred because it prevents dispersion of the contaminant into the general work area by eliminating it at its source. Consult the latest edition of Genium reference 103 for detailed recommendations. **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 your shoes and equipment. Do not wear work clothes home. **Comments:** Practice good personal hygiene; always wash thoroughly after using this material and before eating, drinking, smoking, using the toilet, or applying cosmetics. 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. Do not inhale cadmium fume. Do not expose individuals with lung, liver, kidney, and blood ailments to cadmium until such exposure is approved by a physician.

SECTION 9. SPECIAL PRECAUTIONS AND COMMENTS

Storage/Segregation: Store cadmium in closed containers in a cool, dry, well-ventilated area away from sources of ignition and strong oxidizers. Protect containers from physical damage. Avoid storage situations where corrosion can occur. Keep powdered cadmium in closed containers; prevent the airborne dispersion of powdered cadmium. **Engineering Controls:** Make sure all engineering systems (production, transportation) are of maximum explosion-proof design. Ground and bond all containers, pipelines, etc., used in shipping, transferring, reacting, producing, and sampling operations to prevent static sparks. **Other Precautions:** The toxic effects of cadmium are influenced by the presence or absence of other elements such as zinc and selenium. If these materials are present in the workplace, careful evaluation of any exposure to cadmium is required to understand any contributing factors.

Hazardous Materials Table (49 CFR 172.101): Not Listed

Optional Hazardous Materials Table (49 CFR 172.102)

ID No. UN2570

IMO Shipping Name: Cadmium Compounds

IMO Hazard Class: 6.1

IMO Labels: Poison or Saint Andrew's Cross (X)*

*Harmful—Stow away from Foodstuffs (IMO Label, Materials of Class 6.1 Packaging Group III).

References: 1, 26, 38, 84-94, 100, 116, 117, 120, 122.

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Prepared by PJ Igoe, BS

Industrial Hygiene Review: DJ Wilson, CIH

Medical Review: W Silverman, MD

CDR675

α -CHLORDAN

CAS: 5103-71-9

mf: C₁₀H₆Cl₈ mw: 409.76

SYNS:

cis-CHLORDAN
 α -CHLORDANE

α (cis)-CHLORDANE
cis-CHLORDANE

TOXICITY DATA:

ipr-mus TDLo:50 mg/kg (1D
preg):REP
scu-mus TDLo:9 mg/kg (3D
pre):REP
ipr-mus LDLo:290 mg/kg

CODEN:

BECTA6 17,559,77
JTEHD6 3,713,77
TXAPA9 23,288,72

THR: Poison by intraperitoneal route. Experimental reproductive effects. When heated to decomposition it emits toxic fumes of Cl⁻. See also CHLORDANE.

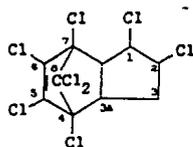
CDR750

CHLORDANE

CAS: 57-74-9

DOT: 2762

mf: C₁₀H₆Cl₈ mw: 409.76



PROP: Colorless to amber, odorless, viscous liquid. Bp: 175°, d: 1.57-1.63 @ 15.5°/15.5°.

SYNS:

ASPON-CHLORDANE
BELT
CD 68
CHLOORDAAN (DUTCH)
CHLORDAN
 γ -CHLORDAN
CHLORDANE, LIQUID (DOT)
CHLORINDAN
CHLOR KIL
CHLORODANE
CHLORTOX
CLORDAN (ITALIAN)
CORODANE
CORTILAN-NEU
DICHLOROCHLORDENE
DOWCHLOR
ENT 9,932
ENT 25,552-X
HCS 3260
KYPCHLOR
M 140
M 410
NCL-C00099
NIRAN
OCTACHLOR
OCTACHLORODIHYDRODICY-
CLOPENTADIENE

1,2,4,5,6,7,8,8-OCTACHLORO-
2,3,3a,4,7,7a-HEXAHYDRO-4,7-
METHANOINDENE
1,2,4,5,6,7,8,8-OCTACHLORO-
2,3,3a,4,7,7a-HEXAHYDRO-4,7-
METHANO-1H-INDENE
1,2,4,5,6,7,8,8-OCTACHLORO-
3a,4,7,7a-HEXAHYDRO-4,7-
METHYLENE INDANE
OCTACHLORO-4,7-METHANOHY-
DROINDANE
OCTACHLORO-4,7-METHANOTET-
RAHYDROINDANE
1,2,4,5,6,7,8,8-OCTACHLORO-
3a,4,7,7a-TETRAHYDRO-4,7-endo-
METHANO-INDAAN (DUTCH)
1,2,4,5,6,7,8,8-OCTACHLORO-4,7-
METHANO-3a,4,7,7a-TETRAHY-
DROINDANE
1,2,4,5,6,7,8,8-OCTACHLORO-
3a,4,7,7a-TETRAHYDRO-4,7-
METHANOINDAN
1,2,4,5,6,7,8,8-OCTACHLORO-
3a,4,7,7a-TETRAHYDRO-4,7-
METHANOINDANE
1,2,4,5,6,7,10,10-OCTACHLORO-
4,7,8,9-TETRAHYDRO-4,7-
METHYLENEINDANE

HR: 3

NIOSH: PB 9705000

1,2,4,5,6,7,8,8-OCTACHLOR-
3a,4,7,7a-TETRAHYDRO-4,7-endo-
METHANO-INDAN (GERMAN)
OCTA-KLOR
OKTATERR
1,2,4,5,6,7,8,8-OTTOCHLORO-
3A,4,7,7A-TETRAIDRO-4,7-
ENDO-METANO-INDANO (ITAL-
IAN)
ORTHO-KLOR

RCRA WASTE NUMBER U036
SD 5532
SHELL SD-5532
SYNKLOR
TAT CHLOR 4
TOPICHLOR 20
TOPICLOR
TOPICLOR 20
TOXICHLOR
VELSICOL 1068

TOXICITY DATA:

sce-ofs-mul 54 pmol/L
dns-hmn:fbr 1 μ mol/L
sce-hmn:lym 10 μ mol/L
msc-ham:lng 10 μ mol/L
orl-mus TDLo:3360 μ g/kg
(1-21D preg):TER
orl-mus TDLo:152 mg/kg
(1-19D preg):TER
orl-mus TDLo:7 mg/kg (15-21D
preg):REP
orl-mus TDLo:2020 mg/kg/80W-
C:CAR
orl-mus TD :3780 mg/kg/80W-
C:CAR
orl-hmn LDLo:29 mg/kg:LIV
orl-wmn LDLo:120 μ g/kg:
CNS,GIT
skn-hmn LDLo:428 mg/kg:CNS
unr-man LDLo:118 mg/kg
orl-rat LD50:283 mg/kg
skn-rat LD50:690 mg/kg
ipr-rat LD50:343 mg/kg
orl-mus LD50:145 mg/kg
ipr-mus LDLo:240 mg/kg
ivn-mus LD50:100 mg/kg
ihl-cat LC50:100 mg/m³/4H
orl-rbt LD50:100 mg/kg
skn-rbt LD50:780 mg/kg
ivn-rbt LDLo:10 mg/kg
orl-ham LD50:1720 mg/kg
orl-ckn LD50:220 mg/kg
orl-dck LD50:1200 mg/kg
orl-dom LD50:50 mg/kg
orl-mam LD50:180 mg/kg

CODEN:

MUREAV 118,61,83
MUREAV 42,161,77
ARTODN 52,221,83
CBINA8 19,369,77
JEPTDQ 2(2),357,78
TXAPA9 62,402,82
BJPCBM 49,311,73
NCITR* NCI-CG-TR-
8,77
NCITR* NIC-CG-TR-
8,77
CMEP** -,1,56
CMEP** -,1,56
34ZIAG -,648,69
85DCAI 2,73,70
DOEAAH 34,25,79
JAVMA4 157,1835,70
TXAPA9 32,443,75
ARSIM* 20,19,66
TXAPA9 23,288,72
CSLNX* NX#04876
GTPZAB 8(4),30,64
PCOC** -,226,66
85DPAN -,71,76
AIHOAX 1,13,50
BJTXAZ 7,159,74
PCOC** -,266,66
DOEAAH 35,25,79
YKYUA6 32,471,81
PCOC** -,226,66

IARC Cancer Review: Human Inadequate Evidence IMEMDT 20,45,79; Animal Sufficient Evidence IMEMDT 20,45,79. NCI Carcinogenesis Bioassay (feed); Clear Evidence: mouse NCITR* NCI-CG-TR-8,77; No Evidence: rat NCITR* NCI-CG-TR-8,77. EPA Genetic Toxicology Program. Community Right To Know List. EPA Extremely Hazardous Substances List.

OSHA PEL: TWA 0.5 mg/m³ (skin)
ACGIH TLV: TWA 0.5 mg/m³ (skin)
DFG MAK: 0.5 mg/m³

DOT Classification: Combustible Liquid, Label: None; Flammable Liquid; Label: Flammable Liquid

THR: Poison to humans by ingestion and possibly other routes. An experimental poison by ingestion, inhalation, intravenous, and intraperitoneal routes. Moderately toxic

MATERIAL SAFETY DATA SHEET

GENIUM PUBLISHING CORPORATION

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MSDS # 5

CHROMIC ACID, SOLID
Revision B

Issued:

Revised: August 1985

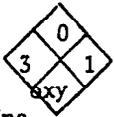
From Genium's MSDS Collection, to be used as a reference.

SECTION 1. MATERIAL IDENTIFICATION

17

MATERIAL NAME: CHROMIC ACID, SOLID

Other designations: Chromium Trioxide, Chromic Anhydride, Chromium (VI) Oxide, CrO_3 , CAS #1333-82-0



Manufacturer: Available from many sources, including: American Chrome and Chemicals, Inc.
PO Box 9912
Buddy Lawrence Dr.
Corpus Christi, TX 78469
(512)883-3202

SECTION 2. INGREDIENTS AND HAZARDS

%

HAZARD DATA

Chromium Trioxide, CrO_3

ca 100

8hr TWA:
0.05 mg/m^3 * as Cr

* Current (1985-1986) ACGIH TLV for water-soluble chromium VI compounds

Ceiling limit:
0.1 mg/m^3 **

**Current OSHA PEL (ceiling limit) from chromic acid and chromates

Dog, subcutaneous:
LDLo: 330 mg/kg

NOTE: the NIOSH-recommended exposure limit for Chromium VI Oxide is 0.025 $mg Cr(VI)/m^3$ average over a work shift of up to 10 hours, with ceiling level of 0.05 $mg Cr(VI)/m^3$ (15 minute period)

SECTION 3. PHYSICAL DATA

Melting point 197°C

Solubility in water, gm/100cc @ 20°C

Boiling point decomposes @ 250°C
to $Cr_2O_3 + O_2$

Molecular weight 63
..... 99.99

Specific gravity 2.7

Appearance and odor: dark red flakes or crystals which are deliquescent. No odor.

SECTION 4. FIRE AND EXPLOSION DATA

Lower

Upper

Flash Point and Method

Autoignition Temp.

Flammability Limits in Air

Not combustible

NA

NA

Chromic anhydride is not flammable but is a strong oxidizing agent and can ignite many hydrocarbons, such as acetic acid and alcohol, when brought into direct contact. Certain inorganic chemicals will produce incandescence when mixed with chromic anhydride; i.e. arsenic, ammonia gas, hydrogen sulfide, phosphorus, potassium, sodium and selenium. Flammable materials near these reactions could be easily ignited.

Firefighters should wear self-contained breathing apparatus and full protective gear to prevent contact when fighting fires involving this material.

SECTION 5. REACTIVITY DATA

This material is stable when properly stored and handled. It is a strong oxidizing agent and will react with many oxidizable substances such as oils, grease, paper and plastics. The reactions can be rapid enough to ignite these materials. Chromic anhydride will ignite many hydrocarbons from direct contact. Incandescence is also produced from contact with the inorganics mentioned in Section 4.

SECTION 6. HEALTH HAZARD INFORMATION

TLV See Section 2

Inhalation of dust or mist can cause irritation of the respiratory tract due to high acidity and tissue oxidation. Ulceration of mucous membranes of the nose and mouth can result from inhalation. Skin contact with acid solutions or the solid may cause irritation. However, the major damage occurs up to 48 hrs. after contact. The chromates slowly dissolve the skin, forming ulcers. Secondary infections can then occur on the broken skin. Chromic acid is also a sensitizer and may cause allergic skin rash. Eye contact may result in severe burns with loss of vision. Ingestion may cause severe burns of the intestinal tract with internal damage. Ingestion of 5 grams or less may be lethal for an adult. Long-term absorption may cause liver damage. Increased instances of respiratory cancers have been reported in the chromate-producing industry. In its 1975 criteria document, NIOSH identified chromium trioxide as a "noncarcinogenic chromium IV." The IARC has classified "chromium and certain chromium compounds" as being carcinogenic to humans. The specific chromium compounds responsible for the carcinogenic effects are not identified.

FIRST AID: INHALATION: Remove person to fresh air. If necessary, aid breathing and seek medical attention*.

EYE CONTACT: Immediately flush eyes, including under the eyelids, with running water for at least 15 minutes.

Obtain medical assistance promptly*. SKIN CONTACT: Promptly remove contaminated clothing and wash infected area with soap and water. Seek medical attention* if irritation persists or other symptoms develop.

INGESTION: Give person large quantities of milk or water to drink. Then induce vomiting. Get prompt medical attention*. (Never induce vomiting or give anything by mouth to an unconscious person.)

* GET MEDICAL ASSISTANCE = Inplant, Paramedic, Community.

SECTION 7. SPILL, LEAK AND DISPOSAL PROCEDURES

Notify safety/environmental personnel of spills. Clean-up personnel should wear respirators and protective gloves and clothing to prevent inhalation and skin contact. Provide adequate ventilation. Spread a reducing agent, such as sodium sulfite or ferrous sulfate, on liquid acid spills. Scoop up the resulting slurry into a container of water and neutralize with soda ash. Solid spills may be carefully scooped into containers taking care to minimize dust generation.

Disposal: Solutions containing this material should be chemically treated with reducing agents and pH-adjusted to precipitate chromium. The precipitate and other solids containing this material should be disposed of in an approved chemical waste landfill.

Follow applicable local, state, and federal regulations.

EPA Hazardous Waste Number: D007(EP Toxicity--40 CFR Part 261)

Reportable Spill Quantity: 1000 lbs. (454 kg)

SECTION 8. SPECIAL PROTECTION INFORMATION

Provide general and local exhaust ventilation to meet TLV requirements. NIOSH-approved high-efficiency dust/mist respirators with full facepiece should be used during non-routine/emergency operations and whenever the TLV may be exceeded. Self-contained breathing apparatus or supplied air respirators (both in positive pressure mode) should be worn under severe exposure conditions (75 mg/m^3). Tanks of chromic acid must be adequately exhausted, with chemically resistant duct work and fans. Employees should wear chemical safety goggles to prevent eye contact. Faceshields should also be worn where splashing can occur. Neoprene or other synthetic rubber gloves and apron or protective clothing should be worn (caution: chromic acid may attack some of these materials). If clothing becomes contaminated, fresh clothing should be obtained immediately. Launder contaminated clothing before reuse. Eyewash stations and safety showers should be readily accessible in areas of use.

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

SECTION 9. SPECIAL PRECAUTIONS AND COMMENTS

Store in closed containers away from oxidizable materials and other incompatible materials. Protect containers from physical damage. Maintain good housekeeping procedures. Avoid breathing dusts and mists. Avoid skin contact. Follow good personal hygiene practices. Wash hands thoroughly before eating and smoking. Wash all areas of the body which may have come in contact with this material at the end of each workday. Eating and smoking should not be permitted in areas where this material is handled.

DOT CLASSIFICATION: Oxidizer

LABEL: Oxidizer, solid

DOT ID NO.: NA 1463

DATA SOURCE(S) CODE (See Glossary) 2, 4, 9, 12, 19, 20, 27, 58, 60, 61, V.

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APPROVALS

Do Approved 11/85

INDUST. HYGIENE/SAFETY

JW 1-86

MEDICAL REVIEW:

[Signature] Jan 86

When heated to decomposition it emits very toxic fumes of PO_x and Cl^- . See also other coumarin entries.

DFH800 CAS:25323-30-2 **HR: 3**
DICHLOROETHYLENE
 DOT: UN 1150
 mf: $\text{C}_2\text{H}_2\text{Cl}_2$ mw: 96.94

TOXICITY DATA with REFERENCE

ihl-mus LCLo: 76 $\text{g}/\text{m}^3/2\text{H}$ AEXPBL 83,235,18
 ihl-gpg LCLo: 155 $\text{g}/\text{m}^3/1\text{H}$ AEXPBL 83,235,18
 orl-mam LDLo: 2500 mg/kg UGLAAD 121,375,59

DOT Classification: Flammable Liquid; Label: Flammable Liquid.

SAFETY PROFILE: Moderately toxic by ingestion. Mildly toxic by inhalation. Flammable when exposed to heat or flame. When heated to decomposition it emits toxic fumes of Cl^- . See also 1,1-DICHLOROETHYLENE.

DFI100 CAS:540-59-0 **HR: 3**
1,2-DICHLOROETHYLENE
 mf: $\text{C}_2\text{H}_2\text{Cl}_2$ mw: 96.94

SYNS: ACETYLENE DICHLORIDE \diamond DIOFORM \diamond 1,2-DICHLOR-
 AETHEN (GERMAN) \diamond DICHLORO-1,2-ETHYLENE (FRENCH) \diamond sym-
 DICHLOROETHYLENE \diamond NCI-C56031

TOXICITY DATA with REFERENCE

ipr-mus LD50: 2 g/kg EJTXAZ 7,247,74
 ihl-frg LCLo: 117 $\text{mg}/\text{m}^3/1\text{H}$ AISFAR 15,1,37
 orl-rat LD50: 770 mg/kg ARSIM* 20,10,66

CONSENSUS REPORTS: Reported in EPA TSCA Inventory. Community Right-To-Know List.

OSHA PEL: TWA 200 ppm
 ACGIH TLV: TWA 200 ppm
 DFG MAK: 200 ppm ($790 \text{ mg}/\text{m}^3$)

SAFETY PROFILE: Poison by inhalation. Moderately toxic by ingestion and other routes. When heated to decomposition it emits highly toxic fumes of Cl^- . See also ACETYLENE COMPOUNDS; and CHLORINATED HYDROCARBONS, ALIPHATIC.

DFI200 CAS:156-59-2 **HR: 1**
cis-DICHLOROETHYLENE
 mf: $\text{C}_2\text{H}_2\text{Cl}_2$ mw: 96.94
 HCCI=CHCI

PROP: Colorless liquid, pleasant odor. Mp: -80.5° , bp: 59° , lel: 9.7%, uel: 12.8%, flash p: 39°F , d: 1.2743 @ $25^\circ/4^\circ$, vap press: 400 mm @ 41.0° , vap d: 3.34.

SYN: 1,2-DICHLOROETHYLENE

TOXICITY DATA with REFERENCE

mno-smc 100 mmol/L TCMUD8 4,365,84
 mma-smc 40 mmol/L TCMUD8 4,365,84
 mrc-smc 100 mmol/L TCMUD8 4,365,84
 dns-rat:ivr 4300 $\mu\text{mol}/\text{L}$ CRNGDP 5,1629,84
 ihl-mus LCLo: 65000 $\text{mg}/\text{m}^3/2\text{H}$ AHBAAM 116,131,36
 ihl-cat LCLo: 20000 $\text{mg}/\text{m}^3/6\text{H}$ AHBAAM 116,131,36

CONSENSUS REPORTS: Reported in EPA TSCA Inventory.

DFG MAK: 200 ppm ($790 \text{ mg}/\text{m}^3$)

SAFETY PROFILE: Mildly toxic by ingestion and inhalation. In high concentration it is irritating and narcotic. Has produced liver and kidney injury in experimental animals. Mutation data reported. Sometimes thought to be nonflammable, however, it is a dangerous fire hazard when exposed to heat or flame. Reaction with solid caustic alkalis or their concentrated solutions produces chloroacetylene gas which ignites spontaneously in air. Reacts violently with N_2O_4 , KOH, Na, NaOH. Moderate explosion hazard in the form of vapor when exposed to flame. Can react vigorously with oxidizing materials. To fight fire, use water spray, foam, CO_2 , dry chemical. When heated to decomposition it emits toxic fumes of Cl^- . See also 1,1-DICHLOROETHYLENE and CHLORINATED HYDROCARBONS, ALIPHATIC.

DFI800 CAS:3967-55-3 **HR: 3**
1,2-DICHLOROETHYLENE CARBONATE
 mf: $\text{C}_2\text{H}_2\text{Cl}_2\text{O}_3$ mw: 156.95

SYN: 4,5-DICHLORO-2-OXO-1,3-DIOXOLANE

TOXICITY DATA with REFERENCE

scu-mus TDLo: 648 $\text{mg}/\text{kg}/54\text{W-I:ETA}$ JNCIAM
 48,1431,72

SAFETY PROFILE: Questionable carcinogen with experimental tumorigenic data. When heated to decomposition it emits toxic fumes of Cl^- .

DFJ000 CAS:14096-51-6 **HR: 3**
DICHLORO(ETHYLENEDIAMINE)PLATINUM(II)
 mf: $\text{C}_2\text{H}_8\text{Cl}_2\text{N}_2\text{Pt}$ mw: 326.11

SYNS: ETHYLENEDIAMINEDICHLORIDE PLATINUM (II) \diamond PLATINUM ETHYLENEDIAMMINE DICHLORIDE

TOXICITY DATA with REFERENCE

mno-sat 2 $\mu\text{g}/\text{plate}$ MUREAV 77,45,80
 dni-hmn:oth 25 $\mu\text{mol}/\text{L}$ IJCNW 6,207,70
 ipr-mus LDLo: 14 mg/kg BCPCA6 2,187,73

SAFETY PROFILE: Poison by intraperitoneal route. Human mutation data reported. See also PLATINUM COMPOUNDS. When heated to decomposition it emits very toxic fumes of Cl^- and NO_x .

Material Safety Data Sheet

from Genium's Reference Collection
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No. 385

ETHYL BENZENE
 (Revision A)
 Issued: August 1978
 Revised: November 1988

SECTION 1. MATERIAL IDENTIFICATION

27

Material Name: ETHYL BENZENE

Description (Origin/Uses): Used as a solvent and as an intermediate in the production of styrene monomer.

Other Designations: Phenylethane; Ethylbenzol; $C_2H_5C_6H_5$; CAS No. 0100-41-4

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



NFPA

HMIS

H	2	R	1
F	3	I	3
R	0	S	2
PPG*		K	4

*See sect. 8

SECTION 2. INGREDIENTS AND HAZARDS

%

EXPOSURE LIMITS

Ethyl Benzene, CAS No. 0100-41-4

Ca 100

OSHA PELs

8-Hr TWA: 100 ppm, 435 mg/m³
 15- Min STEL: 125 ppm, 545 mg/m³

ACGIH TLVs, 1988-89

TLV-TWA: 100 ppm, 435 mg/m³
 TLV-STEL: 125 ppm, 545 mg/m³

Toxicity Data*

Human, Inhalation, TC_{L_0} : 100 ppm (8 Hrs)
 Rat, Oral, LD_{50} : 3500 mg/kg

*See NIOSH, RTECS (DA0700000), for additional data with references to reproductive, irritative, and mutagenic effects.

SECTION 3. PHYSICAL DATA

Boiling Point: 277°F (136°C)
Melting Point: -139°F (-95°C)
Vapor Pressure: 7.1 Torrs at 68°F (20°C)
Vapor Density (Air = 1): 3.7
% Volatile by Volume: Ca 100

Molecular Weight: 106 Grams/Mole
Solubility in Water (%): Slight
Specific Gravity ($H_2O = 1$): 0.86258 at 77°F (25°C)

Appearance and Odor: A clear, colorless, flammable liquid; characteristic aromatic hydrocarbon odor.

SECTION 4. FIRE AND EXPLOSION DATA

Flash Point and Method: 64°F (18°C) CC | **Autoignition Temperature:** 310°F (432.22°C) | **LEL:** 1% v/v | **UEL:** 6.7% v/v

Extinguishing Media: Use foam, dry chemical, or carbon dioxide to put out ethyl benzene fires. A water spray may be ineffective in extinguishing the fire, because it can scatter and spread the burning liquid. Use water spray to cool fire-exposed containers of ethyl benzene, to disperse ethyl benzene vapor, and to protect personnel attempting to stop an ethyl benzene leak. **Unusual Fire or Explosion Hazards:** This liquid can readily form explosive vapor-air mixtures, especially when heated. Ethyl benzene vapor is heavier than air and may travel a considerable distance to a low-lying source of ignition and flash back to its origin. **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

Stability/Polymerization: Ethyl benzene is stable in closed containers during routine operations. Hazardous polymerization cannot occur. **Chemical Incompatibilities:** Hazardous chemical reactions can occur between ethyl benzene and strong oxidizing agents, acids, ammonia, and bases. **Conditions to Avoid:** Avoid any exposure to sources of ignition such as heat, sparks, open flame, and lighted tobacco products, etc., and to incompatible chemicals. Use caution when entering confined spaces, particularly low-lying areas where explosive concentrations of ethyl benzene vapor may be present. Provide good ventilation to such areas to prevent the concentration of this vapor. **Hazardous Products of Decomposition:** Thermal-oxidative degradation can include toxic gases such as carbon monoxide and/or aromatic hydrocarbon gases.

SECTION 6. HEALTH HAZARD INFORMATION

Carcinogenicity: Ethyl benzene is not listed as a carcinogen by the NTP, IARC, or OSHA.

Summary of Risks: Ethyl benzene vapor is severely irritating to the eyes and to the mucous membranes of the respiratory system. Sustained inhalation of excessive levels can cause depression of the central nervous system (CNS) characterized by dizziness, headache, narcosis, and coma. Skin contact with liquid ethyl benzene causes irritation; dermatitis and defatting can also develop. The acute oral toxicity of ethyl benzene is low; however, ingestion of it presents a serious aspiration hazard. Aspirating even a small amount into the lungs can result in extensive edema (lungs filled with fluid) and hemorrhaging of the lung tissue. No systemic effects are expected at the levels that produce pronounced, unignorable, disagreeable skin and eye irritation. The TLVs cited in section 2 are set to prevent this intolerable irritation. **Medical Conditions Aggravated by Long-Term Exposure:** None reported. **Target Organs:** Skin, eyes, respiratory system, and CNS. **Primary Entry:** Inhalation, skin contact **Acute Effects:** Irritation of the skin, eyes, and respiratory system. Also, cardiac-rhythm disturbance due to sensitization; acute bronchitis, bronchospasm, pulmonary and laryngeal edema; euphoria; headache; giddiness; dizziness; ...
First Aid: Eyes: Immediately

SECTION 6. HEALTH HAZARD INFORMATION, cont.

flush eyes, including under the eyelids, gently but thoroughly with flooding amounts of running water for at least 15 minutes. Skin. Rinse the affected area with plenty of water, 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 qualified medical personnel administer oxygen as required. Ingestion. Unlikely. Should this type of exposure occur, the aspiration hazard must be considered. Do not induce vomiting unless directed to do so by a physician. To prevent aspiration by spontaneous vomiting, keep the victim's head low (between his or her knees). 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: Professional judgment is required as to whether or not to induce vomiting because of the possibility of aspiration. A gastric lavage may be administered, followed by saline catharsis, if this procedure is appropriate to the specific incident. Monitor cardiac and pulmonary functions.

SECTION 7. SPILL, LEAK, AND DISPOSAL PROCEDURES

Spill/Leak: Notify safety personnel, evacuate unnecessary personnel, eliminate all sources of ignition immediately, and provide adequate explosion-proof ventilation. Cleanup personnel need protection against skin or eye contact with this liquid as well as inhalation of its vapor (see sect. 8). Contain large spills and collect waste or absorb it with an inert material such as sand, earth, or vermiculite. Use nonsparking tools to place waste liquid or absorbent into closable containers for disposal. Keep waste out of sewers, watersheds, and waterways. **Waste Disposal:** Contact your supplier or a licensed contractor for detailed recommendations. Follow Federal, state, and local regulations.

OSHA Designations

Listed as an Air Contaminant (29 CFR 1910.1000 Subpart Z).

EPA Designations (40 CFR 302.4)

CERCLA Hazardous Substance, Reportable Quantity: 1000 lbs (454 kg), per the Clean Water Act (CWA), §§ 311 (b) (4) and 307 (a).

SECTION 8. SPECIAL PROTECTION INFORMATION

Goggles: Always wear protective eyeglasses or chemical safety goggles. Where splashing 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 Genium reference 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 prolonged or repeated skin contact with this material. **Ventilation:** Install and operate general and local maximum, explosion-proof ventilation systems powerful enough to maintain airborne levels of this material below the OSHA PEL standard cited in section 2. Local exhaust ventilation is preferred because it prevents dispersion of the contaminant into the general work area by eliminating it at its source. Consult the latest edition of Genium reference 103 for detailed recommendations. **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 and before eating, drinking, smoking, using the toilet, or applying cosmetics. 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. Do not inhale ethyl benzene vapor.

SECTION 9. SPECIAL PRECAUTIONS AND COMMENTS

Storage/Segregation: Store ethyl benzene in closed containers in a cool, dry, well-ventilated area away from sources of ignition and strong oxidizers. Protect containers from physical damage. **Special Handling/Storage:** Outside, isolated, detached, or remote storage is recommended for large quantities of ethyl benzene. Isolate bulk storage areas from acute fire hazards. **Engineering Controls:** Make sure all engineering systems (production, transportation) are of maximum explosion-proof design. To prevent static sparks, electrically ground and bond all containers, pipelines, etc., used in shipping, transferring, reacting, production, and sampling operations. **Other:** Use safety cans for transferring small amounts of ethyl benzene.

Transportation Data (49 CFR 172.101-2)

DOT Shipping Name: Ethyl Benzene

DOT Hazard Class: Flammable Liquid

ID No. UN1175

DOT Label: Flammable Liquid

DOT Packaging Exceptions: 49 CFR 173.118

DOT Packaging Requirements: 49 CFR 173.119

IMO Shipping Name: Ethylbenzene

IMO Hazard Class: 3.2

IMO Label: Flammable Liquid

IMDG Packaging Group: II

References: 1, 26, 38, 84-94, 100, 116, 117, 120, 122.

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Material Safety Data Sheet

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No. 38
LEAD MONOXIDE
(Revision B)
Issued: November 1979
Revised: February 1986

SECTION 1. MATERIAL IDENTIFICATION 19

MATERIAL NAME: LEAD MONOXIDE

OTHER DESIGNATIONS: Lead (II) Oxide, Plumbous Oxide, Litharge, Massicot, PbO, CAS # 1317-36-8



MANUFACTURER/SUPPLIERS: Available from several suppliers, including:
NL Baroid, Inc., PO Box 1675, Houston, TX 77251; Telephone: (713) 527-1100
Eagle-Picher Industries, Inc., Chemicals Division, 580 Walnut Street, Cincinnati, OH 45202;
Telephone: (513) 721-7010

HMIS	Not Found
H: 2	
F: 0	R 0
R: 0	I 4
PPE: *	S 0
* See Sect. 8	K 0

SECTION 2. INGREDIENTS AND HAZARDS HAZARD DATA

	%	
LEAD MONOXIDE, PbO	>99	ACGIH TLV*: 8-hr TWA: 0.15 mg/m ³
* Current (1985-86) ACGIH TLV, as Pb		----- OSHA PEL**: 8-hr TWA: 0.05 mg/m ³
** Current OSHA PEL (as Pb) with an action level of 0.03 mg/m ³ (29 CFR 1910.1025)		----- Rat, Intraperitoneal, LDLo: 430 mg/kg
		----- Dog, Oral, LDLo: 1400 mg/kg

SECTION 3. PHYSICAL DATA

Melting Point ... 1646.6°F(897°C) (Begins to Sublime before Melting)
Boiling Point ... 2681.6°F(1472°C) (Decomposes)
Molecular Weight ... 223.2

	Litharge	Massicot
Density	9.53 g/cc	9.6 g/cc
Solubility in Water (@ 25°C)	0.0504 g/L	0.1065 g/L

Appearance and odor: Lead monoxide exists in two crystalline forms: litharge and massicot. The reddish litharge transforms to yellow massicot at 912.2°F(489°C). Lead monoxide is odorless.

SECTION 4. FIRE AND EXPLOSION DATA LOWER UPPER

Flash Point and Method	Autoignition Temp.	Flammability Limits In Air	LOWER	UPPER
NA	NA	NA		

This material is nonflammable. Use whatever extinguishing agents are appropriate for the surrounding fire.

When hot, lead monoxide can act as an oxidizing agent and may intensify combustion.

Toxic dust and fumes may be generated in a fire situation. Fire fighters should wear self-contained breathing apparatus and full protective gear.

SECTION 5. REACTIVITY DATA

Lead monoxide is stable at room temperature. It does not polymerize. When heated and cooled in air it can undergo transitions between crystalline and oxide forms.

Mixtures of lead oxide and chlorinated rubber may react violently when heated. A lead oxide-glycerol mixture (used as cement/jointing compound) can ignite when exposed to fluorine gas and may explode after exposure to perchloric acid fumes. Violent reactions can occur when lead monoxide is heated with aluminum, sodium, zirconium, titanium, boron, or silicon. Other incompatibles include hydrogen trisulfide, metal acetylides, and peroxyformic acid.

Toxic lead fumes can form at high temperatures.

SECTION 6. HEALTH HAZARD INFORMATION | TLV

Lead compounds are toxic when inhaled or ingested. Lead is a cumulative poison. The chief effects of excessive lead intake are anemia, neurological disorders, and kidney damage. Symptoms of the neurological effects may include irritability, headaches, insomnia, delirium, convulsions, muscular tremors, and palsy of the extremities. Excessive lead exposure may also have adverse effects on human reproduction. Symptoms of acute lead poisoning by ingestion include headache; abdominal pain; nausea; vomiting; diarrhea; and, in severe cases, coma and death. The IARC concludes that the evidence for carcinogenicity of lead and lead compounds to humans is inadequate. The NTP does not list lead monoxide in its third annual report on carcinogens.

FIRST AID: Any worker who experiences symptoms of lead poisoning should be removed from exposure and receive prompt medical care. **EYE CONTACT:** Flush eyes (including under the eyelids) with running water for at least 15 minutes. Obtain medical attention. **SKIN CONTACT:** Flush affected area with plenty of water. If irritation persists, seek medical attention. **INHALATION:** Remove victim from exposure. Get medical attention for treatment of symptoms. **INGESTION:** If person is conscious, give him/her plenty of milk or water to drink. Induce vomiting. Keep victim warm and at rest. Get medical assistance immediately.

SECTION 7. SPILL, LEAK, AND DISPOSAL PROCEDURES

Notify safety/environmental personnel of large spills. Ventilate spill area. Cleanup personnel should wear respiratory protection, gloves, and protective clothing. Carefully vacuum up spilled material. Place collected material in a suitable container that can be tightly sealed for reclaim or disposal. Avoid dusting conditions at all stages of handling.

DISPOSAL: Salvage material when possible. PbO requires disposal as a hazardous waste. Contact supplier or a licensed chemical waste disposal contractor for treatment, packaging, and disposal requirements. Follow Federal, state, and local regulations.

EPA Hazardous Waste No.: D008 (EP TOXIC; 40 CFR 261.24)

SECTION 8. SPECIAL PROTECTION INFORMATION

Provide local exhaust ventilation and/or other engineering controls to meet the PEL requirement. NIOSH-approved respirators should be worn where engineering controls and work practices do not reduce exposures to or below the PEL. Half-mask air-purifying respirators with high-efficiency filters are acceptable for concentrations up to 0.5 mg/m³ (2.5 mg/m³ with full facepiece). Protective clothing and equipment such as coveralls, gloves, hats, and shoes should be worn when exposures exceed the PEL or where the possibility of skin and eye contact exist. Provide clean body-covering work clothing weekly to workers exposed to above the PEL (daily if exposed above 0.2 mg/m³) and arrange for special handling and laundering of contaminated clothing. Changing rooms (with separate storage facilities for street and work clothing) and showers are required for employees exposed to above the PEL. Prevent dust from being transported to lunchroom by way of the ventilation system or contaminated clothing. Consult the OSHA lead standard (29 CFR 1910.1025) for detailed requirements.

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

SECTION 9. SPECIAL PRECAUTIONS AND COMMENTS

Store in tightly closed containers away from incompatibles. Protect containers from physical damage. Keep away from food or feed. Use good housekeeping procedures (vacuuming and/or wet cleanup) to prevent accumulation of dust. DO NOT use compressed air for cleaning surfaces or clothing (use vacuum). Follow good personal hygiene practice. Wash face and hands thoroughly after handling and before eating, drinking, or smoking. Do not eat, drink, or use tobacco in areas where this material is used.

Exposure monitoring, biological monitoring, and medical surveillance should be provided in accordance with the OSHA Lead Standard (29 CFR 1910.1025).

Prevent dust generation. Use with adequate ventilation. Avoid inhalation and contact. Do not ingest!

DOT Classification: Not listed in Hazardous Materials Table, 49 CFR 172.101.

Data Source(s) Code: 2, 4, 5, 12, 14, 25, 55, 57, 58, 61, 62, 82, 84. CV

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Approvals *JCO Accrocco*

Indust. Hygiene/Safety *JW 6/86*

Medical Review *[Signature]*

MATERIAL SAFETY DATA SHEET

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NO. 530

PETROLEUM "ETHER",
HIGH BOILING

DATE May 1984

SECTION I. MATERIAL IDENTIFICATION

MATERIAL NAME: PETROLEUM "ETHER", HIGH BOILING
DESCRIPTION: Distillation mixture of aliphatic hydrocarbons mainly in C₇ to C₈ range.
OTHER DESIGNATIONS: Ligroin(e); Aliphatic Naphtha, CAS #008 030 317, CAS #008⁸030 306;
CAS #008 032 324 (C₅-C₁₂ Aliphatic hydrocarbons); CAS #064 748 898 Light Aliphatic
Solvent Naphtha (see also MSDS #518)
MANUFACTURER: Available from several suppliers, including:
Fisher Scientific Co. - Chemical Manufacturing Div.
P.O. Box 375, Reagent Lane (201) 796-7100
Fairlawn, NJ 07410 Tel: (201) 796-7100

SECTION II. INGREDIENTS AND HAZARDS

	%	HAZARD DATA	
Typical Composition:			
Petroleum distillate (Aliphatic Naphtha C ₇ -C ₈)*	~100	8-hr TWA, ppm	
n-Hexane (Minor fraction or nil; see MSDS #397)		OSHA PEL**	ACGIH (1983) TLV
Heptanes } (Major fraction)		500	50
Octanes } (Major fraction)		500	400
Other Hydrocarbons (Minor fraction or nil)		500	300
*Petroleum fraction related to MSDS #518 but of higher boiling range, higher density, higher flash point.			
**Current OSHA PEL; NIOSH (1977) recommended a 10-hr TWA for all petroleum distillates of 350 mg/m ³ (85 ppm for heptane; 75 ppm for octane).			

SECTION III. PHYSICAL DATA

Boiling point, 1 atm, deg C ----- 80-130* Specific gravity, (H₂O=1) ----- 0.68-0.72*
Vapor pressure, 20C, mm Hg ----- ~40* Volatiles, % ----- ~100
Vapor density (Air=1) ----- ~3.4
Solubility in water ----- Insoluble

Appearance & Odor: Clear, colorless liquid. Slight, characteristic odor.

*Exact values depend on the particular petroleum "ether" cut used. Cuts narrower and lower boiling than this range are also used (see also MSDS #518).

SECTION IV. FIRE AND EXPLOSION DATA

Flash Point and Method	Autoignition Temp.	Flammability Limits in Air	Lower	Upper
>15F (CC)	~450F	% by Volume	~1	~6

Extinguishing media: Dry chemical, carbon dioxide, foam. Use water spray to cool fire-exposed containers and surroundings. Use smothering technique to put out fires. Water may be ineffective. Forced water stream could scatter fire. Highly flammable when exposed to heat or flame. Readily volatilizes to form explosive vapor-air mixtures. Vapors can flow along surfaces to distant ignition sources and flashback. Firefighters should wear self-contained breathing apparatus.

SECTION V. REACTIVITY DATA

This is a stable material in closed containers at room temperature under normal storage and handling conditions. It does not polymerize. Heating greatly increases the flammability hazard of this OSHA Class IB Flammable Liquid. It is incompatible with strong oxidizing agents. Thermal-oxidative degradation can yield partial oxidation products, hydrocarbons, carbon monoxide and carbon dioxide.

MATERIAL SAFETY DATA SHEET

GENIUM PUBLISHING CORPORATION
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SCHENECTADY, NY 12303-1836 USA
(518) 377-8855



NO. 531

CAMPHOR

DATE May 1984

SECTION I. MATERIAL IDENTIFICATION				
<p>MATERIAL NAME: CAMPHOR</p> <p>OTHER DESIGNATIONS: Natural Camphor, USP Camphor and Gum Camphor is d or (+)-Camphor CAS #000 464 493; d,l-or (+,-)-Camphor, CAS #021 368 683; 2-Camphānone; 2-Bornanone; 1,7,7-Trimethylbicyclo[2.2.1]heptan-2-one; Synthetic Camphor, CAS#000 076 222</p> <p>SUPPLIER: Material available from several suppliers, including: Alfa Products 152 Andover Street Danvers, MA 01923 Tel: (617) 777-1970</p>				
SECTION II. INGREDIENTS AND HAZARDS		%	HAZARD DATA	
Camphor		>97	8-hr TWA 2 mg/m ³ *	
<p>*Current OSHA PEL and the ACGIH (1968) TLV. After a 1969 study, ACGIH raised the TLV for Synthetic Camphor (CAS #000 076 222) to 2 ppm or 12 mg/m³ which is the 1983 TLV.</p>			<p><u>Oral LDLo</u> Human, infant 70 mg/kg Dog 800 mg/kg Rabbit 2000 mg/kg</p> <p><u>Rabbit, skin</u> 500 mg/24/hr/Mod Irr. d-Camphor.</p>	
SECTION III. PHYSICAL DATA				
Boiling point, 1 atm, deg C ----- 204 (Sublimes 14%/hr at 80 C; steam distills)		Specific gravity, 25/4 C ---- 0.992		
Vapor pressure at 41.5 C, mm Hg ---- 1.0		Melting point, deg C ----- <179		
Vapor density (Air=1) ----- 5.2		Evaporation rate (n-BuAc=1) -- <1		
Solubility in 100 g water at 25 C, g - 0.12 (colloidal)		Molecular weight ----- 152.2		
Appearance & Odor: Translucent, crystalline solid with a characteristic fragrant, penetrating odor. 50% recognition threshold, 16 ppm (1.6 ppm has also been reported)				
SECTION IV. FIRE AND EXPLOSION DATA			Lower	Upper
Flash Point and Method	Autoignition Temp.	Flammability Limits in Air		
150 F (CC)	871 F	Volume % in air	0.6	3.5
Extinguishing media: Dry chemical, carbon dioxide, alcohol foam, water spray. When heated, material emits flammable and explosive vapors. If it can be safely done, remove containers from fire area. Firefighters should use self-contained breathing apparatus and full protective clothing.				
SECTION V. REACTIVITY DATA				
Camphor is a stable material in closed containers at room temperature under normal storage and handling conditions. It does not polymerize. Avoid exposure of this combustible solid to heat and sources of ignition. It is incompatible with strong oxidizing agents such as potassium permanganate & chromic anhydride. Thermal-oxidative degradation products can include partial oxidation products and carbon monoxide.				

Material Safety Data Sheet

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GENIUM PUBLISHING CORP.

No. 683

POLYCHLORINATED BIPHENYLS
(PCBs)

Issued: November 1988



Genium

SECTION 1. MATERIAL IDENTIFICATION

27

Material Name: POLYCHLORINATED BIPHENYLS (PCBs)

Description (Origin/Uses): Commercial PCBs are mixtures that were once widely manufactured by combining chlorine gas, iron filings, and biphenyls. Their high stability contributes to their intended commercial applications and their accidental, long-term adverse environmental and health effects. PCBs are useful as insulators in electrical equipment because they are electrically nonconductive. Their distribution has been limited since 1976. The Aroclor PCB codes identify PCBs by type. The first two digits of a code indicate whether the PCB contains chlorinated biphenyls (12), chlorinated terphenyls, (54), or both (25, 44); the last two digits indicate the approximate percentage of chlorine. Found in insulating liquid, synthetic rubber, plasticizers, flame retardants, floor tile, printer's ink, paper and fabric coatings, brake linings, paints, automobile body sealants, asphalt, adhesives, electrical capacitors, electrical transformers, vacuum pumps, gas-transmission turbines, heat-transfer fluids, hydraulic fluids, lubricating and cutting oil, copying paper, carbonless copying paper, and fluorescent light ballasts.

Synonym: Chlorodiphenyls

Other Designations (Producer, Trade Name, Nation): Monsanto, Aroclor® (USA, Great Britain); Bayer, Clophen® (German Democratic Republic); Prodelec, Phenoclor®, Pyralene® (France); Kanegafuchi, Kanechlor®; Mitsubishi, Santotherm® (Japan); Caffaro, Fenclor® (Italy).

Trade Name	CAS No.	RTECS No.	Trade Name	CAS No.	RTECS No.	HMIS
Aroclors	01336-36-3	TQ1350000	Aroclor 1242	53469-21-9	TQ1356000	H 1 R 1
Aroclor 1016	12674-11-2	TQ1351000	Aroclor 1248	12672-29-6	TQ1358000	F 1 I 3
Aroclor 1221	11104-28-2	TQ1352000	Aroclor 1254	11097-69-1	TQ1360000	R 0 S 1
Aroclor 1232	11141-16-5	TQ1354000	Aroclor 1260	11096-82-5	TQ1362000	PPG* K 1

SECTION 2. INGREDIENTS AND HAZARDS/EXPOSURE LIMITS

PCB-42% Chlorine/Aroclor 1242	PCB-54% Chlorine/Aroclor 1254	All PCBs/Aroclors
CAS No. 53469-21-9	CAS No. 11097-69-1	CAS No. 1336-36-3
OSHA PEL (Skin*)	OSHA PEL (Skin*)	NIOSH REL 1977
8-Hr TWA: 1 mg/m ³	8-Hr TWA: 0.5 mg/m ³	10-Hour TWA: 0.001mg/m ³
ACGIH TLV (Skin*), 1988-89	ACGIH TLV (Skin*), 1988-89	Toxicity Data**
TLV-TWA: 1 mg/m ³	TLV-TWA: 0.5 mg/m ³	Mouse, Oral, LD ₅₀ : 1900 mg/kg

*This material can be absorbed through intact skin, which contributes to overall exposure.

**See NIOSH, RTECS (Genium ref. 90), at the locations specified in section 1 for additional data with references to tumorigenic, reproductive, mutagenic, and irritative effects.

SECTION 3. PHYSICAL DATA

Bolling Point: Ranges from 527°F (275°C) to 725°F (385°C)	% Volatile by Volume: Ranges from 1.2 to 1.6
Solubility in Water (%): Insoluble	Molecular Weight (Average): Aroclor 1242: 258 Grams/Mole
Pour Point: Ranges from -31°F (-35°C) to 87.8°F (31°C)	Aroclor 1254: 326 Grams/Mole

Appearance and Odor: Clear to light yellow mobile oil to a sticky resin; a sweet "aromatic" odor. As the percentage of chlorine increases, the PCB becomes thicker and heavier; e.g., Aroclor 1254 is more viscous than Aroclor 1242.

SECTION 4. FIRE AND EXPLOSION DATA

Flash Point*	Autoignition Temperature: Not Found	LEL: Not Found	UEL: Not Found
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Extinguishing Media: Use water spray/fog, carbon dioxide (CO₂), dry chemical, or "alcohol" foam to extinguish fires that involve polychlorinated biphenyls. Although it is very difficult to ignite PCBs, they are often mixed with more flammable materials (oils, solvents, etc.) Unusual Fire or Explosion Hazards: If a transformer containing PCBs is involved in a fire, its owner may be required to report the incident to appropriate authorities. Consult and follow all pertinent Federal, state, and local regulations. Special Fire-fighting Procedures: Wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in the pressure-demand or positive-pressure mode; fire fighters must also wear a complete set of protective clothing. Comments: The hazards of PCB fires are associated with the possibility of their being released into the environment where they and their products of degeneration can pose serious long-term health risks. These potential problems are heightened by the PCBs' resistance to biological and chemical degradation and by the possibility that they will contaminate underground water systems (see sect. 5)

*Ranges from 284°F (140°C) to 392°F (200°C).

SECTION 5. REACTIVITY DATA

Stability/Polymerization: Polychlorinated biphenyls are very stable materials. Hazardous polymerization cannot occur. Chemical Incompatibilities: PCBs can react dangerously with sodium or potassium. These reactions are part of an industrial process used to destroy PCBs; however, people have been killed by explosions at PCB treatment, storage, and disposal sites. Conditions to Avoid: Limit human exposure to PCBs to the lowest possible level; especially avoid contact with skin. Hazardous Products of Decomposition: Thermal-oxidative degradation of PCBs can produce toxic gases such as carbon monoxide, chlorine, chlorinated aromatic fragments, phenolics, aldehydes, and hydrogen chloride. Incomplete combustion of PCBs produces toxic compounds such as polychlorinated dibenzofuran (PCDF, the major product of combustion), and polychlorinated dibenzo-*p*-dioxin (PCDD or dioxin).



SECTION 1. MATERIAL IDENTIFICATION

20

MATERIAL NAME: Toluene

OTHER DESIGNATIONS: Methyl Benzene, Methyl Benzol, Phenylmethane, Toluol, C₇H₈, CAS #0108-88-3

MANUFACTURER/SUPPLIER: Available from many suppliers, including:
 Allied Corp., PO Box 2064R, Morristown, NJ 07960; Telephone: (201) 455-4400
 Ashland Chemical Co., Industrial Chemicals & Solvents Div., PO Box 2219,
 Columbus, OH; Telephone: (614) 889-3844

HIMIS

H: 2

F: 3

R: 0

PPE*

*See sect. 8



R 1
 I 3
 S 2
 K 4

SECTION 2. INGREDIENTS AND HAZARDS

% HAZARD DATA

Toluene



ca 100

8-hr TLV: 100 ppm, or
 375 mg/m³* (Skin)**

Man, Inhalation, TClO:
 100 ppm: Psychotropic***

Rat, Oral, LD₅₀: 5000 mg/kg

Rat, Inhalation, LCLo:
 4000 ppm/4 hrs.

Rabbit, Skin, LD₅₀: 14 gm/kg

Human, Eye: 300 ppm

- * Current (1985-86) ACGIH TLV. The OSHA PEL is 200 ppm with an acceptable ceiling concentration of 300 ppm and an acceptable maximum peak of 500 ppm/10 minutes.
- ** Skin designation indicates that toluene can be absorbed through intact skin and contribute to overall exposure.
- *** Affects the mind.

SECTION 3. PHYSICAL DATA

Boiling Point ... 231°F (111°C)

Vapor Pressure @ 20°C, mm Hg ... 22

Water Solubility @ 20°C, wt. % ... 0.05

Vapor Density (Air = 1) ... 3.14

Evaporation Rate (BuAc = 1) ... 2.24

Specific Gravity (H₂O = 1) ... 0.866

Melting Point ... -139°F (-95°C)

Percent Volatile by Volume ... ca 100

Molecular Weight ... 92.15

Appearance and odor: Clear, colorless liquid with a characteristic aromatic odor. The odor is detectable to most individuals in the range of 10 to 15 ppm. Because olfactory fatigue occurs rapidly upon exposure to toluene, odor is not a good warning property.

SECTION 4. FIRE AND EXPLOSION DATA

LOWER UPPER

Flash Point and Method

Autoignition Temp.

Flammability Limits In Air

40°F (4°C) CC

896°F (480°C)

% by Volume

1.27

7.1

EXTINGUISHING MEDIA: Carbon dioxide, dry chemical, alcohol foam. Do not use a solid stream of water because the stream will scatter and spread the fire. Use water spray to cool tanks/containers that are exposed to fire and to disperse vapors.

UNUSUAL FIRE/EXPLOSION HAZARDS: This OSHA class IB flammable liquid is a dangerous fire hazard. It is a moderate fire hazard when exposed to oxidizers, heat, sparks, or open flame. Vapors are heavier than air and may travel a considerable distance to an ignition source and flash back.

SPECIAL FIRE-FIGHTING PROCEDURES: Fire fighters should wear self-contained breathing apparatus with full facepiece operated in a positive-pressure mode when fighting fires involving toluene.

SECTION 5. REACTIVITY DATA

CHEMICAL INCOMPATIBILITIES: Toluene is stable in closed containers at room temperature under normal storage and handling conditions. It does not undergo hazardous polymerization. This material is incompatible with strong oxidizing agents, dinitrogen tetroxide, silver perchlorate, tetranitromethane, and uranium hexafluoride. Contact with these materials may cause fire or explosion. Nitric acid and toluene, especially in the presence of sulfuric acid, will produce nitrated compounds that are dangerously explosive.

CONDITIONS TO AVOID: Avoid exposure to sparks, open flame, hot surfaces, and all sources of heat and ignition. Toluene will attack some forms of plastics, rubber, and coatings. Thermal decomposition or burning produces carbon dioxide and/or carbon monoxide.

SECTION 6. HEALTH HAZARD INFORMATION | TLV

Toluene is not considered a carcinogen by the NTP, IARC, or OSHA. **SUMMARY OF RISKS:** Vapors of toluene may cause irritation of the eyes, nose, upper respiratory tract, and skin. Exposure to 200 ppm for 8 hours causes mild fatigue, weakness, confusion, lacrimation (tearing) and paresthesia (a sensation of prickling, tingling, or creeping on the skin that has no objective cause). Exposure to higher concentrations may cause headache, nausea, dizziness, dilated pupils, and euphoria, and, in severe cases, may cause unconsciousness and death. The liquid is irritating to the eyes and skin. Contact with the eyes may cause transient corneal damage, conjunctival irritation, and burns if not promptly removed. Repeated and/or prolonged contact with the skin may cause drying and cracking. It may be absorbed through the skin in toxic amounts. Ingestion causes irritation of the gastrointestinal tract and may cause effects resembling those from inhalation of the vapor. Chronic overexposure to toluene may cause reversible kidney and liver injury. **FIRST AID: EYE CONTACT:** Immediately flush eyes, including under eyelids, with running water for at least 15 minutes. Get medical attention if irritation persists. **SKIN CONTACT:** Immediately flush skin (for at least 15 minutes) while removing contaminated shoes and clothing. Wash exposed area with soap and water. Get medical attention if irritation persists or if a large area has been exposed. **INHALATION:** Remove victim to fresh air. Restore and/or support breathing as required. Keep victim warm and quiet. Get medical help. **INGESTION:** Give victim 1 to 2 glasses of water or milk. Contact a poison control center. Do not induce vomiting unless directed to do so. Transport victim to a medical facility. Never give anything by mouth to a person who is unconscious or convulsing. **GET MEDICAL ASSISTANCE** - In plant, paramedic, community. Get medical help for further treatment, observation, and support after first aid, if indicated.

SECTION 7. SPILL, LEAK, AND DISPOSAL PROCEDURES

SPILL/LEAK: Notify safety personnel of large spills or leaks. Remove all sources of heat and ignition. Provide maximum explosion-proof ventilation. Limit access to spill area to necessary personnel only. Remove leaking containers to safe place if feasible. Cleanup personnel need protection against contact with liquid and inhalation of vapor (see sect. 8). **WASTE DISPOSAL:** Absorb small spills with paper towel or vermiculite. Contain large spills and collect if feasible, or absorb with vermiculite or sand. Place waste solvent or absorbent into closed containers for disposal using nonsparking tools. Liquid can be flushed with water to an open holding area for handling. Do not flush to sewer, watershed, or waterway. **COMMENTS:** Place in suitable container for disposal by a licensed contractor or burn in an approved incinerator. Consider reclaiming by distillation. Contaminated absorbent can be buried in a sanitary landfill. Follow all Federal, state, and local regulations. TLV 96: 100-10 ppm. Toluene is designated as a hazardous waste by the EPA. The EPA (RCRA) HW No. is U220 (40 CFR 261). The reportable quantity (RQ) is 1000 lbs/454 kg (40 CFR 117).

SECTION 8. SPECIAL PROTECTION INFORMATION

Provide general and local exhaust ventilation to meet TLV requirements. Ventilation fans and other electrical service must be nonsparking and have an explosion-proof design. Exhaust hoods should have a face velocity of at least 100 fpm (linear feet per minute) and be designed to capture heavy vapor. For emergency or nonroutine exposures where the TLV may be exceeded, use an organic chemical cartridge respirator if concentration is less than 200 ppm and an approved canister gas mask or self-contained breathing apparatus with full facepiece if concentration is greater than 200 ppm. Safety glasses or splash goggles should be worn in all work areas. Neoprene gloves, apron, face shield, boots, and other appropriate protective clothing and equipment should be available and worn as necessary to prevent skin and eye contact. Remove contaminated clothing immediately and do not wear it until it has been properly laundered.

Eyewash stations and safety showers should be readily available in use and handling areas.

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

SECTION 9. SPECIAL PRECAUTIONS AND COMMENTS

STORAGE SEGREGATION: Store in a cool, dry, well-ventilated area away from oxidizing agents, heat, sparks, or open flame. Storage areas must meet OSHA requirements for class IB flammable liquids. Use metal safety cans for handling small amounts. Protect containers from physical damage. Use only with adequate ventilation. Avoid contact with eyes, skin, or clothing. Do not inhale or ingest. Use caution when handling this compound because it can be absorbed through intact skin in toxic amounts. **SPECIAL HANDLING/STORAGE:** Ground and bond metal containers and equipment to prevent static sparks when making transfers. Do not smoke in use or storage areas. Use nonsparking tools. **ENGINEERING CONTROLS:** Preplacement and periodic medical exams emphasizing the liver, kidneys, nervous system, lungs, heart, and blood should be provided. Workers exposed to concentrations greater than the action level (50 ppm) should be examined at least once a year. Use of alcohol can aggravate the toxic effects of toluene.

COMMENTS: Emptied containers contain product residues. Handle accordingly!

Toluene is designated as a hazardous substance by the EPA (40 CFR 116). DOT Classification: Flammable liquid. UN1294.

Data Source(s) Code: 1-9, 12, 16, 20, 21, 24, 26, 34, 81, 82. CR

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Approvals *JO. Recheles, 11/86.*

Indust. Hygiene/Safety *JW p-86*

Medical Review *JW p-86*

Material Safety Data Sheet

From Genium's Reference Collection
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No. 312
TRICHLOROETHYLENE
 (Revision E)

Issued: July 1979
 Revised: August 1987

SECTION 1. MATERIAL IDENTIFICATION

MATERIAL NAME: TRICHLOROETHYLENE

DESCRIPTION (Origin/Uses): Prepared from *sym*-tetrachloroethane by way of eliminating HCl by boiling with lime. Used to manufacture organic chemicals, pharmaceuticals; in degreasing and dry cleaning; and as a solvent for fats, waxes, rubbers, oils, paints, varnishes, ethers, and cellulose esters.



OTHER DESIGNATIONS: Ethylene Trichloride; TCE; Trichloroethene; 1,1,2-Trichloroethylene;

C_2HCl_3 ; NIOSH RTECS #KX4550000; CAS #0079-01-6

MANUFACTURER/SUPPLIER: Available from several suppliers, including:

Dow Chemical USA, 2020 Dow Center, Midland, MI 48640;

Telephone: (517) 636-1000; (800) 258-CHEM

COMMENTS: Trichloroethylene is a toxic solvent and a suspected occupational carcinogen.

HMIS

H 2

F 1

R 1

PPE*

I 3

S 1

K 0

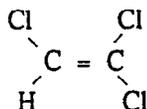
* See sect. 8

SECTION 2. INGREDIENTS AND HAZARDS

Trichloroethylene, CAS #0079-01-6; NIOSH RTECS #KX4550000

%

HAZARD DATA



- * The TLV-TWA is set to control subjective complaints such as headache, fatigue, and irritability.
- ** The TLV-STEL is set to prevent incoordination and other beginning anesthetic effects from TCE. These levels should provide a wide margin of safety in preventing liver injury.
- *** The OSHA PEL is 300 ppm for 5 minutes in any 2 hours.

ACGIH Values 1987-88
 TLV-TWA*: 50 ppm, 270 mg/m³
 TLV-STEL**: 200 ppm, 1080 mg/m³
 OSHA PEL 1986***
 8-Hr TWA: 100 ppm
 Ceiling: 200 ppm
 NIOSH REL 1986
 10-Hr TWA: 25 ppm
TOXICITY DATA
 Human, Oral, LD₅₀: 7 g/kg
 Human, Inhalation, TC_{Lo}: 6900 mg/m³
 (10 Min)
 Human, Inhalation, TC_{Lo}: 160 ppm/
 83 Min
 Human, Inhalation, TD_{Lo}: 812 mg/kg

SECTION 3. PHYSICAL DATA

Boiling Point ... 188.6°F (87°C)

Vapor Pressure ... 58 Torr at 68°F (20°C)

Water Solubility ... Insoluble

Vapor Density (Air = 1) ... 4.53

Evaporation Rate ... Not Listed

Specific Gravity ... 1.4649 at 68°F (20°C)

Melting Point ... -120.64°F (-84.8°C)

Molecular Weight ... 131.40 Grams/Mole

Appearance and odor: Colorless, nonflammable mobile liquid; sweetish odor like chloroform.

COMMENTS: TCE is highly soluble in lipids. A high vapor pressure at room temperature provides the potential for TCE vapors to contaminate use areas.

SECTION 4. FIRE AND EXPLOSION DATA

LOWER

UPPER

Flash Point and Method

Autoignition Temperature

Flammability Limits in Air

Not Listed

770°F (410°C)

% by Volume

8%

10.5%

EXTINGUISHING MEDIA: TCE has no flash point in a conventional closed tester at room temperature, but it is moderately flammable at higher temperatures. Use dry chemical, carbon dioxide, alcohol foam, or other extinguishing agents suitable for the surrounding fire.

OSHA Flammability Class (29 CFR 1910.106): Not Regulated

UNUSUAL FIRE/EXPLOSION HAZARDS: During fire conditions TCE emits highly toxic and irritating fumes, including hydrochloric acid and phosgene. **SPECIAL FIRE-FIGHTING PROCEDURES:** Wear a self-contained breathing apparatus with a full facepiece operated in a pressure-demand or another positive-pressure mode. At TCE vapor levels of 300-1000 ppm, fire fighters who lack the proper respiratory equipment may experience incoordination and impaired judgment.

DOT Flammability Class (49 CFR 173.115): Not Regulated

SECTION 5. REACTIVITY DATA

Trichloroethylene is stable. Hazardous polymerization can occur under certain circumstances (see Conditions to Avoid and Comments, below).

CHEMICAL INCOMPATIBILITIES include magnesium or aluminum powder, NaOH, KOH, or other strong alkaline materials. Reactions with alkaline materials may lead to the formation of dangerous explosive mixtures of chloroacetylenes.

CONDITIONS TO AVOID: When TCE is heated (as in the case with vapor degreasers) or exposed to sunlight, it requires extra stabilization against oxidation, degradation, and polymerization. It is slowly decomposed by light when moist.

PRODUCTS OF HAZARDOUS DECOMPOSITION include hydrochloric acid and phosgene under certain conditions at elevated temperatures.

COMMENTS: TCE is stable under normal handling and storage conditions, and hazardous polymerization is not expected to occur. However, failure of the stabilizer at elevated temperatures or other extreme conditions may allow polymerization to take place.

SECTION 6. HEALTH HAZARD INFORMATION

Trichloroethylene is listed as a carcinogen by the NTP, IARC, and OSHA. NIOSH recommends that trichloroethylene be treated as an occupational carcinogen. IARC carcinogenic results are animal suspect, animal positive, and human indefinite. **SUMMARY OF RISKS:** Moderate exposures to TCE cause symptoms similar to those of alcohol inebriation. Higher concentrations cause narcotic effect. Ventricular fibrillation has been cited as the cause of death following heavy exposures. TCE-induced hepato cellular carcinomas have been detected in mice during tests conducted by the National Cancer Institute (*Chem & Eng News* 54 (April 5, 1976):4). Organ systems affected by overexposure to TCE are the central nervous system (euphoria, analgesia, anesthesia), degeneration of the liver and kidneys, the lungs (tachypnea), heart (arrhythmia) and skin (irritation, vesication, and paralysis of fingers when immersed in liquid TCE). Contact with the liquid defats the skin, causing topical dermatitis. Certain people appear to experience synergistic effects from TCE exposure concomitant with exposure to caffeine, alcohol, and other drugs. When combined with alcohol intake, toxic effects are increased and may cause a red, blotchy facial and upper body rash commonly called "degreaser's flush." Other reported symptoms of TCE exposure include abnormal fatigue, headache, irritability, gastric disturbances, and intolerance to alcohol. Toxic effects from testing of TCE on humans include hallucination, distorted perception, somnolence (general depressed activity), and jaundice. **TARGET ORGANS:** Respiratory system, central nervous system, heart, liver, kidneys, and skin. **PRIMARY ENTRY:** Ingestion, inhalation, skin contact. **ACUTE EFFECTS:** Headache, vertigo, visual disturbance, tremors, nausea, vomiting, dermatitis, dizziness, drowsiness, and irritation to the eyes, nose, and throat. **CHRONIC EFFECTS:** None Reported. **MEDICAL CONDITIONS AGGRAVATED BY LONG-TERM EXPOSURE:** Diseases of the liver, kidneys, lungs, and central nervous system. **FIRST AID: EYE CONTACT:** Immediately flush eyes, including under the eyelids, gently but thoroughly with plenty of running water for at least 15 minutes. Get medical help.* **SKIN CONTACT:** Wash thoroughly with soap and water. Remove and launder contaminated clothing before wearing it again; clean material from shoes and equipment. Get medical help.* **INHALATION:** Remove victim to fresh air; restore and/or support his breathing as needed. Do not give adrenalin to the victim. Get medical help.* **INGESTION:** Call a poison control center. Never give anything by mouth to someone who is unconscious or convulsing. A professional decision regarding whether or not to induce vomiting is required. Do not give adrenalin to the victim. Get medical help.* ***GET MEDICAL ASSISTANCE = IN PLANT, PARAMEDIC, COMMUNITY.** Get prompt medical assistance for further treatment, observation, and support after first aid.

COMMENTS: Workers' responses to TCE vary significantly because of many factors, including age, health status, nutrition, and intake of alcohol, caffeine, and medicines. Do not use these substances before, during, or after exposure to TCE. If a worker displays any of the symptoms of exposure to TCE, thoroughly investigate all the possible contributing factors to determine, if possible, how much the work environment levels of TCE are responsible.

SECTION 7. SPILL, LEAK, AND DISPOSAL PROCEDURES

SPILL/LEAK: Inform safety personnel of any trichloroethylene spill or leak and evacuate the area for large spills. Cleanup personnel must use respiratory and liquid contact protection. Adequate ventilation must be provided. Confine the spilled TCE to as small an area as possible. Do not allow it to run off to sewers or open waterways. Pick up spilled TCE with a vacuum cleaner or an absorbent such as vermiculite.

DISPOSAL: Consider reclamation, recycling, or destruction rather than disposal in a landfill.

Trichloroethylene is designated as a hazardous substance by the EPA (40 CFR 116.4).

Trichloroethylene is reported in the 1983 EPA TSCA Inventory.

EPA Hazardous Waste Number (40 CFR 261.33): U228

EPA Reportable Quantity (40 CFR 117.3): 1000 lbs (454 kgs)

Aquatic Toxicity Rating, TLM 96: Not Listed

SECTION 8. SPECIAL PROTECTION INFORMATION

GOGGLES: Always wear protective eyeglasses or chemical safety goggles. Follow the eye and face protection guidelines of 29 CFR 1910.133. **GLOVES:** Wear impervious gloves. **RESPIRATOR:** Use a NIOSH-approved respirator per the *NIOSH Guide to Chemical Hazards* (Genium ref. 88) for the maximum-use concentrations and/or the exposure limits cited in section 2. Follow the respirator guidelines in 29 CFR 1910.134. Any detectable concentration of TCE requires an SCBA, full facepiece, and pressure-demand/positive-pressure modes. **WARNING:** Air-purifying respirators will not protect workers from oxygen-deficient atmospheres. **OTHER EQUIPMENT:** Wear rubber boots, aprons, and other suitable body protection appropriate to the existing work environment. **VENTILATION:** Install and operate general and local exhaust ventilation systems of sufficient power to maintain airborne concentrations of TCE below the OSHA PEL standards cited in section 2. **SAFETY STATIONS:** Make eyewash stations, washing facilities, and safety showers available in areas of use and handling. Contact lenses pose a special hazard; soft lenses may absorb irritants, and all lenses concentrate them. **OTHER SPECIAL MODIFICATIONS IN THE WORKPLACE:** Because of the unresolved controversy about the carcinogenic status of TCE, all existing personal protective equipment and engineering technology should be used to prevent any possibility of worker contact with this material.

COMMENTS: Practice good personal hygiene. Keep material off of your clothes and equipment. Avoid transfer of material from hands to mouth while eating, drinking, or smoking. Adhere to the sanitation requirements of 29 CFR 1910.141 and 29 CFR 1910.142.

SECTION 9. SPECIAL PRECAUTIONS AND COMMENTS

STORAGE SEGREGATION: Prevent TCE from coming into contact with strong caustics such as NaOH; KOH; chemically active metal like Ba, Li, Na, Mg, Ti; and powdered aluminum or magnesium in acidic solutions. **SPECIAL HANDLING/STORAGE:** Store this material in a cool, dry, well-ventilated area. Avoid elevated temperatures because products of toxic and corrosive decomposition from TCE may form. Monitor the level of any stabilizer component that may be added to the TCE. (Consult the technical data from the supplier to determine the specifics of any added stabilizer.) If applicable, follow the supplier's recommendation concerning proper rotation of stock, shelf-life requirements, and levels of stabilizers.

ENGINEERING CONTROLS IN THE WORKPLACE: Avoid collecting aluminum fines (very small particles) or chips in a TCE vapor degreaser. Monitor TCE stabilizer levels regularly. Only trained personnel should operate vapor degreasers.

TRANSPORTATION DATA (per 49 CFR 172.101-2):

DOT Hazard Class: ORM-A	DOT ID No. UN1710	IMO Class: 6.1
IMO Label: St. Andrew's Cross (X)*	DOT Shipping Name: Trichloroethylene	DOT Label: None

* Harmful - Stow away from foodstuffs (IMO Label, Materials of Class 6.1 Packaging Group III).

References: 1-9, 12, 14, 21, 73, 87-94. PI

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Approvals *JO DeCiccio*

Indust. Hygiene/Safety *[Signature]*

Medical Review *[Signature]*

11-18-87

Material Safety Data Sheet

From Genium's Reference Collection
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GENIUM PUBLISHING CORP.

No. 382

VINYL CHLORIDE
(Revision A)
Issued: August 1978
Revised: August 1988

SECTION 1. MATERIAL IDENTIFICATION

26

Material Name: VINYL CHLORIDE

Description (Origin/Uses): Widely used to make PVC resins and plastics; also used in organic synthesis.

Other Designations: VCM; Vinyl Chloride Monomer; Chloroethylene; Chloroethene; C_2H_3Cl ; CAS No. 0075-01-4

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



NFPA

HMIS

H 2

F 4

R 1

PPG*

*See sect. 8

R 1

I 4

S 3

K 4

SECTION 2. INGREDIENTS AND HAZARDS

%

EXPOSURE LIMITS

Vinyl Chloride, CAS No. 0075-01-4

Ca 100

OSHA PEL

8-Hr TWA: 1 ppm*

ACGIH TLV, 1987-88

TLV-TWA: 5 ppm, 10 mg/m³

Toxicity Data**

Rat, Oral, LD₅₀: 500 mg/kg

*The action level set by OSHA in 29 CFR 1910.1017 is 0.5 ppm. Exposures above this level are strictly regulated by extensive medical record keeping, reporting, surveillance, and other requirements. Consult 29 CFR 1910.1017 for details.

**See NIOSH, RTECS (No. KU9625000), for additional data with references to mutagenic, reproductive, and tumorigenic effects.

SECTION 3. PHYSICAL DATA

Boiling Point: 61°F (16°C)

Water Solubility (%): Insoluble

Molecular Weight: 107 Grams/Mole

Vapor Density (Air = 1): 2.2

Appearance and Odor: A colorless gas; mild, sweet odor at high concentrations.

SECTION 4. FIRE AND EXPLOSION DATA

LOWER

UPPER

Flash Point and Method	Autoignition Temperature	Flammability Limits in Air	LOWER	UPPER
-108.4°F (-78°C)	882°F (472°C)	% by Volume	3.6%	33%

Extinguishing Media: Vinyl chloride gas is a severe fire and explosion hazard; treat any fire involving it as an emergency. Try to shut off the flow of gas. Use a water spray to protect the personnel attempting this and to cool fire-exposed cylinders/containers of vinyl chloride.

Unusual Fire or Explosion Hazards: This heavier-than-air gas can flow along surfaces, reach distant sources of ignition, and flash back. Eliminate sources of ignition in the workplace, particularly in low-lying areas such as sumps, cellars, basement utility rooms, and underground piping systems.

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

Vinyl chloride is stable in closed, airtight, pressurized containers at room temperature under normal storage and handling conditions. It can undergo hazardous polymerization if it is heated or reacted with a polymerization catalyst, or if the concentration/activity of the added inhibitor becomes too low.

Chemical Incompatibilities: This material is incompatible with copper, aluminum, and other polymerization catalysts or free radical initiators like hydroquinone.

Conditions to Avoid: Do not allow sources of ignition such as open flame, unprotected heaters, lighted tobacco products, electric sparks, or excessive heat in work areas. Avoid prolonged exposure to air, especially in the presence of certain contaminants, because dangerous levels of polyperoxides may accumulate. Avoid exposure to sunlight; if the proper catalytic conditions occur, the vinyl chloride monomer may react with itself and undergo an explosive polymerization reaction. Violent ruptures of containers of this gas can occur.

Hazardous Products of Decomposition: During fires, vinyl chloride may decompose into toxic gases such as hydrogen chloride, carbon monoxide, and phosgene.

SECTION 6. HEALTH HAZARD INFORMATION

Vinyl chloride is listed as a carcinogen by the ACGIH, NTP, and IARC with sufficient epidemiological evidence from human studies.

Summary of Risks: Vinyl chloride depresses the central nervous system (CNS), causing effects that resemble mild alcohol intoxication; however, these effects can progress to narcosis, eventual collapse, and even death as the intensity and/or duration of the exposure continues. Thrombocytopenia (decrease in blood platelets) has been reported following exposures.

Medical Conditions Aggravated by Long-Term Exposure: Possible liver effects. **Target Organs:** Respiratory system, skin, eyes, kidneys, hematopoietic (blood) system, and musculoskeletal system. **Primary Entry:** Inhalation. **Acute Effects:** Headache, dizziness, lightheadedness, skin and eye irritation. **Chronic Effects:** Cancer, especially angiosarcoma of the liver.

FIRST AID: Eyes. Immediately flush eyes, including under the eyelids, gently but thoroughly with plenty of running water for at least 15 minutes. **Skin.** Skin contact with liquid vinyl chloride causes frostbite (cryogenic injury). Treat this accordingly.

Inhalation. Remove the exposed person to fresh air; restore and/or support his or her breathing as needed.

Ingestion. Unlikely.

GET MEDICAL HELP (IN PLANT, PARAMEDIC, COMMUNITY) FOR ALL EXPOSURES. Seek prompt medical assistance for further treatment, observation, and support after first aid.

SECTION 7. SPILL, LEAK, AND DISPOSAL PROCEDURES

Spill/Leak: *Treat any vinyl chloride gas leak as an emergency.* Preplan emergency responses and make sure all personnel know about them. Notify safety personnel, evacuate all nonessential personnel, provide maximum explosion-proof ventilation, and eliminate all sources of ignition immediately. Make sure cleanup personnel have protection against contact with this material and inhalation of its vapor (see sect. 8). **Waste Disposal:** Contact your supplier or a licensed contractor for detailed recommendations for disposal. Follow Federal, state, and local regulations.

OSHA Designations

Air Contaminant (29 CFR 1910.1000 Subpart Z)

Vinyl chloride is specifically regulated by OSHA at 29 CFR 1910.1017 as a suspected carcinogenic agent.

EPA Designations (40 CFR 302.4)

RCRA Hazardous Waste, No. U043

CERCLA Hazardous Substance, Reportable Quantity: 1 lb (0.454 kg), per Clean Water Act (CWA), section 307 (a); Clean Air Act (CAA), section 112; and Resource Conservation and Recovery Act (RCRA), section 3001.

SECTION 8. SPECIAL PROTECTION INFORMATION

Goggles: Always wear protective eyeglasses or chemical safety goggles. Follow OSHA eye- and face-protection regulations (29 CFR 1910.133). **Respirator:** Consult the *NIOSH Pocket Guide to Chemical Hazards* for general recommendations on respirators. Follow OSHA respirator regulations (29 CFR 1910.134). For emergency or nonroutine use (leaks or cleaning reactor vessels and storage tanks), wear an SCBA with a full facepiece operated in the pressure-demand or positive-pressure mode. **Warning:** Air-purifying respirators will *not* protect workers in oxygen-deficient atmospheres. **Other:** Wear impervious gloves; boots; aprons; head covers; and clean, impervious, body-covering clothing to prevent any possibility of skin contact with vinyl chloride. All clothing must be flame resistant. **Ventilation:** Install and operate general and local ventilation systems powerful enough to maintain airborne levels of vinyl chloride below the OSHA PEL standard cited in section 2. All ventilation systems must be of maximum explosion-proof design, e.g., nonsparking, electrically grounded and bonded. **Safety Stations:** Make eyewash stations, safety showers, and washing facilities available in areas of use and handling. **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. **Other:** Design all engineering systems to be explosion-proof in areas where vinyl chloride gas may occur. Pressure check all pipes and equipment used with this gas and make sure that all connections are leak tight. **Comments:** Practice good personal hygiene; always wash thoroughly after using this material. Avoid transferring it from your hands to your mouth while eating, drinking, or smoking. Do *not* eat, drink, or smoke in any work area.

SECTION 9. SPECIAL PRECAUTIONS AND COMMENTS

Storage/Segregation: Store vinyl chloride in a cool, dry, well-ventilated area away from sources of ignition and incompatible chemicals. Outside or detached storage is recommended. Shade containers from radiant heat and direct sunlight. **Special Handling/Storage:** Vinyl chloride is shipped/stored as a pressurized gas in cylinders or tank cars. Protect these containers against physical damage and regularly inspect them for cracks, leaks, or faulty valves. Ground and bond all containers used in shipping/transferring operations. Store cylinders upright; secure them tightly; do not drag or slide them; move them in a carefully supervised manner with a suitable hand truck. Monitor the activity and concentration of the added inhibitor to the vinyl chloride product. Follow your supplier's recommendations concerning proper shelf life, rotation of inventory, and maintenance of purity. **Engineering Controls:** Make all engineering systems (ventilation, production, etc.) of maximum explosion-proof design. **Comments:** Perform all operations with vinyl chloride carefully to prevent accidental ignition. Do not smoke in any use or storage area. Maintain the valve protection cap in place until immediately before using vinyl chloride. Insert a check valve or trap into the transferral line to prevent a dangerous backflow into the original container. Use pressure-reducing regulators when connecting cylinders to lower-pressure piping systems. Obtain detailed handling, shipping, and storage information from your supplier. A trained chemist or safety specialist familiar with the physical and chemical properties of this material should be present during all work operations.

Transportation Data (49 CFR 172.101-2)

DOT Shipping Name: Vinyl Chloride

DOT Label: Flammable Gas

IMO Label: Flammable Gas

DOT ID No. UN1086

DOT Hazard Class: Flammable Gas

IMO Class: 2.1

References: 1, 2, 12, 73, 84-94.

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Material Safety Data Sheet

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GENIUM PUBLISHING CORP.

No. 318

XYLENE (Mixed Isomers)
 (Revision D)
 Issued: November 1980
 Revised: August 1988

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SECTION 1. MATERIAL IDENTIFICATION

Material Name: XYLENE (Mixed Isomers)

Description (Origin/Uses): Used as a raw material for the production of benzoic acid, phthalic anhydride, isophthalic and terephthalic acids and their dimethyl esters in the manufacture of polyester fibers; in sterilizing catgut; with Canadian balsam as oil-immersion in microscopy; and as a cleaning agent in microscopic techniques.

Other Designations: Dimethylbenzene; Xylol; C₈H₁₀; CAS No. 1330-20-7

Manufacturer: Contact your supplier or distributor. Consult the latest edition of the *Chemicalweek*

Buyers' Guide (Genium ref. 73) for a list of suppliers.

Comments: Although there are three different isomers of xylene (*ortho*, *meta*, and *para*), the health and physical hazards of all three isomers are very similar. This MSDS is written for a xylene mixture of all three isomers, which is usually commercial xylene.



NFPA

HMIS

H	2	R	1
F	3	I	3
R	0	S	2
PPG*		K	3

*See sect. 8

SECTION 2. INGREDIENTS AND HAZARDS

%

EXPOSURE LIMITS

Xylene (Mixed Isomers), CAS No. 1330-20-7*

**

IDLH*** Level: 1000 ppm

**o*-Xylene, CAS No. 0095-47-6

m-Xylene, CAS No. 0108-38-3

p-Xylene, CAS No. 0106-42-3

**Check with your supplier to determine if there are additions, contaminants, or impurities (such as benzene) that are present in reportable quantities per 29 CFR 1910.

***Immediately dangerous to life and health.

**** See NIOSH, *RTECS* (No. ZE2100000), for additional data with references to reproductive, irritative, and mutagenic effects.

OSHA PEL
 8-Hr TWA: 100 ppm, 435 mg/m³
 ACGIH TLVs, 1987-88
 TLV-TWA: 100 ppm, 435 mg/m³
 TLV-STEL: 150 ppm, 655 mg/m³

Toxicity Data****
 Human, Inhalation, TC₅₀: 200 ppm
 Man, Inhalation, LC₅₀: 10000 ppm/6 Hrs
 Rat, Oral, LD₅₀: 4300 mg/kg

SECTION 3. PHYSICAL DATA

Boiling Point: 275°F to 293°F (135°C to 145°C)*

Melting Point: -13°F (-25°C)

Evaporation Rate: 0.6 Relative to BuAc = 1

Specific Gravity (H₂O = 1): 0.86

Water Solubility (%): Insoluble

Molecular Weight: 106 Grams/Mole

% Volatile by Volume: Ca 100

Vapor Pressure: 7 to 9 Torrs at 68°F (20°C)

Vapor Density (Air = 1): 3.7

Appearance and Odor: A clear liquid; aromatic hydrocarbon odor.

*Materials with wider and narrower boiling ranges are commercially available.

SECTION 4. FIRE AND EXPLOSION DATA

LOWER

UPPER

Flash Point and Method

Autoignition Temperature

Flammability Limits in Air

81°F to 90°F (27°C to 32°C)

867°F (464°C)

% by Volume

1%

7%

Extinguishing Media: Use foam, dry chemical, or carbon dioxide. Use water sprays to reduce the rate of burning and to cool containers.

Unusual Fire or Explosion Hazards: Xylene vapor is heavier than air and may travel a considerable distance to a low-lying source of ignition and flash back.

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

Xylene is stable in closed containers during routine operations. It does not undergo hazardous polymerization.

Chemical Incompatibilities: This material may react dangerously with strong oxidizers.

Conditions to Avoid: Avoid any exposure to sources of ignition and to strong oxidizers.

Hazardous Products of Decomposition: Carbon monoxide (CO) may be evolved during xylene fires.

SECTION 6. HEALTH HAZARD INFORMATION

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

Summary of Risks: Liquid xylene is a skin irritant and causes erythema, dryness, and defatting; prolonged contact may cause blistering. Inhaling xylene can depress the central nervous system (CNS), and ingesting it can result in gastrointestinal disturbance; and possibly hematemesis (vomiting blood). Effects on the eyes, kidneys, liver, lungs, and the CNS are also reported. **Medical Conditions Aggravated by Long-Term Exposure:** Problems with eyes, skin, central nervous system, kidneys, and liver may be worsened by exposure to xylene. **Target Organs:** CNS, eyes, gastrointestinal tract, blood, liver, kidneys, skin. **Primary Entry:** Inhalation, skin contact/absorption. **Acute Effects:** Dizziness; excitement; drowsiness; incoordination; staggering gait; irritation of eyes, nose, and throat; corneal vacuolization; anorexia; nausea; vomiting; abdominal pain; and dermatitis. **Chronic Effects:** Reversible eye damage, headache, loss of appetite, nervousness, pale skin, and skin rash.

FIRST AID: **Eyes.** Immediately flush eyes, including under the eyelids, gently but thoroughly with plenty of running water for at least 15 minutes. **Skin.** Immediately wash the affected area with soap and water. **Inhalation.** Remove the exposed person to fresh air; restore and/or support his or her breathing as needed. Have a trained person administer oxygen. **Ingestion.** Never give anything by mouth to someone who is unconscious or convulsing. Vomiting may occur spontaneously, but do not induce it. If vomiting should occur, keep exposed person's head below his or her hips to prevent aspiration (breathing the liquid xylene into the lungs). Severe hemorrhagic pneumonitis with grave, possibly fatal, pulmonary injury can occur from aspirating very small quantities of xylene.

GET MEDICAL HELP (IN PLANT, PARAMEDIC, COMMUNITY) FOR ALL EXPOSURES. Seek prompt medical assistance for further treatment, observation, and support after first aid. If exposure is severe, hospitalization for at least 72 hours with careful monitoring for delayed onset of pulmonary edema is recommended.

SECTION 7. SPILL, LEAK, AND DISPOSAL PROCEDURES

Spill/Leak: Notify safety personnel, provide ventilation, and eliminate all sources of ignition immediately. Cleanup personnel need protection against contact with and inhalation of xylene vapor (see sect. 8). Contain large spills and collect waste or absorb it with an inert material such as sand, earth, or vermiculite. Use nonsparking tools to place waste liquid or absorbent into closable containers for disposal. Keep waste out of sewers, watersheds, and waterways.

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

OSHA Designations

Air Contaminant (29 CFR 1910.1000 Subpart Z)

EPA Designations (40 CFR 302.4)

RCRA Hazardous Waste, No. U239

CERCLA Hazardous Substance, Reportable Quantity: 1000 lbs (454 kg), per the Clean Water Act (CWA), section 311 (b) (9)

SECTION 8. SPECIAL PROTECTION INFORMATION

Goggles: Always wear protective eyeglasses or chemical safety goggles. Where splashing is possible, wear a full face shield as a supplementary protective measure. Follow OSHA eye- and face-protection regulations (29 CFR 1910.133). **Respirator:** Use a NIOSH-approved respirator per the *NIOSH Pocket Guide to Chemical Hazards* 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 use (leaks or cleaning reactor vessels and storage tanks), wear an SCBA with a full facepiece operated in the pressure-demand or positive-pressure mode. **Warning:** Air-purifying respirators will *not* protect workers in oxygen-deficient atmospheres. **Other:** Wear impervious gloves, boots, aprons, gauntlets, etc., as required by the specifics of the work operation to prevent prolonged or repeated skin contact with xylene. **Ventilation:** Install and operate general and local maximum, explosion-proof ventilation systems powerful enough to maintain airborne levels of xylene below the OSHA PEL standard cited in section 2. Local exhaust ventilation is preferred because it prevents dispersion of xylene into general work areas by eliminating it at its source. Consult the latest edition of Genium reference 103 for detailed recommendations. **Safety Stations:** Make eyewash stations, safety/quick-drench showers, and washing facilities available in areas of use and handling. **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 xylene from shoes and equipment. **Comments:** Practice good personal hygiene; always wash thoroughly after using this material. Keep it off of 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. Do not inhale xylene vapor.

SECTION 9. SPECIAL PRECAUTIONS AND COMMENTS

Storage/Segregation: Store xylene in a cool, dry, well-ventilated area away from sources of ignition and strong oxidizers. Protect containers from physical damage.

Special Handling/Storage: Make sure all engineering systems (production, transportation) are of maximum explosion-proof design. Ground and bond all containers, pipelines, etc., used in shipping, transferring, reacting, producing, and sampling operations.

Transportation Data (49 CFR 172.101-2)

DOT Shipping Name: Xylene

DOT ID No. UN1307

DOT Label: Flammable Liquid

DOT Hazard Class: Flammable Liquid

IMO Label: Flammable Liquid

IMO Class: 3.2 or 3.3

References: 1, 2, 12, 73, 84-94, 100, 103.

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MATERIAL SAFETY DATA SHEET

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No. 73

ZINC METAL/POWDER

Date September 1980

SECTION I. MATERIAL IDENTIFICATION					
MATERIAL NAME: ZINC METAL/POWDER DESCRIPTION: Bulk metal, granular, flake, powder and dust forms. OTHER DESIGNATIONS: Zn, ASTM B6, GE Materials B10C2 and D4X7 (flake), CAS #007 440 666 MANUFACTURER: Available from several suppliers					
SECTION II. INGREDIENTS AND HAZARDS		%	HAZARD DATA		
Zinc		>98	No TLV Established* Human, Skin 300 µg/3 days - (intermittent) Mild irritation Human, Inhalation TClO 124 mg/m ³ /50M Pulmonary system effects		
*Current OSHA standard and ACGIH (1980) TLV for zinc oxide fume is 5 mg/m ³ . NIOSH has proposed a 10-hr TWA of 5 mg/m ³ and a ceiling level of 15 mg/m ³ (15 minute sample). TLV was set at a level to prevent metal fume fever.					
SECTION III. PHYSICAL DATA					
Boiling point, deg C (F)	----- 907 (1663)	Specific gravity @ 25 C	----	7.13	
Vapor pressure at 487 C, mm Hg	-- 1	Melting point, deg C (F)	----	419 (787)	
Index of explosibility, Zn powder		Brinell hardness	-----	31	
(<0,1 weak, >10 severe)	----- 0.1	Atomic weight	-----	65.37	
Appearance: Bluish white lustrous metal, also finely divided forms.					
SECTION IV. FIRE AND EXPLOSION DATA				LOWER	UPPER
Flash Point and Method	Autoignition Temp.	Flammability Limits In Air	0.5		
	580 C* (cloud)	460 C* (dust layer)	oz/ft ³	--	
Extinguishing Media: Use special dry chemical. Do not use CO ₂ . Water stream can disperse dust in air, producing a fire hazard and a weak explosion hazard if exposed to heat or ignition source. In a fire zinc metal can melt, vaporize and burn to ZnO. Hydrogen is liberated by reaction with acids or strong alkalis or (when powdered) water, which is an explosion hazard in a confined space. Firefighters should use self-contained breathing equipment.					
*Dust 100% thru 74 µm sieve; cloud can be ignited by 0.96J spark. Ignition temperature in CO ₂ is 480 C. Reaction temperature in nitrogen atmosphere is 600 C.					
SECTION V. REACTIVITY DATA					
Stable in dry air. In moist air bulk metal reacts to form a white coating of basic carbonate which tends to resist further corrosion, but moist zinc dust can react exothermically and ignite spontaneously in air. Zinc foil will ignite in the presence of moisture. Vaporized zinc burns in air with a blue-green flame above 537 C to produce ZnO fume. Zinc, especially when powdered, is incompatible with acids and strong alkalis, with oxidizing agents, and with halogenated hydrocarbons. When powdered zinc is heated with sulfur, an explosive reaction occurs.					

MATERIAL SAFETY DATA SHEET

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No. 96

ZINC SULFATE

Date October 1981

SECTION I. MATERIAL IDENTIFICATION				
<p>MATERIAL NAME: ZINC SULFATE DESCRIPTION: Anhydrous (1:1) zinc salt of sulfuric acid. This material is also available as mono- and hepta-hydrates. OTHER DESIGNATIONS: Zinc Vitriol, White Vitriol, ZnSO₄ (CAS# 007 733 020), ZnSO₄·7H₂O (CAS# 007 446 200) MANUFACTURER: Available from several suppliers, including: ASRCO 120 Broadway United Mineral & Chemical Corp. New York, NY 10005 129 Hudson St., New York, NY 10013 Phone: (212) 732-9500 Phone: (212) 966-4330</p>				
SECTION II. INGREDIENTS AND HAZARDS		X	HAZARD DATA	
Zinc Sulfate Water* *Water present as a hydrate. (See Sect. III & V)	56-100 0-44		No TLV Established <u>Zinc Sulfate</u> Human, Oral, TDLo 45 mg/kg/7D-C <u>TFX: G.I.</u> 106 mg/kg <u>TFX:SYS & BPR</u> Rat, Oral LDLo 2200 mg/kg	
SECTION III. PHYSICAL DATA				
	<u>Anhydrous</u>	<u>Monohydrate</u>	<u>Heptahydrate</u>	
Specific gravity, 25/4 C -----	3.54	--	1.96	
Water solubility at 20 C -----	Soluble	Soluble	Soluble	
Formula or Molecular Weight -----	161.4	179.4	287.6	
Melting point, deg C -----	dec >600	--	100	
Dehydration, deg C -----	--	>238 (-H ₂ O)	280 (-7H ₂ O)	
Appearance & Odor: Colorless or white, metallic taste, odorless	crystals	powder/granules (free flowing)	crystals or powder/granules	
SECTION IV. FIRE AND EXPLOSION DATA			LOWER	UPPER
Flash Point and Method	Autoignition Temp.	Flammability Limits In Air		
Nonflammable				
<p>Extinguishing Media: Use that which is appropriate for the surrounding fire. Use of dry chemical or carbon dioxide has been recommended. Material dissolves in water to produce an acidic solution. Sealed containers of this material may rupture from decomposition pressure at high temperature. (Hydrated materials will generate pressure at lower temperatures.) Firefighters should wear self-contained breathing apparatus when this material is involved in a fire situation. (See Sect V).</p>				
SECTION V. REACTIVITY DATA				
<p>This material is stable in closed containers under normal storage and handling. It does not polymerize. Hydrated salts will lose water on heating (See Sect. III). Zinc sulfate hydrolyzes in water, producing an acidic solution which can be corrosive. Thermal degradation above 600 C will produce oxides of sulfur and zinc oxide fume.</p>				

SECTION VI. HEALTH HAZARD INFORMATION

TLV (See Section II)

The acidity of this material can be a contact hazard. Excessive inhalation of dust or solution mist can irritate the mucous membranes of the upper respiratory tract & lung. Repeated or prolonged contact of this material or its solutions with the skin is irritating and can be damaging. A fatality has been reported after ingestion of 10 grams. Thermal degradation products of $ZnSO_4$ (ZnO fume and sulfur oxides) can be an inhalation hazard.

FIRST AID:

Eye Contact: Flush eyes with running water for 15 minutes. Get medical help.

Skin Contact: Remove contaminated clothing. Wash with running water, then with soap and water. Get medical help if irritation persists or if large skin area affected.

Inhalation: Remove to fresh air. Keep at rest. Get medical help.

Ingestion: Contact physician. Give water or milk to drink to dilute. Gastric lavage indicated if spontaneous vomiting has not occurred.

Physician note: Antidote: Calcium disodium edatate. Treatment for hypotension has been recommended.

SECTION VII. SPILL, LEAK, AND DISPOSAL PROCEDURES

Notify safety personnel of large leaks or spills. Clean-up personnel need protection against inhalation and contact. Provide ventilation. Avoid dusting or misting conditions in clean-up. Pick up solids and place in suitable container for recovery or disposal. Cover spilled solution with soda ash or sodium bicarbonate; scoop up slurries for disposal.

DISPOSAL: Neutralize with soda ash or sodium bicarbonate for disposal. Bury in approved landfill. Follow Federal, State, and Local regulations.

EPA (CWA) "RQ" is 1000 lb (44FR No. 169, p 50778).

SECTION VIII. SPECIAL PROTECTION INFORMATION

Provide local ventilation for point sources of dust or mist. Ventilation should be sufficient to prevent any discomfort for workers. Where dust or mist concentration may be excessive, use NIOSH approved respirator for dust or acid mist, respectively. (Supplier recommends respirator use when handling bulk solids or bulk solutions.)

Use safety goggles where dust or mist may be present. Use rubber gloves to prevent skin contact. An apron or other protective clothing should be used as appropriate for working conditions to minimize skin contact.

Provide eyewash station and washing facilities near handling and use area. Safety shower may be needed where bulk solutions are prepared or used.

SECTION IX. SPECIAL PRECAUTIONS AND COMMENTS

Store in tightly closed, moisture-impervious containers in a dry, well ventilated area. The acid corrosion resistance of containers and facilities for the use of this material should be considered.

DATA SOURCE(S) CODE: 1, 4-7, 10, 39, 49

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APPROVALS: MIS
CRD *L.M. Nielsen*

Industrial Hygiene
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MEDICAL REVIEW: 14 November 1981

**APPENDIX
D**

APPENDIX D
EXCAVATION PROCEDURES



OHM Corporation

HEALTH & SAFETY PROCEDURES

EXCAVATION

PROCEDURE NUMBER 28

Page 1 of 8

LAST REVISED 12/92 APPROVED BY: JFK/FHH

1. OBJECTIVE

OHM Remediation Services Corp. (OHM) will control the hazards posed by open excavation through strict compliance with this procedure and the provisions of the excavation permit.

2. SCOPE, APPLICATION AND PURPOSE

This procedure outlines requirements for all open excavations made in the earth's surface. Excavations are defined to include trenches. This policy is intended to protect personnel from the hazards of collapse.

3. REGULATORY REQUIREMENTS

This procedure will follow the guidelines of 29 CFR 1926, Subpart P - Excavations. In the case of United States Army Corp of Engineers projects, the requirements of EM 385-1-1, Section 25 will be observed. In the event of a conflict between these referenced standards, the more stringent will prevail.

4. GENERAL REQUIREMENTS

Safety operations while working in and around excavations involve many factors. Factors to be evaluated and discussed before starting work at daily safety meetings include:

4.1 Surface Encumbrances

All surface encumbrances that are located so as to create a hazard to employees shall be removed or supported, as necessary to safeguard employees.

4.2 Underground Installations/Utility Locations

The estimated location of utility installations, such as sewer, telephone, fuel, electric, water lines, or any other underground installations that reasonably may be expected to be encountered during excavation work, shall be determined prior to opening an excavation.

- 4.2.1 Utility companies or the state utility protection service shall be contacted at least two (2) working days prior to excavation activities to be advised of the proposed work, and asked to establish the location of the utility underground installations prior to the start of actual excavation.
- 4.2.2 OHM personnel and sub-contractors should be careful to protect and preserve the markings of approximate locations of facilities until the markings are no longer required for safe and proper excavations.
- 4.2.3 If the markings of utility locations are destroyed or removed before excavation commences or is completed, the OHM competent person must notify the utility company or utility protection service to inform them that the markings have been destroyed. Normally, it will take two (2) working days of the notice for the utility protection service to remark the locations.
- 4.2.4 OHM equipment operators shall maintain a reasonable clearance between any underground utility and the cutting edge or point of powered equipment.
- 4.2.5 When excavating with powered equipment within 18 inches of the markings of underground facilities, personnel should conduct the excavation in a careful and prudent manner, excavating by hand to determine the precise location of the facility/utility and to prevent damage.
- 4.2.6 While the excavation is open, underground installations shall be protected, supported or removed as necessary to safeguard employees.

4.3 ACCESS AND EGRESS

4.3.1 Structural Ramps

Structural ramps that are used solely by employees as a means of access or egress from excavations shall be designed by a competent person. Structural ramps used for access or egress of equipment shall be designed by a competent person qualified in structural design, and shall be constructed in accordance with the design.

Ramps and runways constructed of two or more structural members shall have the structural members connected together to prevent displacement.

Structural members used for ramps and runways shall be of uniform thickness.

Cleats or other appropriate means used to connect runway structural members shall be attached to the bottom of the runway or shall be attached in a manner to prevent tripping.

Structural ramps used in lieu of steps shall be provided with cleats or other surface treatments on the top surface to prevent slipping.

4.3.2 Means of Egress from Trench Excavations

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

4.4 EXPOSURE TO VEHICULAR TRAFFIC

Employees exposed to public vehicular traffic shall be provided with and shall wear, warning vests or other suitable garments marked with or made of reflectorized or high-visibility material.

4.5 EXPOSURE TO FALLING LOADS

No employee shall be permitted underneath loads handled by lifting or digging equipment. Employees shall be required to stand away from any vehicle being loaded or unloaded to avoid being struck by any spillage or falling materials. Operators may remain in the cabs of vehicles being loaded or unloaded when the vehicles are equipped, in accordance with 29 CFR 1926.601(b)(6), to provide adequate protection for the operator from falling objects during loading and unloading operations.

4.6 WARNING SYSTEM FOR MOBILE EQUIPMENT

When mobile equipment is operated adjacent to an excavation or when such equipment is required to approach the edge of an excavation, and the operator does not have a clear and direct view of the edge of the excavation, a warning system shall be utilized such as barricades, hand or mechanical signals or stop logs. If possible, the grade should be away from the excavation.

4.7 HAZARDOUS ATMOSPHERES

4.7.1 Testing and Controls

In addition to the requirements set forth, 29 CFR 1926.50 - 1926.107; to prevent exposure to harmful levels of atmospheric contaminants and to assure acceptable atmospheric conditions, the following requirements shall apply:

Where oxygen deficiency (atmospheres containing less than 19.5 percent oxygen) or a hazardous atmosphere exists or could reasonably be expected to exist, such as in excavations in landfill areas or excavations in areas where hazardous substances are suspected, the atmospheres in the excavation shall be tested before employees enter excavations greater than 4 feet in depth.

Adequate precautions shall be taken, to prevent employee exposure to atmospheres containing less than 19.5 percent oxygen and other hazardous atmospheres. These precautions include providing proper respiratory protection or ventilation as needed.

Adequate precaution shall be taken such as providing ventilation, to prevent employee exposure to an atmosphere containing a concentration of a flammable gas in excess of 10 percent of the lower explosive limit (LEL) of the gas or vapor.

When controls are used that are intended to reduce the level of atmospheric contaminants to acceptable levels, testing shall be conducted as often as necessary to ensure that the atmosphere remains safe.

4.7.2 Emergency Rescue Equipment

Emergency rescue equipment, such as self contained breathing apparatus (SCBA), a safety harness and line, or a basket stretcher, shall be readily available where hazardous atmospheric conditions exist or may reasonably be expected to develop during work in an excavation. This equipment shall be attended when in use.

Employees entering bell-bottom pier holes or other similar deep and confined excavations, shall wear a harness with a life-line securely attached to it. The lifeline shall be separate from any line used to handle materials, and shall be individually attended at all times while the employee wearing the lifeline is in the excavation.

4.8 PROTECTION FROM HAZARDS ASSOCIATED WITH WATER ACCUMULATION

Employees shall not work in excavations in which there is accumulated water, or in excavations in which water is accumulating, unless adequate precautions have been taken to protect employees against the hazards posed by water accumulation. The precautions necessary to protect employees adequately vary with each situation, but could include special support or shield systems to protect from cave-ins, water removal to control the level of accumulating water, or use of a safety harness and lifeline.

If water is controlled or prevented from accumulating by the use of water removal equipment, the water removal equipment and operations shall be monitored by a competent person to ensure proper operation.

If excavation work interrupts the natural drainage of surface water (such as streams); diversion ditches, dikes, or other suitable means shall be used to prevent surface water from entering the excavation and to provide adequate drainage of the area adjacent to the excavation. Excavations subject to run-off from heavy rains will require an inspection by a competent person.

4.9 STABILITY OF ADJACENT STRUCTURES

Where the stability of adjoining buildings, walls, or other structures is endangered by excavation operations, support systems such as shoring, bracing, or underpinning shall be provided to ensure the stability of such structures for the protection of employees.

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

- 4.9.1 A support system, such as underpinning, is provided to ensure the safety of employees and the stability of the structure; or
- 4.9.2 The excavation is in stable rock; or
- 4.9.3 A registered professional engineer has approved the determination that the structure is sufficiently removed from the excavation so as to be unaffected by the excavation activity; or
- 4.9.4 A registered professional engineer has approved the determination that such excavation work will not pose a hazard to employees.

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

4.10 PROTECTION OF EMPLOYEES FROM LOOSE ROCK OR SOIL

Adequate protection shall be provided to protect employees from loose rock or soil that could pose a hazard by falling or rolling from an excavation face. Such protection shall consist of scaling to remove loose material; installation of protective barricades at intervals as necessary on the excavation face to stop and contain falling material; or other means that provide equivalent protection.

Employees shall be protected from excavated or other materials or equipment that could pose a hazard by falling or rolling into excavations. Protection shall be provided by placing and keeping such materials or equipment at least 2 feet from the edge of excavations, or by the use of retaining devices that are sufficient to prevent materials or equipment from falling or rolling into excavations, or by a combination of both if necessary.

4.11 INSPECTIONS

Daily inspections of excavations, the adjacent areas, and protective systems shall be made by a competent person for evidence of a situation that could result in possible cave-ins, indications of failure of protective systems, hazardous atmospheres, or other hazardous conditions. An inspection shall be conducted by the competent person prior to the start of work and as needed throughout the shift. Inspections shall also be made after every rainstorm or other hazard increasing occurrence. These inspections are required when employee exposure can be reasonably anticipated. An Excavation/Trenching Permit must be completed by the competent person to document the inspections.

Where the competent person finds evidence of a situation that could result in a possible cave-in, indications of failure of protective systems, hazardous atmospheres, or other hazardous conditions, exposed employees shall be removed from the hazardous area until the necessary precautions have been taken to ensure their safety.

4.12 FALL PROTECTION

Where employees or equipment are required or permitted to cross over excavations; walkways, or bridges with standard guardrails shall be provided.

Adequate barrier for physical protection shall be provided at all remotely located excavations. All wells, pits, shafts, etc. shall be barricaded or covered. Upon completion of exploration and similar operations, temporary wells, pits, shafts, etc., shall be covered or backfilled.

5. SOIL CLASSIFICATION

OSHA Soil Classification (Appendix A to Subpart P)

5.1 Type A means:

Cohesive soils with an unconfined compressive strength of 1.5 ton per square foot (tsf) (144 kPa) or greater. Examples of cohesive soils are: clay, silty clay, sandy clay, clay loam and, in some cases, silty clay loam and sandy clay loam. Cemented soils such as caliche and hardpan are also considered Type A. However, no soil is Type A if:

- 5.1.1 The soil is fissured; or
- 5.1.2 The soil is subject to vibration from heavy traffic, pile driving, or similar effects; or
- 5.1.3 The soil has been previously disturbed; or
- 5.1.4 The soil is part of a sloped, layered system where the layers dip into the excavation on a slope of four horizontal to one vertical (4H:1V) or greater; or
- 5.1.5 The material is subjected to other factors that would require it to be classified as a less stable material.

5.2 Type B means:

- 5.2.1 Cohesive soil with an unconfined compressive strength greater than 0.5 tsf (48 kPa) but less than 1.5 tsf (144 kPa); or
- 5.2.2 Granular cohesionless soils including: angular gravel (similar to crushed rock), silt, silt loam, sandy loam and, in some cases, silty clay loam and sandy clay loam.
- 5.2.3 Previously disturbed soils except those which would otherwise be classed by Type C soil.
- 5.2.4 Soil that meets the unconfined compressive strength or cementation requirements for Type A, but is fissured or subjected to vibration; or

5.2.5 Dry rock that is not stable; or

5.2.6 Material that is part of a sloped, layered system where the layers dip into the excavation on a slope less steep than four horizontal to one vertical (4H:1V), but only if the material would otherwise be classified as Type B.

5.3 Type C means:

5.3.1 Cohesive soil with an unconfined compressive strength of 0.5 tsf (48 kPa) or less; or

5.3.2 Granular soils including gravel, sand, and loamy sand; or

5.3.3 Submerged soil or soil from which water is freely seeping; or

5.3.4 Submerged rock that is not stable; or

5.3.5 Material in a sloped, layered system where the layers dip into the excavation or a slope of four horizontal to one vertical (4H:1V) or steeper.

6. TIMBER SHORING, ALUMINUM HYDRAULIC AND ALTERNATIVES TO SHORING

Refer to 29 CFR 1926 Subpart P (Appendices C, D, and E) for details on shoring, shields, and trench boxes.

7. SELECTION OF PROTECTIVE SYSTEMS

Refer to 29 CFR 1926 Subpart P (Appendix F) for the decision logic in selecting protective systems.

8. PERMITS

An Excavation/Trenching Permit must be completed by the competent person each day that an excavation is open and personnel may be required to enter the excavation. The excavation permit follows this procedure.



OHM Corporation

EXCAVATION/TRENCHING PERMIT

PERMIT NO. _____

Good on This Date Only: _____

From: _____

AM ___ PM ___

Project Name: _____

Project Number: _____

Project Location: _____

Name of Competent Person: _____ -- A competent person

means one who is capable of identifying existing and predictable hazards in the surroundings, or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them. The competent person shall also be capable of classifying soil types.

Description of Job or Special Procedures: _____

EMPLOYEE TRAINING AND PRE-EXCAVATION BRIEFING

- 1. Safe Excavation and Rescue Training Conducted on: _____ (DATE)
2. Mandatory pre-excavation briefing conducted on: _____ (DATE)
3. Does this job require special training: YES ___ NO ___

ELECTRICAL SAFETY

- 1. Are all electrical devices grounded, double insulated, or GFCI protected? YES ___ NO ___ N/A ___
2. Have all power cords and tools been visually inspected? YES ___ NO ___ N/A ___

SURFACE ENCUMBRANCES

- 1. Have all surface encumbrances that are located so as to create a hazard to employees been removed or supported, as necessary, to safeguard employees? YES ___ NO ___ N/A ___

UNDERGROUND INSTALLATIONS

- 1. Have the estimated locations of all underground installation been determined prior to excavation? YES ___ NO ___ N/A ___
2. Have utility companies been contacted and advised of proposed work? YES ___ NO ___ N/A ___
3. Are underground installations protected, supported or removed while excavations are open? YES ___ NO ___ N/A ___

ACCESS AND EGRESS

- 1. Are structural ramps that are used solely by personnel as a means of access or egress from excavations designed by a competent person? YES ___ NO ___ N/A ___
2. Are structural ramps that are used for access and egress of equipment designed by a competent person qualified in structural design and constructed in accordance with the design? YES ___ NO ___ N/A ___
3. Are ramps and runways constructed so structural members are connected to prevent displacement? YES ___ NO ___ N/A ___

- 4. Are structural members used for ramps and runways of uniform thickness? YES___ NO___ N/A___
- 5. Are cleats used in connecting runway structural members attached in a manner to prevent tripping? YES___ NO___ N/A___
- 6. Are structural ramps used in lieu of steps provided with cleats or other surface treatment to prevent slipping? YES___ NO___ N/A___

MEANS OF EGRESS FOR TRENCHES DEEPER THAN 4 FEET

- 1. Are stairways, ladders, or ramps provided every 25 feet? YES___ NO___ N/A___

EXPOSURE TO VEHICULAR TRAFFIC

- 1. Are personnel exposed to public vehicular traffic wearing reflectorized or high visibility vests? YES___ NO___ N/A___

EXPOSURE TO FALLING LOADS

- 1. Are employees prohibited from standing underneath loads handled by lifting or digging equipment? YES___ NO___ N/A___
- 2. Are employees prohibited from standing next to vehicles being loaded or unloaded? YES___ NO___ N/A___

WARNING SYSTEMS FOR MOBILE EQUIPMENT

- 1. Are warning systems such as barricades, hand or mechanical signals, or stop logs utilized when mobile equipment is operated adjacent to or at the edge of an excavation? YES___ NO___ N/A___

TESTING FOR HAZARDOUS ATMOSPHERES

- 1. Are the atmospheric hazards that can be reasonably expected to exist in excavations greater than 4 feet deep tested and controlled? YES___ NO___ N/A___

	READING:	TIME:	INITIAL:
2. Test for Oxygen Content:	_____ % O ₂ (19.5% Minimum)	_____	_____
3. Test for Flammable Concentrations:	_____ % LEL (10% Maximum)	_____	_____
4. Test for Toxic Concentration:	_____ PPM of _____	_____	_____
5. Is testing conducted as often as necessary to ensure safety or personnel?		YES___ NO___	N/A___

EMERGENCY RESCUE EQUIPMENT

- 1. Is emergency rescue equipment such as SCBA, safety harness and line, or basket stretcher readily available and attended when hazardous atmospheric conditions exist? YES___ NO___ N/A___
- 2. Are employees who enter bell-bottom pier holes or other similar deep and confining excavations wearing a body harness with a life-line? YES___ NO___ N/A___

PROTECTION FROM HAZARDS ASSOCIATED WITH WATER ACCUMULATION

- | | | | |
|--|--------|-------|--------|
| 1. Are employees prohibited from entering excavations that have accumulated water? | YES___ | NO___ | N/A___ |
| 2. Is water being controlled or prevented from accumulating in excavation by the use of water removal equipment? | YES___ | NO___ | N/A___ |
| 3. Is water control equipment operation being monitored by a competent person? | YES___ | NO___ | N/A___ |
| 4. Are diversion ditches, dikes, or other suitable means used to prevent surface water from entering excavation? | YES___ | NO___ | N/A___ |
| 5. Are excavations subjected to run-off from heavy rain immediately re-inspected by a competent person? | YES___ | NO___ | N/A___ |

STABILITY OF ADJACENT STRUCTURES

- | | | | |
|---|--------|-------|--------|
| 1. Are support systems such as shoring, bracing, or underpinning provided to ensure stability of adjoining structures (i.e., buildings, walls) endangered by excavation activities? | YES___ | NO___ | N/A___ |
| 2. Has any excavation below the level of the base or footing of foundations or retaining walls been: | | | |
| - Provided with a support system such as under pinning to ensure the safety of employees and stability of the structure | YES___ | NO___ | N/A___ |
| - Performed in stable rock | YES___ | NO___ | N/A___ |
| - Determined by a registered professional engineer that the structure is sufficiently removed from the excavation so as to be unaffected by the excavation activity | YES___ | NO___ | N/A___ |
| - Determined by a registered professional that the excavation work will not pose a hazard to employees | YES___ | NO___ | N/A___ |
| 3. Is the undermining of sidewalks and pavement structures prohibited? | YES___ | NO___ | N/A___ |

PROTECTION OF EMPLOYEES FROM LOOSE ROCK OR SOIL

- | | | | |
|---|--------|-------|--------|
| 1. Is adequate protection provided to protect employees from loose rock or soil that could pose a hazard by falling or rolling from an excavation face? | YES___ | NO___ | N/A___ |
| 2. Are employees protected from excavated or other material and equipment by placing this material a minimum of two (2) feet from the edge of excavations or by the use of retaining devices? | YES___ | NO___ | N/A___ |

INSPECTIONS

- | | | | |
|---|--------|-------|--------|
| 1. Are daily inspections of excavations where employee exposure can be reasonably anticipated being done by the competent person? | YES___ | NO___ | N/A___ |
| 2. Are inspections being performed by a competent person after every rainstorm or other hazard increasing occurrence? | YES___ | NO___ | N/A___ |
| 3. Are employees removed from the excavation if the competent person finds evidence at any time of a situation that could result in a possible cave-in, protective system failure, hazardous atmosphere or other hazardous condition? | YES___ | NO___ | N/A___ |



OHM Corporation

HEALTH & SAFETY PROCEDURES

UNDERGROUND TANK REMOVAL

PROCEDURE NUMBER 29

Page 1 of 5

LAST REVISED 12/92 APPROVED BY: JFK/FHH

1. OBJECTIVE

OHM Remediation Services Corp. (OHM) will control the hazards at projects where underground storage tanks (UST) are removed by following the procedures described in this procedure.

2. PURPOSE

This procedure outlines the steps necessary to ensure the safe removal of underground tanks.

3. PROCEDURE

- 3.1 Visually inspect the site to ensure that the work can be safely done. Special attention must be given to safe work surfaces for equipment, the presence of overhead lines which may hinder equipment operation, and local traffic which may be affected.
- 3.2 Call the local utility companies to locate telephone, power, water, and sewer lines which may be in the way of excavation. Ensure they are well marked before excavation.
- 3.3 Locate the tank, together with piping, vents, and manways.
- 3.4 Sample the tank to verify that the tank contains the product which was indicated. Note liquid levels. Check for the presence of water and other contaminants.
- 3.5 Sample the tank vapor space with a Combustible Gas Indicator/Oxygen meter (CGI/O₂) to verify safe/unsafe conditions.

4. TANK EXCAVATION

- 4.1 Establish the boundaries of the exclusion zone so that unprotected personnel will not accidentally come in contact with any possible liquid splashes or vapors arising from the excavation.

**APPENDIX
E**

APPENDIX E
CONFINED SPACE ENTRY PROCEDURES



OHM Corporation

HEALTH & SAFETY PROCEDURES

CONFINED SPACE ENTRY

PROCEDURE NUMBER 24

Page 1 of 5

LAST REVISED 12/92 APPROVED BY: JFK/FHH

1. OBJECTIVE

OHM Remediation Services Corp. (OHM) shall enforce this procedure as a means of protecting the health and safety of workers while entering, working in, and exiting confined spaces. Before entry, the worker will be made aware of the hazards of confined space work and the safe work practices necessary.

2. PURPOSE

The purpose of this procedure is to establish confined space entry standards for all OHM employees. This procedure meets and exceeds the guidelines in the Occupational Safety and Health Administration (OSHA) Confined Space Entry standard 29 CFR 1910.146.

3. PROCEDURE

3.1 Permitting - All "permit required confined space" entries will be proceeded by the completion of a confined space entry permit. The OHM confined space entry permit follows this procedure.

3.1.1 The following definitions address the requirement for permits when entering a confined space.

Definition - Confined Spaces requiring a permit:

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

Definition - Confined Spaces not requiring a permit: a confined space that does not contain or, with respect to atmospheric hazards, have the potential to contain any hazard capable of causing death or serious physical harm.

3.2 Written Rescue Procedure - Prior to any confined space work, a site specific written rescue plan will be developed that addresses minimum requirements.

3.2.1 Rescue

- The equipment required to rescue an unconscious victim must be in-place before the first person enters the confined space.
- A trained stand-by person will be assigned to each confined space with a fully charged SCBA or airline and egress unit.
- The stand-by is to keep life lines clear, to maintain contact with all workers within the confined space and to summon help if needed.
- The stand-by must never enter the confined space unless relieved by rescue assistance.
- The stand-by may attempt rescue by lifeline while waiting for rescue assistance.
- The stand-by will not leave his observation point unless he/she is replaced by an equivalently trained person.

4. PERMIT SYSTEM

All confined space entry permits will address the following:

- Location
- Hazards-Isolation
- Lockout / Tagout
- PPE and special equipment
- Air monitoring requirements and results of such monitoring
- Personal monitoring
- Training required
- Stand-by persons to be present as alternates
- Communication procedures
- Emergency / rescue procedures
- Confined space classification
- Posting of notification

5. TRAINING

OHM will train employees involved in confined space entry and confined space rescue on the hazards associated with confined space work. This training will, as a minimum, cover the following:

- Hazard recognition
- Emergency entry and exit
- Respirator use
- First aid

- Lock-out procedures
- Safety equipment
- Rescue drills
- Permit system
- Work practices
- Communication requirements

5. TESTING AND MONITORING

- 5.1 Initial Monitoring - Entry into a confined space is prohibited until initial testing of the atmosphere for oxygen content and toxic gas concentration is conducted from the outside. Initial monitoring gives critical information concerning oxygen level, flammability and toxicity hazards.
- 5.2 Hot Work - All hot work is prohibited in confined space where monitoring indicates that there are flammable compounds in excess of 10% of the Lower Explosive Limit (LEL). The monitoring device will be intrinsically safe for flammable atmospheres or explosion proof. If hot work must be performed in the confined space, a hot work permit must be completed. Cutting gas cylinders and welding machines will not be taken into confined space.
- 5.3 Calibration - All monitoring equipment will be calibrated before each use and those calibrations will be logged in the equipment records. The calibration record will be kept for a minimum of one year from the date of measurement.
- 5.4 Oxygen Requirement - The percent oxygen for entry will not be less than 19.5% for confined space entry without supplied air respirators. If elevated (greater than 22%) oxygen levels are detected, the confined space must be ventilated prior to any "hot work". Any oxygen reading above or below 20.9% will be reported to the site safety officer before further entry is attempted.
- 5.5 Permissible Exposure Limits (PEL) - OHM employees will be provided with and will be required to properly use protective clothing and respiratory protective equipment when contaminants in the atmosphere reach or exceed the PEL. The personal protective equipment (PPE) selected will reduce exposure to contaminants to acceptable levels.

6. LABELING AND POSTING

- 6.1 Any signs warning of dangers in the work area will be in English and the predominant language of any non-English reading workers.
- 6.2 All entrances to confined spaces at OHM facilities and on-going projects will have appropriate signs posted. The signs should include the following, if applicable:

**Danger
Confined Space Entry
Entry by Permit Only**

The following statements shall be added where necessary:

**Respirator Required for Entry
Lifeline Required for Entry
Hot Work Permitted
or
No Hot Work**

6.3 Emergency numbers will be conspicuously posted near the work area or at the telephone nearest the work area.

7. SAFETY EQUIPMENT AND PPE

The site safety officer or site supervisor will determine and list on the confined space permit the necessary safety equipment and PPE. The site supervisor will ensure that the safety equipment is properly used and is maintained in the proper working condition. These items may include, but are not limited to:

- Eye / face protection
- Head protection
- Foot protection
- Protective clothing
- Hearing protection
- Respiratory protection
- Safety bells/Alarms
- Harnesses
- Lifelines
- Wrist harnesses
- Life jackets
- Fall nets
- Barricades
- Retrieval systems

8. WORK PRACTICES

8.1 Purge and Ventilation - During purge and ventilation procedures, blower controls will be a safe distance from the confined space. Initial testing is to be conducted prior to purge/ventilation to determine what precautions are necessary. If a flammable atmosphere exists, all electrical equipment must be intrinsically safe or explosion proof. Continuous ventilation will be required when welding or painting in a confined space, or where a toxic atmosphere may form from desorption from walls, or evaporation of chemicals.

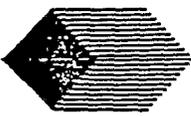
Ventilation systems must not prevent egress from the area or interfere with communications.

- 8.2 Isolation / Lock-out / Tag-out - Each confined space will have isolation procedures specifically developed. The confined space must be completely isolated from all systems by physical disconnect, block and bleed, or blanking and tagging. Electrical systems must be de-energized and locked-out. All systems should be checked for stored energy before any entry into confined space is attempted.
- 8.3 Cleaning - Cleaning procedures will be reviewed and approved by the qualified person. Initial cleaning will be conducted from outside the tank whenever possible to minimize exposures to employees. Cleaning may be accomplished by flushing with water or chemical cleaners. At times the use of a "Butterworth" cleaning head may be required. In any case, gross material must be removed before entry is performed.

9. EQUIPMENT AND TOOLS

All equipment that is used in confined space will be inspected and as a minimum, will meet the following requirements:

- Hand tools will be kept clean and in proper working condition.
- Electric tools, equipment and lighting will be intrinsically safe or explosion proof for flammable atmospheres and be equipped with ground fault circuits interrupters (GFCI).
- Extension cords will be industrial quality, 3 wire and 12 gauge as a minimum.
- Cylinders of compressed gas will never be taken into a confined space, with the exception of SCBA tanks or life saving equipment.
- Ladder and scaffolding will meet or exceed OSHA requirements in 29 CFR 1910.25-28.



Permit No. _____

Good on this Date Only: _____ From: _____ a.m. p.m. To: _____ a.m. p.m.

Location: _____ Project No. _____

Workers Authorized Entry:	Work Monitors:	Work Monitors:
_____	_____	_____
_____	_____	_____
_____	_____	_____

Description of Job or Special Procedures: _____

Employee Training and Pre-Entry Briefing

- 1. Safe Entry and Rescue Training Conducted on: _____ (Date)
- 2. Mandatory Pre-Entry Briefing Conducted on: _____ (Date)
- 3. Does this Job Require Special Training? Yes No

Contractor Notification

Contractor Notified of: Permit Conditions _____ Potential Hazards _____ N/A _____

Lighting Requirements	Special Tools/Equipment	Communication Devices
_____	_____	_____
_____	_____	_____
_____	_____	_____

- 1. Are All Electrical Devices Intrinsically Safe? Yes No
- 2. Have All Power Cords and Tools Been Visually Inspected? Yes No

Vessel Preparation

- 1. Work Area Isolated with Signs/Barriers? Yes No
- 2. All Energy Sources Locked/Tagged Out? Yes No
- 3. All Input Lines Capped/Blinded? Yes No
- 4. Vessel Contents Drained/Flushed/Neutralized? Yes No
- 5. Vessel Cleaned/Purged? Yes No
- 6. Ventilation Provided 30 Minutes Before Entry? Yes No

Pre-Entry Atmospheric Testing

	Reading:		Time:	Initials:
1. Test for Oxygen Content:	_____ % O ₂		_____	_____
2. Test for Flammable Concentration:	_____ % LEL		_____	_____
3. Test for Toxic Concentration:	_____ ppm of _____ (TLV= _____)		_____	_____
4. Test for Heat Stress Hazard:	_____ °F _____ °C _____ WBGT		_____	_____

Emergency/Rescue Procedures

- 1. Location of Written Emergency/Rescue Plan: _____
- 2. Type of Emergency/Rescue Team Required: On-Site _____ Off-Site _____ Phone No. _____

Safety Equipment

Personal Protective Equipment Required:	Area Safety Equipment Required:
_____	_____
_____	_____
_____	_____

- 1. Self-Contained Breathing Apparatus Required? Yes No Type: _____
- 2. Portable Atmospheric Monitor Required? Yes No Type: _____

Permit Authorization

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

Permit Authorized by (Signature): _____

**APPENDIX
F**

APPENDIX F
HIGH PRESSURE WASHER PROCEDURES

1. OBJECTIVE

OHM Remediation Services Corp. (OHM) personnel who have been trained in the proper set-up, use, and care of high pressure washers will be authorized to operate this equipment.

2. PURPOSE

This procedure describes requirements for the safe operation of the high-pressure washer.

3. PERSONAL PROTECTIVE EQUIPMENT

The following equipment will be worn by operators and assistants:

- Safety shoes or boots
- Metal foot and shin guards
- Eye protection (goggles and face shield)
- Hard hat
- Heavy duty PVC rain suit or equivalent
- Heavy chemical resistant gloves
- Appropriate respiratory protection, when required by site-specific HASP

4. OPERATION PROCEDURE

- Only trained, authorized personnel will operate the high-pressure washer.
- The lance must always be pointed at the work area.
- The operator must maintain good footing.
- The operator must have an assistant to aid in moving the hose to different areas and backing up the operator. The assistant must remain in back of the operator.
- Non-operators must remain a safe distance from the operator. The distance must be a minimum of 25 feet.
- The operating pressure should never exceed that which is necessary to complete the job.

- No unauthorized attachment may be made to the unit. (The trigger should never be tied down.)
- The operator should be changed at frequent intervals to avoid fatigue (at least hourly).
- Equipment should be cleaned often to avoid oil or dirt build-up, especially around the trigger and guard area.
- An assistant should always be standing by at the pressure generator to shut down the equipment and monitor the pressure.
- All users must be trained in emergency shut down procedures and general equipment maintenance.
- All lances must be made of seamless stainless steel. Do not use carbon steel which can corrode and result in weakening of the lance.
- DO NOT MODIFY THE LANCE. The lance barrel, from trigger block to the tip, should not be less than 48 inches as recommended by manufacturers of hydroblasting equipment.
- Always increase pressure slowly to inspect for leaks. All leaks or malfunctioning equipment must be repaired immediately or the unit taken out-of-service. Never exceed the operating pressure necessary to do the job.
- Attach a cable which connects the water supply hose to the laser wand to prevent whipping should they accidentally disconnect.
- A serious risk of infection and further complications is possible from a hydroblasting laceration. If an injection injury is suspected, the treating physician should be informed so he/she can request a surgeon who specializes in injection injuries. The specialist may have to perform surgery on the affected body part in order to remove the material (oil, particles) that was injected directly through the skin.

5. CONTAMINATED LIQUIDS

Liquids generated by operations involving high-pressure washers may require containment, characterization and disposal as hazardous waste. Washers used for decontamination purposes will be operated with respect to containment of liquid run-off, splash and spray to prevent migration of any contamination from the containment within the EZ (exclusion zone), CRZ (contamination reduction zone) decontamination area. Contaminated liquids will be containerized and disposed of in accordance with, federal, state, and local regulations.

**APPENDIX
G**



APPENDIX G
HEAT STRESS



OHM Corporation

HEALTH & SAFETY PROCEDURES

HEAT STRESS

PROCEDURE NUMBER 22

Page 1 of 3

LAST REVISED 12/92 APPROVED BY: JFK/FHH

1. OBJECTIVE

In work situations where heat stress may be a factor, OHM Remediation Services Corp. (OHM) will attempt to prevent heat related illness by use of work-rest schedules, physiological monitoring and/or personal cooling devices.

2. PURPOSE

This procedure describes the causes, symptoms, treatment, and prevention of heat-related illness.

3. GENERAL INFORMATION

3.1 Heat-related illnesses are caused by the body's inability to dissipate metabolic heat in conjunction with excessive environmental heat and wearing PPE.

3.2 A period of adjustment or acclimatization is necessary before maximum tolerance to heat is acquired. Most workers require 7 to 10 working days of gradually increasing workload to become fully acclimatized.

4. HEAT-RELATED ILLNESSES

4.1 Heat rash can be caused by continuous exposure to hot and humid air and skin abrasion from sweat soaked clothing.

Signs and Symptoms: The condition is characterized by a localized red skin rash and reduced sweating. Aside from being a nuisance, the ability to tolerate heat is reduced.

Treatment: Keep skin hygienically clean and allow it to dry thoroughly after using chemical protective clothing.

4.2 Heat cramps are caused by profuse perspiration with inadequate fluid intake and salt replacement. This often robs the larger muscle groups (stomach and quadriceps) of blood which can make them cramp.

Signs and Symptoms: Muscle spasm and pain in the extremities and abdomen.

Treatment: Remove affected person to a cool place and give sips of clear water or an electrolytic drink (Gatorade). It should be recommended to the person experiencing heat cramps to lightly salt their food to make up for the sodium lost when sweating. Manual pressure may also be applied to the cramped muscles.

- 4.3 **Heat exhaustion** is a mild form of shock caused by sustained physical activity in heat and profuse perspiration without adequate fluid and salt replacement.

Signs and Symptoms: Weak pulse; shallow breathing; pale, cool, moist (clammy) skin; profuse sweating; dizziness; fatigue

Treatment: Remove affected person to a cool place and remove as much clothing as possible. Give sips of water or electrolytic solution and fan the person continually to remove heat by convection. **CAUTION:** Do not allow the affected person to become chilled -- treat for shock if necessary.

- 4.4 **Heat stroke** is the most severe form of heat stress; the body must be cooled immediately to prevent severe injury and/or death. **THIS IS A MEDICAL EMERGENCY!!**

Signs and Symptoms: Red, hot, dry skin; body temperature of 105 degrees Fahrenheit or higher; no perspiration; nausea; dizziness and confusion; strong, rapid pulse; coma

Treatment: Heat stroke is a true medical emergency. Transportation of the victim to a medical facility must not be delayed. Prior to transport, remove as much clothing as possible and wrap the victim in a sheet soaked with water. Fan vigorously while transporting to help reduce body temperature. Apply cold packs, if available; place under the arms, around the neck, or any other place where they can cool large surface blood vessels. If transportation to a medical facility is delayed, reduce body temperature by immersing victim in an ice/water bath (however, be careful not to over chill the victim once body temperature is reduced below 102 degrees Fahrenheit). If this is not possible, keep victim wrapped in a sheet and continuously douse with water and fan.

5. SPECIFIC REQUIREMENTS

- 5.1 The environmental hazards section of site health and safety plans will address heat stress if the ambient temperature is expected to exceed 65 degrees Fahrenheit.
- 5.2 The site health and safety plan will discuss work-rest cycles and provisions for monitoring the level of heat stress (i.e., pulse rate).

- 5.3 Workers are to be advised not to drink caffeinated or alcoholic beverages because they increase the rate of body water loss.
- 5.4 Increased dietary salt or lightly salted (0.2 percent) water is adequate to replace lost salt. Salt tablets are not to be used.
- 5.5 If juice or electrolyte drinks are used, they should be diluted prior to drinking.
- 5.6 Thirst is not an adequate indicator of body water loss. Workers are to drink at least small amounts of water on each break.
- 5.7 Workers are to rest when any of the symptoms described above are present. The buddy system is mandatory, as most often the potential victim will not be aware of any symptoms. Watch out for each other.

**APPENDIX
H**

APPENDIX H
SAFETY TRAINING REQUIREMENTS



OHM Corporation

HEALTH & SAFETY PROCEDURES

SAFETY TRAINING REQUIREMENTS

PROCEDURE NUMBER 13

Page 1 of 3

LAST REVISED 12/92 APPROVED BY: JFK/FHH

01 OBJECTIVE

All employees will receive training in compliance with 29 CFR 1910.120 prior to participation in hazardous waste site activities, emergency response or before undertaking an unfamiliar task which presents an occupational risk.

2. PURPOSE

The purpose of this procedure is to describe training requirements for employees who may be exposed to hazardous substances, health or safety hazards.

3. REQUIREMENTS

3.1 Prior to working on a hazardous waste site, employees will receive 40 hours of training off site to comply with 29 CFR 1910.120. Such training will, as a minimum, include:

- Hazard Communication 29 CFR 1910.1200 (basic toxicology, chemical and physical hazards, labeling, and other information systems).
- Elements of a site safety plan.
- Respiratory protection.
- Personal protective equipment.
- Use of direct reading instruments.
- Medical surveillance.
- Decontamination.
- Site control.
- General work practices.
- Electrical safety including Lockout/Tagout.
- Confined space safety.
- Eye safety.

- Hearing safety.
 - Incident command.
 - Fire safety.
- 3.2 Employees who can document experience or a level of training equivalent to that required in section 4.1, may be "Grandfathered" and will not be required to complete the 40-hour initial training as specified in 29 CFR 1910.120(e)(9).
- 3.3 After the initial training, or above "Grandfathering", the individual will receive 3 days of on the job experience under the supervision of a trained, experienced supervisor as specified in 29 CFR 1910.120(e)(3)(i).
- 3.4 Supervisory personnel will receive 8 additional hours of specialized training on the Safety and Health Program, Personnel Protective Equipment, Spill Containment, and Health Hazard Monitoring and procedures and techniques as specified in 29 CFR 1910.120(e)(4).
- 3.5 Additional training may be received concerning the Drug-Free Workplace Act, the United States Department of Transportation (DOT) drug awareness training, and on lockout/tagout, defensive driving, trenching, etc.
- 3.6 An on-site safety training session, in compliance with 29 CFR 1910.120(b)(4), addressing site specific safety concerns will be conducted by the safety officer prior to work at a hazardous waste site involving potential exposures to hazardous materials.
- 3.7 Specific training is required prior to working with certain hazardous materials such as asbestos, lead, or known carcinogens. The specific training requirements for each regulated material will be met.
- 3.8 Operators of equipment such as fork-lifts or high-pressure washers, etc., must receive additional training prior to using such equipment.
- 3.9 Employees working on sites regulated under the Resource Conservation and Recovery Act (RCRA) will receive 24 hours of initial training as required in 40 CFR 264.16
- 3.10 All employees involved with hazardous waste site activities who receive the 40-hour or the 24-hour initial training will receive 8 hours of refresher training annually as required in 29 CFR 1910.120(e)(8).
- 3.11 Daily safety meetings will be conducted at all sites to address new tasks, prior days events and applicable health and safety topics.

- 3.12 Contractor employees must provide proof of appropriate training and adhere to all of the conditions of this health-and-safety procedures manual.
- 3.13 Employees assigned to emergency response activities will receive training specific to the equipment and procedures of such activities.
- 3.14 Employees will be issued copies of training certificates which documents the training received. Employees are required to bring these copies to all job assignments as documentation of current and applicable training.

APPENDIX

I

APPENDIX I
PERSONAL PROTECTIVE EQUIPMENT



OHM Corporation

HEALTH & SAFETY PROCEDURES

PERSONAL PROTECTIVE EQUIPMENT PROGRAM

PROCEDURE NUMBER 17

Page 1 of 9

LAST REVISED 12/92 APPROVED BY: JFK/FHH

1. OBJECTIVE

OHM Remediation Services Corp. (OHM) has established and observes a Personal Protective Equipment (PPE) Program for all OHM personnel.

2. PURPOSE

The purpose of this procedure is to address the elements of the (PPE) program. This PPE program will conform to the requirements found in 29 CFR 1910.120 (g), .132, .133, .134, .135, .136 and .1200 .

3. THE PROGRAM

3.1 Hazards - All work undertaken by OHM personnel will be characterized for physical and chemical hazards prior to commencement of work. All known hazards will be considered to ensure that OHM personnel use an acceptable level of PPE.

3.2 PPE Selection - The regional health-and-safety manager will review the expected work to assure the proper selection of PPE for the associated hazard.

3.3 PPE Use - Each site supervisor will be responsible for the proper use of PPE by workers under his/her direction. The site safety officer (SSO) will advise and assist the site supervisor in proper PPE use and will monitor the effectiveness of the chosen PPE.

3.4 Work Mission Duration - The site supervisor will be responsible for the establishment of the duration of specific work missions. The duration will be determined by the complexity of the assignment, PPE involved, physical factors, temperature, humidity, weather conditions, elevation of work, acclimation of the worker to the demands of the task assigned, and recommendation of the SSO.

A sufficient amount of rest breaks will be allowed in order to avoid overexertion by the employees while maintaining productive work practices.

3.5 PPE Maintenance and Storage - Each employee is responsible for the proper maintenance and storage of the standard equipment issued (e.g., hard hat, full facepiece negative pressure respirator, safety glasses). The

site supervisor, will assure that proper maintenance is carried out. OHM will provide, at no cost to the employees, spare parts for maintenance of OHM standard issue PPE.

All supplied air respirators will be cleaned and prepared for storage by the individual wearer or an individual that has been assigned to that task. The SSO will perform periodic inspections to verify proper cleaning and storage of PPE. Only factory representatives or certified technicians will perform maintenance or make adjustments that are considered to be other than basic maintenance.

- 3.6 PPE Decontamination - Each employee is responsible for daily cleaning and decontamination of standard issue PPE. Some projects may require other designated personnel to decontaminate reusable PPE, such as Level A and acid suits.
- 3.7 PPE Training and Proper Fitting - All employees will receive training in the proper use of PPE prior to wearing the equipment in a work situation. This training will be administered upon commencement of employment and will be reviewed annually. Employees will be directed in the proper use and fitting of PPE by the site supervisor.
- All employees that are required to wear full facepiece negative pressure respirators will be qualitatively or quantitatively fit tested in the type and size respirator which is assigned to them.
 - All employees that are required to wear full-facepiece negative pressure respirators and work with asbestos, lead or any other chemical or compound that requires quantitative respirator fit testing will receive the proper test.
- 3.8 PPE Donning and Doffing Procedures - All employees will receive training upon commencement of employment and during annual refresher training concerning the donning and doffing of PPE. Periodic training will be given as needed.
- 3.9 PPE Inspection - Each employee shall inspect standard issue PPE for defects and proper function prior to each use. If any parts are missing or defective, they will be replaced at no cost to the employee.

Supplied air respirators shall be periodically inspected by qualified employees for defective or missing parts and if the unit is defective it will be sent to a licensed service facility for repairs.

- 3.10 PPE In Use Monitoring - The site supervisor is responsible for monitoring the effectiveness of selected PPE. If at any time PPE is to be down-graded, it is mandatory that the change be approved by the regional health and safety manager.
- 3.11 Evaluation of PPE Program - It is the goal of OHM to supply our employees with PPE that provides the highest degree of protection required in any situation. OHM SSO's will compile data on PPE in the field to determine that the PPE performs to OHM needs. Periodically, this information should be reviewed manager of industrial hygiene to ensure that PPE is providing the necessary level of protection, quality, and is appropriate for the work performed.

If at any time the failure of PPE causes injury to an employee or fails to perform as expected, OHM will take the unit out of service and investigate the incident. If after scrutiny, the unit is determined to have a manufacturing defect, all like units will be de-activated and recalled.

- 3.12 Limitations During Temperature Extreme - Extreme temperatures exert undue stress on personnel and equipment. During periods of extreme temperature, work assignments will be adjusted to protect the employee from overexertion or exposure.
- 3.13 Unserviceable PPE - Any PPE which is no longer functioning properly or is no longer serviceable, shall be repaired or removed and destroyed.

4. WORK CLOTHES

OHM employees, contractors, and visitors will observe the requirements for proper work clothing when on OHM project sites, facilities and shops.

- 4.1 Long pants are required at all times.
- 4.2 Shirts will be worn on the job. Shirts will be buttoned up the front and at the cuff unless rolled up. Shirt tails must be kept in the trousers. Sleeveless shirts are prohibited at all work locations.
- 4.3 Loose or ragged clothing will not be worn.
- 4.4 Clothing (including shoes) saturated with petroleum products or chemicals will be removed immediately to prevent irritation and possible dermal exposure.

4.5 Rings and other jewelry (except watches) must be removed when working in areas where they could catch on moving objects or sharp protrusions or come in contact with electrical circuits or chemical agents. Additionally, the site supervisor, may deem other types of jewelry inappropriate for hazardous waste and emergency response activity.

4.6 Hair long enough to constitute a hazard while working around moving machinery or rotating tools and equipment must be secured by a net or tied back. Hair styles must make it possible to wear safety headgear and safety glasses properly.

5. SAFETY FOOTWEAR

All OHM employees, contractors, and visitors that enter OHM operating facilities must wear approved, steel toe and shank safety shoes or boots.

5.1 Project Sites

Steel toe and shank leather work boots conforming to the American National Standards Institute (ANSI) standard Z-41.1 - 1991 shall be worn on all OHM project sites. High top or low top sneakers, even though ANSI approved are not appropriate for the activities encountered at hazardous waste and emergency response sites and shall not be worn.

5.2 OHM Facilities and Shops

Personnel working at OHM shops and facilities have the option of wearing other types of ANSI approved safety work shoes and boots provided they are appropriate for the tasks being performed. The supervisor of the affected personnel is responsible to decide what type footwear is appropriate.

6. SAFETY HEADGEAR

All OHM employees, contractors, and visitors will wear approved safety headgear at all times on project sites and as described in 6.2 of this procedure for activities conducted at OHM facilities and shops.

6.1 Safety headgear meeting the requirements of ANSI Z89.1-1986 shall be worn in all appropriate operating areas. The safety headgear worn must meet the ANSI requirements of impact resistance.

6.2 Safety headgear will be worn by all personnel while engaged in work where there is a hazard of falling objects or where there are low overhead restrictions. Safety headgear and winter liners are furnished by OHM.

6.3 Safety headgear must be worn by all contractors' employees and visitors to company facilities where overhead hazards exist and work sites where safety headgear is required to be worn by company employees.

6.4 Safety headgear must be worn prescribed by the manufacturer and shall not be painted, drilled or modified in any manner.

7. HAND PROTECTION / GLOVES

OHM employees and contractors will don suitable gloves when engaged in any operation that presents a hazard to the hands.

7.1 A wide variety of work gloves are available for hand protection against heat and flame, cold, chemicals, petroleum products, corrosive materials, moisture, mechanical abrasion, electricity, and sharp and rough surfaces. The type of work gloves used must be approved by the regional health and safety manager.

7.2 Employees shall wear suitable gloves while engaged in all operations that are hazardous to the hands. Specific types of hand hazardous operations are:

- Welder's leather gloves, protective sleeves, jacket and chaps for use during welding and burning operations to prevent burns from flying sparks.
- Protective gloves must be worn during any operation where there is the probability of contact with harmful chemicals, solvents or oil.
- When handling slings or wire ropes and rough, abrasive materials, leather palmed, flame resistant leather, heat-treated, gauntlet work gloves should be worn.
- When working on certain high voltage (480 volts and above) electrical equipment, electrically tested high voltage gloves will be worn. Leather protection will be worn over these gloves. (NOTE: only authorized personnel are allowed to work on High Voltage electrical equipment).

8. EYE/FACE PROTECTION

No OHM employee, contractor or visitor will knowingly expose himself/herself to a hazardous condition without donning the proper protective eye/face equipment. All eye and face protection shall meet the ANSI Z87.1 - 1989 standard for eye/face protection designated for the hazard present during the operation posing exposure to eye or face injury.

8.1 To protect the face and eyes against injuries from flying objects, splashing liquids, and harmful rays that cannot always be controlled at the source, spectacles with side shields, goggles, and face shields will be used. No unprotected person shall knowingly subject themselves to a hazardous condition but shall protect themselves with the proper eye and face protection that is provided by OHM. The SSO will be responsible to identify the need for eye/face protection and specify the eye/face protection required for each operation.

8.2 Nearly all eye/face injuries can be prevented by the use of eye/face protection. From past general industry experience, certain areas and operations have been designated as requiring the use of safety spectacles or goggles. Several areas and operations are listed below:

- Flying Objects - When striking one object with another object, personnel will wear safety goggles to protect their eyes/face from flying metal particles. Proper goggles shall be worn by all personnel performing work with a recognized hazard to the eyes/face such as: wire brushing, buffing, chipping, grinding, cutting wire, welding, handling chemicals, acids or caustic, working on rusty or dirty chains or cable.
- Welding - Never look directly at a welding arc and always shield your eyes/face from the rays, even rays being reflected from another surface. Wear special goggles provided by OHM while helping or working within close range of welders. Refer to Table 1 and Table 2 at the end of this procedure to determine the darkness of goggle and welding helmets lenses.
- Prescription Spectacles - For personnel that wear prescription spectacles, OHM provides prescription safety spectacles. It is mandatory that prescription safety spectacles not be altered by the employee and be worn at all times when safety spectacles are required.
- Splash Goggles - Safety spectacles are not safety goggles. Wear safety goggles over spectacles if work being performed requires safety goggles.
- Pressure Vessels - Working with any elevated pressure piping, tubing, or cylinders.

8.3 Eye/face protection will meet the following requirements:

- They provide adequate protection against the hazard for which they were designed.
- They will be reasonably comfortable when worn under actual work conditions.

- They will fit securely and will not impede the movement of the wearer.
- They will be durable.
- They will be capable of being disinfected.
- They will be easily cleaned.
- They will be kept in good repair and clean.

9. FALL PROTECTION

OHM requires that employees and contractors never engage in activities at heights that put them at risk without the proper fall protection. Fall protection shall be used whenever work is performed above 4 feet.

9.1 General

OHM requires that no exposure shall be permitted to a fall hazard without protection. Protection shall consist of:

- Removing the hazard exposure by establishing walls, floors and railings.
- Restricting the travel on unprotected elevations.
- Using safety nets or personal fall protection equipment to arrest an accidental fall.
- Enforcing general housekeeping requirements to ensure that all places of employment are kept clean and orderly at all times.

9.2 Handrail / Scaffold Fall Protection

Fall protection utilizing approved handrails shall be considered as the best method of protection when working on all elevated platforms. Handrails shall be constructed per 29 CFR 1910.28. As a minimum, the following criteria will be met:

- Scaffolding on wheels shall have wheels locked before any work aloft can commence.
- Scaffolding members shall be free of defects such as kinks in the tubular members.

- Scaffolding members shall not be constructed more than 5 units high unless approved by the SSO or a qualified engineer.
- All scaffolding shall be equipped with guardrails not less than 2 x 4 inches and not less than 36 inches or more than 42 inches high, with a mid-rail of 1 x 4 inch lumber or equivalent.
- All scaffolding 10 feet or more above the ground or floor must be equipped with toeboards on all open sides. Toeboards shall be a minimum of 4 inches in height.
- All planking or scaffolding floor members shall be of an approved type.

9.3 Fall Protection Equipment

Anchorage points for lifelines shall have the following minimum specifications:

- Anchorage points shall be at least waist high and preferably overhead.
- Anchorage points such as eyebolts or pad-eyes will be specified by a qualified engineer before utilization in a complete fall protection system.
- Anchorage points must be able to support a minimum of 5400 lbs. per worker in the direction of pull.
- Swing falls shall be prohibited.
- OHM approved full body harnesses shall be used for all fall protection applications. The harnesses are equipped with several "D" rings to accommodate safety lanyards or ladder climbing devices. Body type belts are not approved.
- OHM approved lanyard with double-locking snap hooks make up the standard personal protection for complete fall protection. Shock absorbing lanyards with double-locking snap hooks are also approved. Always hook the lanyard to the back "D" ring on the full body harness.
- Lifelines used in special cases for manlift applications shall exceed 5400 lbs. of breaking strength. The preferable rope is 5/8" black polypropylene. Use chafe protection around sharp edges. (NOTE: Standard yellow work rope are not to be used as lifelines).

- Ladder safety climbing devices shall be used when the ladder is equipped with such. The climbing device shall always hook to the front "D" ring of the harness.
- Lanyards exposed to shock loading due to a fall arrest shall be destroyed and replaced.

9.4 Rescue

- If the need for a rescue arises, only trained emergency responders shall make the attempt.

9.5 Inspection

All fall protection equipment shall be inspected before use for the following deformities.

- Inspect harness for frayed or torn straps.
- Inspect lanyard for torn or frayed parts especially near the sewn eyes.
- Inspect the snap hooks for cracks or the inability to open and close due to corrosion.
- Inspect all static lifelines for damage.



JHM Corporation

TABLE 1
GUIDE FOR WELDING SHADE NUMBERS

<u>Operation</u>	<u>Electrode Size</u> <u>1/32 inch</u>	<u>Arc Current (A)</u>	<u>Minimum Protective Shade</u>	<u>Suggested* Shade No. (Comfort)</u>
Shielding metal arc welding	Less than 3	Less than 60	7	---
	3-5	60-160	8	10
	5-8	160-250	10	12
	More than 8	250-550	11	14
Gas metal arc welding and flux cored arc welding		Less than 60	7	---
		60-160	10	11
		160-250	10	12
		250-500	10	14
Air carbon Air cutting	(Light)	150-500	10	14
	(Heavy)	Less than 500 500-1000	10 11	12 14
Plasma arc welding		Less than 20	6	6 to 8
		20-100	8	10
		100-400	10	12
		400-800	11	14
Plasma arc cutting	(Light)	Less than 300	8	9
	(Medium)	300-400	9	12
	(Heavy)	400-800	10	14
Torch brazing		---	---	3 or 4
Torch soldering		---	---	2
Carbon arc welding		---	---	14

*As a rule of thumb, start with a shade that is too dark to see the weld zone. Then go to a lighter shade which gives sufficient view of the weld zone without going below the minimum. In oxyfuel gas welding or cutting where the torch produces a high yellow light, it is desirable to use a filter lens that absorbs the yellow or sodium line in the visible light of the (spectrum) operation.



OHM Corporation

TABLE 2
GUIDE FOR CUTTING SHADE NUMBERS

<u>Operation</u>	<u>Plate Thickness</u>	<u>Minimum Protective Shade</u>
Gas Welding		
Light	Under 1/8	4 or 5
Medium	1/8 to 1/2	5 or 6
Heavy	over 1/2	6 or 8
Oxygen Cutting		
Light	Under 1	3 or 4
Medium	1 to 6	4 or 5
Heavy	Over 6	5 or 6



OHM Corporation

HEALTH & SAFETY PROCEDURES

RESPIRATORY PROTECTION

PROCEDURE NUMBER 18

Page 1 of 8

LAST REVISED 12/92 APPROVED BY: JFK/FHH

1. OBJECTIVE

No individual will enter an area where the use of respiratory protective equipment is required unless the person has been trained in the selection, use, care and limitations of the respirators, and the proper respirator has been selected for the task and fit tested.

2. PURPOSE

The purpose of this procedure is to provide information and guidelines for the selection, use, and care of respiratory protective equipment for all OHM Remediation Services Corp. (OHM) and contractor personnel. This procedure complies with the requirements of 29 CFR 1910.134.

3. GENERAL

3.1 The use of engineering controls should be the primary respiratory hazards method to limit employee exposure to respiratory hazards.

3.2 Respirators shall be worn when engineering controls are unsuccessful and:

- When the PEL (Permissible Exposure Limit), TLV (threshold limit value), or ceiling limit for the material exposure is approached or exceeded, as measured by sampling.
- As deemed appropriate by the regional health and safety manager.

3.3 Respirators can only be worn by individuals who have been properly trained and fit tested.

3.4 The regional health and safety manager will evaluate annually the effectiveness of the respirator program and report his findings to the vice president of health and safety.

3.5 The respirator program coordinator for each region will be the regional health and safety manager.

- 3.6 Only respirators approved by the National Institute for Occupational Safety and Health (NIOSH) and the Mine Safety and Health Administration (MSHA) which are appropriate for the potential hazard shall be worn.

4. SELECTION OF RESPIRATORS

- 4.1 Engineering controls should always be the primary control of contaminated air (i.e. elimination of source of contamination, ventilation equipment, barriers, etc).

- 4.2 Once the need for respirators has been established, the respirators shall be selected on the basis of the hazards to which the worker is exposed.

- 4.1.1 Selection criteria should include:

- The concentration of the contaminant.
- Whether the contaminant may be sufficiently toxic to be immediately dangerous to life or health (IDLH).
- The possibility of oxygen deficiency.
- The useful life of the respirator or cartridge.
- The escape routes available.
- Whether the equipment is intended for emergency use, for periodic use, or for stand-by purposes.

- 4.3 Characterization of the hazard and proper respirator data will be performed to determine what type respirator will be used.

5. MEDICAL SCREENING

- 5.1 Prior to assigning personnel tasks requiring the use of respirators, the employee shall be medically evaluated in compliance of requirements of 29 CFR 1910.134(a)(10).

- 5.2 Employees not physically and psychologically capable of wearing respirators shall not be assigned to such work.

- 5.3 The medical status of each employee is to be reviewed as outlined in Procedure 10 and as may be deemed necessary if the physical status of the employee changes.

6. FIT TESTING

- 6.1 Fit testing will be performed in accordance with accepted fit test procedures by the regional health and safety manager or their designated employee who has been trained and qualified to do so. Fit testing will take place annually. Site specific fit tests will take place when requested by the client.
- 6.2 Records of fit testing shall be maintained by the employee's division office and/or corporate human resources. These records will include the type and size of respirator the employee used in the fit test, and the procedures used to perform the fit test.

7. RESPIRATOR USE INSTRUCTIONS

- 7.1 Respirators must be used only by those employees who have been properly trained and qualified on the specific type of respirator to be worn.
- 7.2 All employees whose job assignment requires the use of respirators shall be given respirator training at the time of fit testing before being assigned to the job. Retraining must be performed annually on each type of respirator worn by the individual. Training records must be kept.
- 7.3 Only respirators and cartridges approved for the hazardous atmosphere to be encountered will be used.
- 7.4 Only NIOSH/MSHA approved, respirators will be worn by an individual.
- 7.5 CAUTION: Full face piece or one-half face piece air-purifying respirators are not to be used where there is an oxygen deficiency. Only air-supplied full-face respirators with an emergency escape cylinder or self-contained breathing apparatus will be worn when an oxygen deficiency exists.
- 7.6 CAUTION: A respirator does not protect against excessive heat or against hazardous substance that can attack the body through the skin.
- 7.7 Contact lenses shall not be worn with full-face respirators.
- 7.8 A person wearing a respirator must be clean-shaven in the area of the face piece seal. Long hair, sideburns, and skull caps that extend under the seal are not allowed. Glasses with temple pieces extending under the seal are not allowed. Persons with facial conditions that prevent a proper seal are not allowed to wear a full-face piece respirator until the condition is corrected. Facial conditions which may cause a seal problem include missing dentures, scars, severe acne, etc.

8. RESPIRATOR INSPECTION

8.1 Respirators shall be inspected by the user before and after each day's use and those not used routinely shall be inspected once a month.

8.2 Inspection procedure air purifying respirators (full-face piece and one half-face piece cartridge/canister respirators)

8.2.1 Examine the face piece for:

- Excessive dirt
- Cracks, tears, holes, or distortion from improper storage.
- Inflexibility
- Cracked or badly scratched lenses.
- Incorrectly mounted lens or broken or missing mounting clips.
- Cracked or broken air purifying element holder, badly worn threads, or missing gaskets.

8.2.2 Examine the head straps or head harness for:

- Breaks or cracks
- Broken or malfunctioning buckles. Excessively worn serrations on the head harness which may permit slippage.

8.2.3 Examine exhalation valve for the following after removing cover:

- Foreign material
- Cracks, tears, or distortion in the valve material.
- Improper insertion of the valve body in the face piece.
- Cracks, breaks, or chips in the valve body, particularly in the sealing surface.
- Missing or defective valve cover.
- Improper installation of the valve in the valve body.

8.2.4 Examine the air purifying elements for:

- Missing cartridge adapter gasket
- Incorrect cartridge/canister, or filter for the hazard.
- Incorrect installation, loose connections, missing or worn gaskets, or cross threading in the holder.
- Cracks or dents in outside case or threads of filter or cartridge/canister.

8.2.5 If the device has a corrugated breathing tube, examine it for:

- Broken or missing end connections.
- Missing or loose hose clamps.
- Deterioration, determined by stretching the tube and looking for cracks.

8.3 Inspection procedure air-supplied respirators (full-face piece air line respirators and self contained breathing apparatus (SCBA)) should be inspected as follows:

8.3.1 If the device has a tight-fitting face piece, use the procedures outlined for air purifying respirators will be followed, except those pertaining to the air purifying elements.

8.3.2 The inspection of air-supplied respirators should include checks on the following items:

- Tightness of connections
- Condition of all rubber parts
- Air cylinder (SCBA & egress) must be fully charged and the hydrotest certification must be current (SCBA cylinders-3 years/egress cylinders 5 years).
- Regulators and warning devices function properly.
- Does each unit (SCBA & egress) have a distinct identification number permanently affixed or engraved on the regulator?

- 8.4 A record of respirator inspections including date and inspectors initials and maintenance will be maintained for all pieces of respiratory protective equipment designated for emergency response. The SCBA inspection form follows this procedure.

9. CLEANING OF RESPIRATORS

- 9.1 Respirators assigned and worn by one individual must be cleaned after each day's use. Visitors's or multi-assigned respirators must be cleaned and disinfected after each use.
- 9.2 Extreme caution must be exercised to prevent damage from rough handling during the cleaning procedure.
- 9.3 After cleaning, respirators must be reassembled.
- 9.4 A respirator spray disinfectant is approved as disinfectant between continuous use but not for cleaning and sanitizing after each day's use.
- 9.5 Cleaning Procedure for Individually assigned Respirators
- 9.5.1 Washing: The respirator must be disassembled and washed with a mild liquid detergent in warm water. A brush should be used. To avoid damaging the rubber and plastic in respirator face pieces, use a soft bristle brush and a cleaner/water solution between 90 and 100°F.
- 9.5.2 Rinsing: The respirator should be rinsed thoroughly in clean water (140°F maximum) to remove all traces of detergent. This is very important to prevent dermatitis.
- 9.5.3 Drying: The following drying methods may be used: draining and drying on a clean surface; draining and drying when hung from racks (take care to prevent damage); towel drying with soft clothes or paper towels.
- 9.6 Cleaning Procedure for Visitor or Multi-Assigned Respirators
- 9.6.1 Washing: The respirator must be disassembled and washed with a brush in a cleaning solution in warm water. To avoid damaging the rubber and plastic in respirator face pieces, use a soft bristle brush and a cleaner/water solution between 90 and 100°F.

- 9.6.2 Rinsing: The respirator must be immersed in a disinfectant solutions noted below for at least 2 minutes and then rinsed in clean water at 140°F maximum.
- 9.6.3 Disinfection: 50 ppm of chlorine in a hypochloride solution made from household bleach (2 ml. to one liter of water).
- 9.6.4 Drying: The following drying methods may be used: draining and drying on a clean surface; draining and drying when hung from racks (take care to prevent damage); and drying in steel storage cabinets with built-in circulation fans. (Solid shelves should be replaced with steel mesh).

10. MAINTENANCE OF RESPIRATORS

- 10.1 Respirator maintenance shall only be performed by qualified personnel, for example site supervisors and site safety officers.
- 10.2 Approved replacement parts must be used. Substitution of parts from a different brand or type of respirator invalidates the technical approval of the respirator.
- 10.3 Maintenance performed on a self-contained breathing apparatus shall be done only by an individual who has been certified by the manufacturer.

11. STORAGE OF RESPIRATORS

- 11.1 When not in use, respirators must be stored to protect them from dust, sunlight, heat, extreme cold, excessive moisture, damaging chemicals, and physical damage.
- 11.2 Respirators must be stored in reusable plastic bags between shifts.
- 11.3 The respirator storage environment must be clean, dry and away from direct sunlight. Upright cabinets and wall-mounted cases are suggested.

12. BREATHING AIR

Breathing air shall meet at least the requirements of the specification for Grade D breathing air or better (D, E, or G not A, K, or L) as described in the American National Standard Commodity Specification for Air ANSI/CGA G-71-1989.

13. COLOR CODE

NIOSH recognizes the following standard color codes for respirator cartridges. The color codes can be used as a general guideline, however, personnel should refer to the NIOSH technical certification (TC) to verify adequate protection.

Acid gases	White
Organic vapors	Black
Ammonia gas	Green
Acid gases and organic vapors	Yellow
High Efficiency Particulate Air (HEPA) Dust, fumes, and mists (including asbestos and radioactive materials)	Magenta (Purple)
Dusts, fumes, and mists (other than asbestos and radioactive materials)	Orange



OHM Corporation

RESPIRATOR FIT TEST RECORD

Name: _____

Employee Number: _____

Date of Test: _____

Expiration Date: _____

Type of Fit Test: **Quantitative**
Protective Factor _____

Qualitative

TESTING AGENT:

Isoamyl Acetate (Banana Oil)

Irritant Smoke

Saccharin

RESPIRATOR DESCRIPTION

Manufacturer: _____

Model: _____

Size: _____

Test Conducted by: _____
(Please print)

Signature of Conductor: _____

I certify that I have been trained on the proper use, instructed on maintenance procedures, and have passed a respirator fit test as described above.

SIGNATURE OF EMPLOYEE: _____

COPY TO: Employee Home Division
Corporate Personnel Office (FAX Number: 419-425-6069)



OHM Corporation

SCBA MONTHLY INSPECTION CHECKLIST

SCBA ID NO. _____

YEAR _____

ITEM INSPECTED	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Connections are tight												
Face-piece in good condition												
Rubber parts pliable												
Regulator functions properly												
Alarm bell functions properly												
Cylinder fully charged												
Cylinder hydrotest current (within 3 years)												
Unit is clean												
Emergency bypass functions properly												
Inspectors initials and employee number												

DEFICIENCIES IN ABOVE ITEMS REQUIRE UNIT TO BE TAGGED AND REMOVED FROM SERVICE.

APPENDIX

J

APPENDIX J
BLOODBORNE PATHOGENS



OHM Corporation

HEALTH & SAFETY PROCEDURES

BLOODBORNE PATHOGEN

PROCEDURE NUMBER 52

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LAST REVISED 12/92

APPROVED BY: JFK/FHH

1. OBJECTIVE

This procedure is designed to present information on the nature of bloodborne diseases and to help OHM Remediation Services Corp. (OHM) employees reduce or eliminate potential exposure to bloodborne pathogens in their work environments. This procedure will ensure compliance with 29 CFR 1910.1030.

2. BLOODBORNE PATHOGEN COMPLIANCE - INFORMATION AND TRAINING

2.1 REGULATION AVAILABILITY - A copy of the Bloodborne Pathogen Standard (29 CFR 1910.1030) is available to all employees. OHM employees will be able to review the standard and obtain a copy anytime at the following locations. OHM employees who respond to incidents involving potential exposure to bloodborne pathogens will receive training specified in 29 CFR 1910.1030(g)(2).

- Occupation Health Supervisor Office - Findlay
- Corporate Health and Safety Training Coordinator's Office-Findlay
- Regional Health and Safety Manager Office
- Regional/Divisional Trainers
- Site Safety Officers

2.2 MODES OF TRANSMISSION OF BLOODBORNE PATHOGEN - Illness or disease related to bloodborne pathogens are transmitted through blood and other body fluids including semen, vaginal secretions, and any unfixed tissue or organ (other than intact skin) from a human (living or dead). OHM personnel must recognize that these products are potentially harmful and take precautions to protect themselves.

Occupational exposure to bloodborne disease such as Human Immunodeficiency Virus (HIV) and the Hepatitis B Virus (HBV) are most often transmitted through breaks in the skin or mucous membranes. This usually occurs through needlesticks or other contaminated broken sharp objects, human bites, or having blood or other body fluids enter existing cuts or abrasions.

2.3 EXPOSURE CONTROL PLAN - OHM has developed an exposure control plan which details the procedures which will be implemented to comply with the standard and to prevent or eliminate OHM personnel exposure to bloodborne pathogen. All OHM employees can review and if desired obtain a copy of the Exposure Control Plan at the following locations:

- Occupational Health Supervisor

- Corporate Health and Safety Training Coordinator
 - Regional Health and Safety Manager
 - Division Managers
 - Regional/Divisional Trainer
 - Site Safety Officers
- 2.4 TASK HAZARD ANALYSIS - Generally, OHM personnel are at a low risk for exposure to bloodborne pathogens. However, there are some situations in which OHM personnel may come into contact with potentially infectious contaminated material. These task includes:
- CPR and first-aid at OHM project site and facilities
 - Response to blood or medical waste emergency
- 2.5 PERSONAL PROTECTIVE EQUIPMENT - The personal protective equipment (PPE) required by the bloodborne pathogen standard is available at all OHM facilities and project sites. The PPE required for protection against bloodborne pathogens includes:
- Sample gloves
 - Safety glasses (minimum)
 - Liquid splash goggles (preferred)
 - Full-face shield (if potential to splash on face and in mouth)
 - CPR mask with one-way exhalation valve (for use only by trained personnel)
 - Disposal of regulated waste shall be in accordance with applicable regulations of the United States, States and Territories, and political sub-divisions of States and Territories.
- 2.6 HEPATITIS B VACCINATION - Because OHM personnel are low risk for exposure to bloodborne pathogens, post-exposure Hepatitis B vaccinations and medical evaluations will be implemented. Post-exposure vaccinations and medical evaluations are available to all employees who have had an exposure incident. All OHM employees who are First-Aid/CPR trained will be offered the option of HBV vaccinations.

Confidential medical evaluations and follow-ups will be made available to all affected employees following the report of an exposure incident. The medical evaluations will include the following elements:

- Documentation of exposure routes and circumstances of exposure
- Identification and documentation of source individual
- The source individuals blood will be tested as soon as feasible after consent is obtained in order to obtain the persons HIV/HBV status.

- 2.7 EMERGENCY PROCEDURES - The bloodborne pathogen standard dictates that **Universal Precautions** must be followed by employees at all times whenever contact with potentially infectious materials is possible. Universal precautions is a concept which is summarized as follows:

ALL HUMAN BLOOD AND CERTAIN HUMAN BODY FLUIDS ARE TREATED AS IF KNOWN TO BE INFECTIOUS FOR THE HIV, HBV, AND OTHER BLOODBORNE PATHOGENS.

There is always the potential for accidents in the work place and at project sites. When these incidents involve potentially infectious materials, protecting human health and safety is the primary consideration for all employees involved in the incident. Important steps to follow in this situation include:

- Avoid all contact with blood or other bodily fluids (i.e., vomit, saliva)
- Wear appropriate PPE when there is potential from contact with potentially infectious materials
- Warn employees in surrounding area of potential hazard
- Provide appropriate first aid, if trained to do so
- Report all exposure incidents to your supervisor
- Decontaminate all equipment and surfaces contaminated with blood or other body fluids.
- Employees exposed to potentially contaminated materials will wash-up immediately following the exposure.

- 2.8 BLOODBORNE PATHOGEN HAZARD COMMUNICATION - Communication of the hazards associated with blood, blood products, or other potentially infectious material is extremely important.

Warning labels must be affixed to containers of regulated waste. Labels must also be affixed to containers used to store, transport, or ship blood or other potentially infectious material. Labels must include the universal biohazard symbol and be fluorescent orange or orange-red with lettering or symbols in a contrasting color.

In most situations, OHM personnel will discard all potentially infectious material in red bags or red containers which may be substituted for labels. After an exposure incident occurs and potentially infectious material has been generated and containerized in red bags or containers, it will be the responsibility of the OHM project supervisor or shop foreman to contact the regional transportation and disposal coordinator for direction on the proper disposal of infectious or potentially infectious material.

- 2.9 DECONTAMINATION - Equipment and other surfaces which have been contaminated with blood or other body fluids must be decontaminated. Equipment and surfaces should be initially washed with a 10 percent bleach/water solution, then rinsed with clear water until all visible blood and body fluids has been cleaned up. The water generated during the decontamination can be disposed in the sanitary sewer or absorbed on paper towels for disposal. All solid waste generated should be added to the "Red Bag" waste stream.