2021 Hazardous Waste Scanning Project

File Form Naming Convention.

(*File_Type*).(*Program*).(*Site_Number*).(*YYYY-MM-DD*).(*File_Name*).pdf

Note 1: Each category is separated by a period "."
Note 2: Each word within category is separated by an underscore "_"

Specific File Naming Convention Label:

Report. HW. 932109. 2002-08-27. Revised_IRM_HASP.pdf

NYSEG

August 26, 2002

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Mr. Martin Doster
Division of Hazardous Waste Remediation
NYS Department of Environmental Conservation
270 Michigan Avenue
Buffalo, New York 14203-2999

Subject: ***REVISED*** *IRM* New York State Department of Transportation Prospect Street Over Erie Canal Project Health and Safety Plan for Activities on and Adjacent to NYSEG Lockport State Road Former Manufactured Gas Plant Site, dated August 2002

Dear Mr. Doster:

Enclosed is the ***REVISED*** *IRM* Health and Safety Plan for the Lockport State Road Former Manufactured Gas Plant Site, City of Lockport, Niagara County, New York, dated August 2002. Phone numbers have been corrected in the Contact Lists. Please replace the Health and Safety Plan dated June 2002 with this document. This *IRM* is scheduled to be initiated during the Fall of 2002. This *IRM* is scheduled to be initiated during the Fall of 2002.

Should you have any questions or comments concerning the *IRM* Health and Safety Plan, please feel free to contact me at (607) 762-8683.

Sincerely,

Bert W Finch
Project Manager
Licensing & Environmental Operations

Enclosures
cc: J. Simone, P.E. NYSEG
D. Crosby, P.E. NYSDEC
NYSEG MGP File
NYSEG Letter File

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NEW YORK STATE ELECTRIC & GAS CORPORATION
Corporate Drive, Kirkwood Industrial Park, P.O. Box 5224
Binghamton, New York 13902-5224

INTERIM REMEDIAL MEASURES

HEALTH AND SAFETY PLAN

FOR ACTIVITIES AT

LOCKPORT STATE ROAD
FORMER MANUFACTURE GAS PLANT SITE
City of Lockport, Niagara County, New York

REVISED
AUGUST 2002

Prepared By:
NYSEG Licensing & Environmental Operations Department

Reviewed By:
New York State Department of Environmental Conservation
and New York State Department of Health

NYSEG

NEW YORK STATE ELECTRIC & GAS CORPORATION
Licensing & Environmental Operations Department
Corporate Drive, Kirkwood Industrial Park, P.O. Box 5224
Binghamton, New York 13902-5224

INTERIM REMEDIAL MEASURES

HEALTH AND SAFETY PLAN

FOR ACTIVITIES AT

LOCKPORT STATE ROAD
FORMER MANUFACTURED GAS PLANT SITE
City of Lockport, Niagara County, New York

REVISED
AUGUST 2002

Prepared By:

Bert W Finch
Bert W Finch
Project Manager

Reviewed By:

Joseph M. Simone
Joseph M. Simone, P.E.
Program Manager

Approved By:

Rudolph J. Kunz, C.I.H.
Senior Compliance Specialist

THE AMERICAN BOARD OF INDUSTRIAL HYGIENE
INCORPORATED
CERT. NO
6200-CP
EXPIRES
6-30-2005
RUDOLPH J. KUNZ, CIH

CONTENTS

TABLES

ATTACHMENTS

SITE EMERGENCY FORM

Do Not Endanger Your Own Life.
Survey The Situation Before Taking Any Action.

DIAL 911
FIRST FOR ALL EMERGENCIES

POTENTIAL CONSTITUENTS OF CONCERN

The constituents contained in MGP process residues and at MGP sites can be categorized within five primary chemical classes:

- Polycyclic aromatic hydrocarbons (PAHs);
- Volatile aromatics;
- Phenolics;
- Metals; and
- Non-metallic inorganics.
- Hydrogen Cyanide
- Hydrogen Sulfide

IN THE EVENT OF ANY EMERGENCY CONTACT
CONSTRUCTION SUPERVISOR (HEALTH AND SAFETY REPRESENTATIVE)
AND / OR PROJECT MANAGER

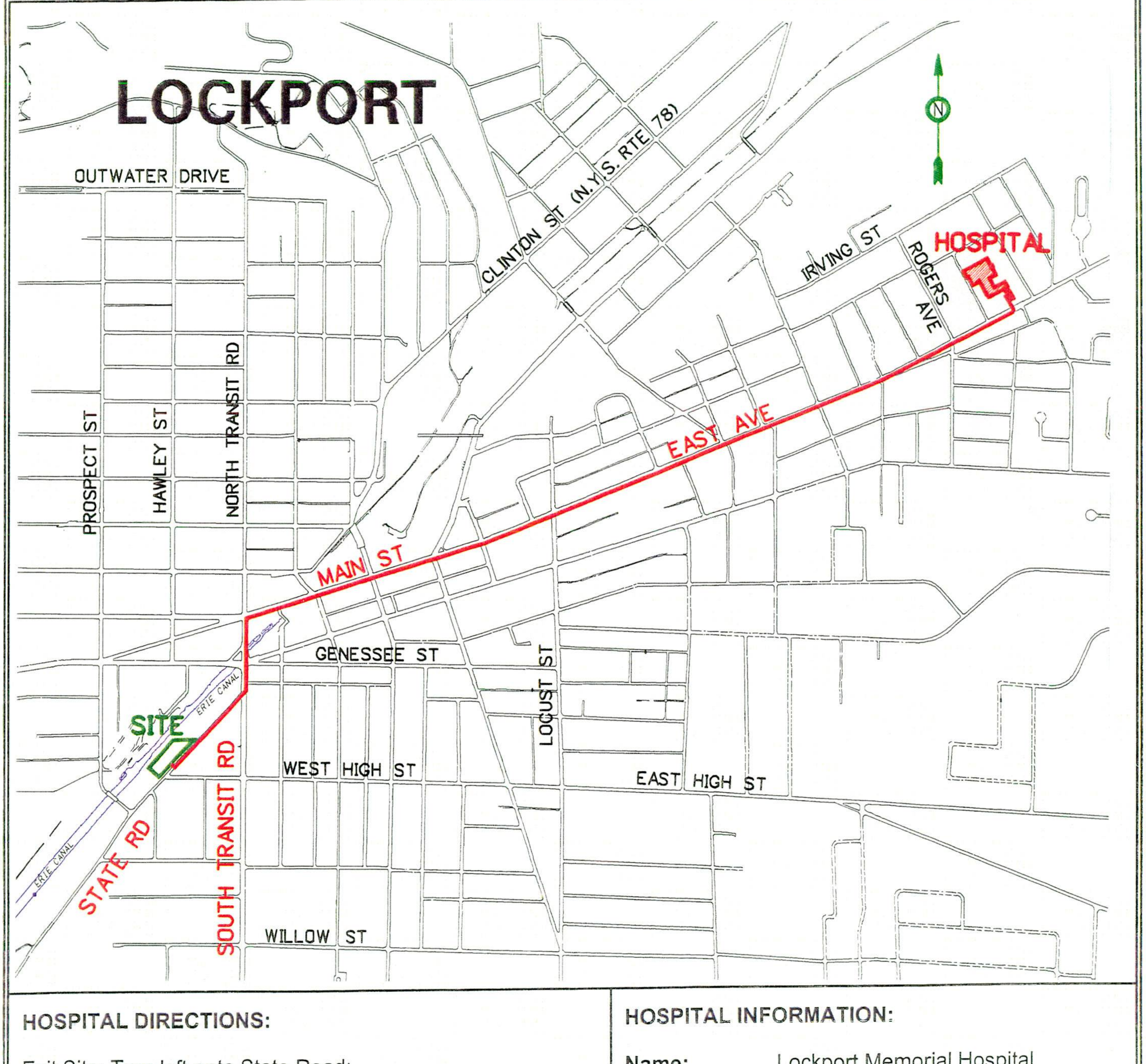
Ambulance	**911**
Fire	**911** Non Emergency (716) 439-6724
Lockport Police Bureau	**911** Non Emergency (716) 433-7700
Poison Control	800-252-5655 or Syracuse (315) 476-4766
Hospital Name	Lockport Memorial Hospital
Hospital Phone Number	Information (716) 434-9111
NYSEG Project Manager	Bert W Finch (607) 762-8683
NYSEG Manager Health and Safety	Joseph P. Santodonato, Ph. D., C.I.H. (607) 762-4335
NYSDOT Contractor Site Safety Officer	(To Be Determined)

DIAL 911
FIRST FOR ALL EMERGENCIES

ADDITIONAL RESPONSE CONTACT LIST

National Emergency Contact List	
USEPA Emergency Response Team, Region 2	(212) 340-6656
Utilities	
Dig Safely New York 3650 James Street, Syracuse, NY	1-800-962-7962
NYSEG (New York State Electric & Gas Corporation)	(716) 438-9803
Verizon	1-800-483-7988
Niagara County Public Works	(716) 439-7242
Lockport Water Department	(716) 439-1612
Lockport Waste Water Department	(716) 439-6678
New York State Department of Environmental Conservation	
NYSDEC Project Manager - David Crosby, P.E.	(518) 457-9285
Oil Spill or Hazardous Material Spill	1-800-457-7362
Department of Health	
NYSDOH Community H&S Oversight - Matthew Forucci	(716) 847-4385
Niagara County Dept. of Health - Paul Dicky	(716) 439-7595
State and County Police Agencies	
New York State Police Department	(716) 434-5588
Niagara County Sheriffs Department	(716) 438-3390
NYSEG	
MGP Remediation - Joseph M. Simone, P.E.	(607) 762-7498
MGP Remediation - Tracy L. Blazicek, C.H.M.M.	(607) 762-8839
MGP Remediation - Walter J. Savichky	(607) 762-7412
Health & Safety - Rudolph J. Kunz, C.I.H.	(607) 762-4808

HOSPITAL LOCATION MAP



HOSPITAL DIRECTIONS:

Exit Site: Turn left onto State Road;
Turn left onto Transit Road;
Take second right onto Main Street;
Follow Main Street until it becomes East Avenue
Proceed on East Avenue
Lockport Memorial Hospital will be on the Left

HOSPITAL INFORMATION:

Name:	Lockport Memorial Hospital
Address:	521 East Avenue
City, State:	Lockport, NY
Phone:	(716) 434-9111

EMERGENCY FIRST AID

SEE ATTACH. A FOR SPECIFIC FIRST AID PROCEDURES FOR CHEMICALS OF CONCERN

FIRST AID

Ingestion:	DO NOT INDUCE VOMITING. Call Poison Control - follow instructions. Administer cardiopulmonary resuscitation (CPR), if necessary. Seek medical attention.
Inhalation:	Remove person from contaminated environment. Administer CPR if necessary. Seek medical attention. DO NOT ENTER A CONFINED SPACE TO RESCUE SOMEONE WHO HAS BEEN OVERCOME UNLESS PROPERLY EQUIPPED AND A STANDBY PERSON IS PRESENT. **If it is suspected that HCN exposure has occurred, mouth to mouth or mouth to nose resuscitation is not recommended. Use disposable bag mask resuscitator (located in construction office trailer).**
Skin Contact:	Brush off dry material, remove wet or contaminated clothing. Flush skin thoroughly with water. Seek medical attention if irritation persists.
Eye Contact:	Flush eyes with water for 15 minutes. Seek medical attention.

RESPONDER MUST HAVE A CURRENT CERTIFICATE TO ADMINISTER FIRST AID OR CPR

1. Survey the situation. Do not endanger your own life. DO NOT ENTER A CONFINED SPACE TO RESCUE SOMEONE WHO HAS BEEN OVERCOME UNLESS PROPERLY EQUIPPED AND A STANDBY PERSON IS PRESENT.

2. Call **911** for emergency or fire **IMMEDIATELY**. Explain the physical injury, chemical exposure, fire, or release.

3. Decontaminate the victim without delaying life-saving procedures.

4. If the victim's condition appears to be noncritical, but seems to be more severe than minor cuts, he/she should be transported to the nearest hospital by trained Emergency Medical Services (EMS) personnel: let the doctor assume the responsibility for

determining the severity of the injury. If the condition is obviously serious, EMS must transport the victim.

5. Notify the Construction Supervisor and Project Manager. Complete the NYSEG Incident Report within 24 hours.

EMERGENCY FIRST AID PROCEDURES

To Stop Bleeding	**CPR**
1. Give medical statement.	1. Give medical statement.
2. Assure airway, breathing, circulation.	2. Arousal: Check for consciousness.
3. Use **DIRECT PRESSURE** over the wound with clean dressing or your hand (use non permeable gloves). Direct pressure will control most bleeding.	3. Open airway with chin-lift.
4. Bleeding from an artery or several injury sites may require **DIRECT PRESSURE** on a **PRESSURE POINT**. Use pressure points for 30 - 60 seconds to help control severe bleeding.	4. Look, listen, and feel for breathing.
5. Continue primary care and seek medical aid as needed.	5. If breathing is absent, give 2 slow, full rescue breaths.
	6. Check the pulse for 5 to 10 seconds.
	7. If pulse is present, continue rescue breathing: **1 breath every 5 seconds**.
	8. If pulse is absent, initiate CPR; 15 compressions for each two breaths.

1.0 INTRODUCTION

This Health and Safety Plan (*HASP*) is written to ensure the well-being of all field personnel and the community surrounding the site. Accordingly, project staff and approved Contractors must follow the policies and procedures established in the *HASP*. All personnel assigned to this project must sign the Agreement and Acknowledgment Sheet, Section 11.0, to confirm that they understand and agree to abide by the provisions of the plan.

All work will comply with the Occupational Safety and Health Act (OSHA) Standard, "Hazardous Waste Operations and Emergency Response," (29 CFR 1910.120) and other federal, state, and local procedures that require the development and implementation of a *HASP*. Generation of this document certifies that the workplace has been evaluated for the hazards as described. A hazard assessment has been performed and the adequacy of the personal protective equipment (PPE) selected is hereby certified per 29 CFR 1910.120(b)(1) and is duly noted by the signature(s) and date appearing on the cover page of this document.

This plan addresses the safety issues associated with the *IRM Work Plan* for excavation and handling of MGP residues of varying physical and chemical characteristics involving the following site tasks:

- Excavation
- Heavy Equipment Operation
- Soil Transfer

The minimum level of protection for this site is Level D. For each task, the potential hazards for employee exposure to site contaminants and/or air monitoring results, will determine the level of protection. Modified Level D will be worn during tasks that may have the potential for skin contact with contaminated media (soil or water). Upgrade to Level C will occur when the possibility of exposure exists from the onset of site specific tasks or results of real-time monitoring exceed established action levels listed in Table 3, Air Monitoring Action Levels. This *HASP* must be modified or amended when circumstances or conditions develop that are beyond the scope of this plan.

Any changes in project work scope and/or site conditions as described must be amended in writing by the Project Manager.

Table 1 presents an overview of the NYSEG health and safety programs in which all field personnel are required to participate. These include the medical surveillance and comprehensive training programs in accordance with OSHA Hazardous Waste Operations and Emergency Response standard, 29 CFR 1910.120.

1.1 Site Description/Background Information

The State road Site is located in a mixed commercial/residential area in the southwest section of Lockport, New York. The closest residence is within 50 feet of the site. The site is bordered by the New York State Barge Canal to the northwest, a NYSEG gas regulator house to the southwest, State Road to the southeast, and by an open lot to the northeast. The site consist of open vegetated and gravel-covered land with the only existing structure being a partially fenced-in gas regulator. A large percentage of the site appears to be filled and rubble emplaced adjacent to the New York State Barge Canal. Former manufactured gas plant structures believed to exist on the site were a gas holder, tar tanks, plant buildings and a warehouse. All of the structures have been razed except for their foundations.

Table 1. NYSEG Health and Safety Programs

Activity	Description	Action
Medical Surveillance	■ The program tracks the physical condition of the Company's employees in compliance with Department of Transportation (DOT) regulations and OSHA standards	■ Medical examinations and consultations are completed for all employees prior to assignment, annually, upon termination, and in the event of injury and/or illness resulting from exposure at the work site.
Training	■ Training requirements and programs comply with the OSHA Hazardous Waste Operations and Emergency Response standard, 29 CFR 1910.120	■ Field personnel must complete a minimum of 40 hours of hazardous waste activity instruction. ■ Field personnel must complete a minimum of 3 days supervised field instruction. ■ Field personnel assigned to the site will also receive 8 hours of refresher training each year. ■ On-site managers and supervisors directly responsible for employees engaged in hazardous waste operations receive an additional 8 hours of supervisory training. ■ Field personnel assigned to site also receive first aid/CPR.
Personnel Protective Equipment (PPE)	■ Training requirements and programs comply with the OSHA Hazardous Waste Operations and Emergency Response standard, 29 CFR 1910.120	■ Field personnel assigned to the site will also receive 8 hours of refresher training each year. ■ Field personnel assigned to the site will receive refresher training for donning PPE.

2.0 HAZARD IDENTIFICATION AND CONTROL

Precautions must be taken to prevent injuries and exposures to the following potential hazards.

Table 2. Potential Hazards and Control

Potential Hazard	Control
Exposure to Chemicals (See Attach. "A") **Benzene** **PAH's** **VOC's**	1. Stand up-wind of chemical products whenever possible. 2. Minimize contact and contact time with chemical products. 3. Avoid walking through discolored areas, puddles, leaning on drums, or contacting anything that is likely to be contaminated. 4. Do not eat, drink, smoke and/or apply cosmetics in the hot or warm zones. 5. Wear gloves when in contact with contaminated surfaces. 6. Safety glasses must be worn at a minimum. 7. Splash goggles must be worn when working with liquids. 8. > 2.5 ppm organic vapors in breathing zone sustained for five minutes, requires upgrade to Level C. 9. > 80 ppm organic vapors in breathing zone sustained for five minutes requires excavation work to stop. 10. If unknown materials are encountered, call the HSM.
Exposure to **Hydrogen Cyanide (HCN)** **Hydrogen Sulfide (H_2S)**	1. Stand up-wind of work area whenever possible. 2. Minimize contact and contact time with purifier waste. 3. Do not touch eyes, nose or mouth without washing first. 4. Always wash before eating, drink, smoking or using toilets. 5. Do not eat, drink, smoke and/or apply cosmetics in the hot or warm zones. 6. Modified Level "D", wear gloves, boot covers, tyvek in work area or during deconning of equipment. 7. Safety glasses must be worn at a minimum. Goggles are recommended. 8. 4 ppm in breathing zone activities will halt and remedial workers will leave the work area. 9. Under no circumstances will any person be allowed to enter work area without level "B" PPE while readings indicate HCN or H_2S levels above 4 ppm. 10. Workers will don level "B" PPE and cover excavation with soil or polyethylene sheeting.

Table 2 Potential Hazards and Control (continued)

Potential Hazard	Control
Exposure to Surface/ Subsurface Airborne Dust **Heavy Metals**	1. Stand up-wind whenever intrusive activities occur and generate visible signs of airborne dust and immediately implement spraying work surface 2. Monitor air for airborne soil dust (surface or subsurface soil) with portable aerosol dust-direct reading instrument. 3. > 0.025 mg/M^3 in breathing zone requires upgrade to Level C. > 0.25 mg/M^3 in the breathing zone requires work to stop. 4. Utilize wet methods (spraying ground, wet drilling, etc.) when visible signs of airborne dust are generated.
Noise	1. Wear hearing protection when equipment such as a drill rig, jackhammer, cut saw, air compressor, blower or other heavy equipment is operating on the site. 2. Hearing protection is required when measured sound pressure levels (SPL) exceed 85 dB(A) where employees stand or conduct work. 3. Conduct noise monitoring of suspected high noise operations at the beginning of the workday or start up of new operations to verify noise control/hearing protection requirements.
Utility Lines Contact	1. Contact Dig Safely New York to have utility lines marked prior to excavation/trenching 2. Refer to site drawings or customer interviews if on private property for utility locations. 3. Hand dig when within 2 feet of utility marker until utilities are observed to avoid breaking utility lines.
Electric Shock	1. Maintain appropriate distance from overhead utilities; **10-foot minimum clearance from power lines required; 1-foot minimum clearance from shielded power lines.** 2. Use ground-fault circuit interrupters as required. 3. Perform lockout/tagout procedures. 4. Use three-pronged plugs and extension cords. 5. Contact your local underground utility-locating service. 6. Follow code requirements for electrical installations in hazardous locations.
Inclement Weather	1. Stop outdoor work during electrical storms and other extreme weather conditions such as extreme heat or cold temperatures. 2. Take cover indoors or in vehicle. 3. Listen to local forecasts for warnings about specific weather hazards such as tornados, hurricanes, and flash floods.

Table 2 Potential Hazards and Control (continued)

Potential Hazard	Control
Physical Injury	1. Wear hard hats and safety glasses when on-site. 2. Maintain visual contact with the equipment operator and wear orange safety vest when heavy equipment is used on-site. 3. Avoid loose-fitting clothing (driller and driller's helper). 4. Prevent slips, trips, and falls; keep work area uncluttered. 5. Keep your hands away from moving parts (i.e., augers). 6. Test the emergency shut-off switch on the drill rig daily.
Back Injury	1. Use a mechanical lifting device or a lifting aid where appropriate. 2. If you must lift, plan the lift before doing it. 3. Check your route for clearance. 4. Bend at the knees and use leg muscles when lifting. 5. Use the buddy system when lifting heavy or awkward objects. 6. Do not twist your body while lifting.
Heat Stress	1. Increase water intake while working. 2. Increase number of rest breaks and/or rotate workers in shorter work shifts; take breaks in shaded areas. 3. Watch for signs and symptoms of heat exhaustion and fatigue. 4. Plan work for early morning or evening during hot months. 5. Use ice vests when necessary. 6. Rest in cool, dry areas. 7. In the event of heat stroke, bring the victim to a cool environment and initiate first aid procedures (Section 9.0).
Cold Stress	1. Take breaks in heated shelters when working in extremely cold temperatures. 2. Remove the outer layer of clothing and loosen other layers to promote evaporation of perspiration, upon entering the shelter. 3. Drink warm liquids to reduce the susceptibility to cold stress (Section 10.0).
Insects	1. Tuck pants into socks, if necessary. 2. Wear long sleeves, if necessary. 3. Use insect repellent.
Poisonous Plants (Such as Poison Ivy, Oak or Sumac)	1. Don't enter areas infested with poisonous plants. 2. Immediately wash any areas that come into contact with poisonous plants.

Table 2 Potential Hazards and Control (continued)

Potential Hazard	Control
Fire Control	1. Smoke only in designated areas. 2. Keep flammable liquids in closed containers. 3. Keep site clean; avoid accumulating combustible debris such as paper. 4. Follow Hot Work Safety Procedures when welding or performing other activities requiring an open flame. 5. Isolate flammable and combustible materials from ignition sources. 6. Ensure fire safety integrity of equipment installations.
Static Electricity	1. Do not create static discharge in flammable atmospheres. 2. Electrically bond and ground pumps transfer vessels, tanks, drums, bailers and probes, when moving liquids. 3. Electrically bond and ground vacuum trucks and the tanks they are emptying. 4. Do not splash fill containers with flammable liquids.
Soil Sampling	1. Wear appropriate PPE to avoid skin, eye, and inhalation contact with contaminated soil. 2. Stand upwind when conducting tasks and minimize possible inhalation exposure. 3. Conduct air monitoring to determine level of respiratory protection. 4. Utilize engineering controls such as portable venturi air movers to draw away or blow away chemical vapors.
Welding, Cutting, Brazing	1. Conduct fire safety evaluation. 2. Complete Hot Work Permit (Attachment B). 3. Ensure flammable materials are protected from hot work, sources of ignition. 4. Ensure fire watch/fire extinguisher is on standby by hot work location.
Vehicular Traffic (Interior and Exterior)	1. Wear traffic safety vest when vehicle hazard exists. 2. Use cones, flags, barricades, and caution tape to define work area. 3. Use vehicle to block work area. 4. Ensure that heavy equipment is equipped with a back-up alarm.
Cleaning Equipment	1. Wear appropriate PPE to avoid skin and eye contact with isopropyl alcohol, alconox, or other cleaning materials. 2. Stand upwind to minimize any potential inhalation exposure. 3. Dispose of spent cleaning solutions and rinses appropriately.

3.0 AIR MONITORING

3.1 Air Monitoring

Air monitoring must be performed on site in accordance with Section 5.0 of NYSEG's *Interim Remedial Measures (IRM) Work Plan, New York state Department of Transportation Prospect Street Over Erie Canal, for Activities Adjacent to Lockport State Road Former Manufactured Gas Plant Site.* Organic vapor compounds concentrations are measured with a photo ionization detector (PID) with an 10.2 Ev lamp. Airborne dust/particulate concentrations are measured with a real-time *personal* DataRam™ (pDR-1000An), which operates on the principle of light scattering, when there are visible signs of airborne dust. Hydrogen Cyanide (HCN) concentrations are measured with a real-time Dräger CMS analyzer with a HCN specific chip and Dräger tubes for HCN, equipped. Hydrogen Sulfide (H_2S) concentrations are measured with a real-time Dynamation Autocal AGM Model 502 and a Jerome 631X-H_2S. Dräger tube grab sampling is conducted for benzene, when results of non-specific real-time monitor action levels are reached or when their presence is suspected. Perimeter of Work Zone Area air monitoring readings are to be taken to characterize site activities. All air monitoring results will be recorded in the Sampling Technician's field notebook.

Calibration and maintenance of air monitoring equipment must follow manufactures specifications and be documented. Recalibration and adjustment of air monitoring equipment must be completed when site conditions and equipment operation reveal the need. Record all air monitoring equipment calibration and adjustment information in the Sampling Technician's field notebook.

Air monitoring action levels (Table 3) have been approved by the NYSEG Manager Health and Safety, to indicate the chemical concentrations in the breathing zone that require an upgrade in level of PPE. All workers on-site must have been properly fitted with PPE (i.e., respirators) and have been trained in their use and limitations. Air monitoring measurements will be taken in the breathing zone of the worker most likely to have the highest exposure. Transient peaks will not automatically trigger action. Action will be taken when levels are consistently exceeded in a 5-minute period. Similarly, if chemical odors are detected that are a nuisance, bothersome, or irritating, an upgrade in respiratory protection can provide an extra level of comfort or protection when conducting site activities. Job tasks that require air monitoring, the applicable action levels that apply for those tasks, and the frequency of air monitoring are described in Table 3 and Table 4. Additional guidelines for frequency of air monitoring are presented in Table 5.

Table 3. Air Monitoring Action Levels

Instrument*	Function	Measurement	Action
Photo ionization detector (PID) (10.2 Ev lamp) - Measures Total Organic Vapors			
Conduct air monitoring for volatile organic compounds during activities where contaminated media are present		> 0 - 2.5 ppm	Level D / Modified Level D required. If PID measures > 3 ppm, check for benzene with detector tubes.
		> 2.5 - 80 ppm	Upgrade to Level C.
		> 80 ppm	Secure Work Area and then leave Work Area. Stop Work, Contact PM and HSM.
Personal DataRam™ (pDR-1000An) / Dust			
Conduct air monitoring for dust particulate when sustained (> 5 minute) levels of visible dust are generated and engineering controls such as wet methods are ineffective.		0 - 0.15 mg/M^3	Level D required.
		> 0.15 mg/M^3	Upgrade to Level C and implement engineering controls.
		Consistently > 0.15 mg/M^3	Secure Work Area and then leave Work Area. Stop Work, Contact PM and HSM.
Detector Tubes / Benzene			
Conduct grab sampling for benzene when sustained PID readings are detected in the breathing zone.		0 - 0.5 ppm	Level D/Modified Level D required.
		> 0.5 - 50 ppm	Upgrade to Level C required.
		> 50 ppm	Secure Work Area and then leave Work Area. Stop Work, Contact PM and HSM for guidance.
Dräger CMS Analyzer, equipped with a HCN specific chip / Hydrogen Cyanide			
Conduct HCN monitoring in areas of purifier waste excavation		0 - 4 ppm	Modified Level D required.
		4 ppm	Immediately leave Work Area
		≥ 4 ppm	Upgrade to Level B required. Secure Work Area and then leave Work Area. Stop Work, Contact PM and HSM for guidance.
Jerome 631X-H_2S / Hydrogen Sulfide (Site Perimeter) Dynamation Autocal AGM Model 502 / Hydrogen Sulfide (Work Area)			
Conduct H_2S monitoring in areas of purifier waste excavation		0 - 4 ppm	Modified Level D required.
		4 ppm	Immediately leave Work Area
		≥ 4 ppm	Upgrade to Level B required. Secure Work Area and then leave Work Area. Stop Work, Contact PM and HSM for guidance.

Table 4. Air Monitoring Requirements

WORK ZONE SAMPLING REQUIREMENTS		
Job Task	Instrument	Frequency
Intrusive Work Soil Transportation Decontamination Soil Sampling	PID, DT, DM, HCN, H_2S	Start up of work, then 15 minutes to continuously based on sampling results and sample location. Continuously if action level is exceeded.

Instruments:		
Instruments:	PID	Photo Ionization Detector
	DT	Benzene Detector Tube
	DM	*Personal* DataRam™ (pDR-1000An)
	HCN	Dräger CMS Analyzer
	H_2S	Dynamation Autocal AGM Model 502

Note: "Start up of work at each new task location" means to monitor the air quality at each new operation on the site. The breathing zone is the area inside a 1-foot radius around the head.

Table 5. Air Monitoring Frequency Guidelines

Conduct periodic monitoring when:

1. It is possible that an immediately dangerous to life or health (IDLH) condition or a flammable atmosphere has developed, or

2. There is an indication that exposures may have risen over permissible exposure limits or published exposure levels since the last monitoring. Look for a possible rise in exposures associated with these situations:

   - **Change in site area** - work begins on a different section of the site.
   - **Change in contaminants** - handling contaminants other than those first identified.
   - **Visible signs of particulate exposure from intrusive activities such as drilling/boring and excavation.**
   - **Perceptible chemical odors or symptoms of exposure.**
   - **Change in on-site activity** - one operation ends and another begins.
   - **Handling leaking drums or containers.**
   - **Working with obvious liquid contamination** (e.g., a spill or lagoon).

Table 6. Specific Criteria and Protocol for Specifying Health and Safety for Projects Involving Specific Chemical Agents or Other Industrial-Specific Conditions

Potential Chemical Exposure or Exposure Scenario	Criteria and Protocol for Health and Safety Specification
Coal Tar	1. Coal Tar can contain up to 160 aromatic compounds such as phenol, pyrol, and pyridine plus additional poly aromatic hydrocarbons (PAHs). It is listed as a carcinogenic substance by IARC, NTP, and OSHA. 2. Coal tar is toxic by inhalation, ingestion and skin contact. The range of toxicity depends on the exposure, concentration and duration. Effects may include irritation to skin, mucous membranes and respiratory system upon exposure from direct contact short term contact to respiratory and skin diseases from repeated long term exposure. Symptoms include redness and itching to skin leading to a dermatitis from skin contact, severe eye irritation when contacted in the eye, and trouble breathing from inhalation. 3. Precautions to take to avoid exposure to Coal Tar are wearing appropriate PPE to avoid skin and eye contact when working with contaminated soil and water. Minimize breathing in contaminated soil by using wet methods to control dust or wear a cartridge respirator with HEPA filter. In the event of contact or suspected exposure, rinse the affected area with water. and seek medical attention.
Aromatic Hydrocarbons Benzene	1. Health hazards associated with aromatic hydrocarbons are central nervous system depression by inhalation exposure and irritating to skin, eyes, and mucous membranes. 2 Potential for exposure can be controlled by setting appropriate action levels and following general safe work practices. Verification of specific aromatic hydrocarbons can be accomplished using colorimetric detector tubes when PID readings are in excess of 2.5 PPM 3. Precautions to take to avoid exposure to Benzene are wearing appropriate PPE to avoid skin and eye contact when working with contaminated soil and water. Minimize breathing in contaminated soil by using wet methods to control dust or wear a cartridge respirator with HEPA filter. In the event of contact or suspected exposure, rinse the affected area with water. and seek medical attention.

Table 6. Specific Criteria and Protocol for Specifying Health and Safety for Projects Involving Specific Chemical Agents or Other Industrial-Specific Conditions (Continued)

Potential Chemical Exposure or Exposure Scenario	Criteria and Protocol for Health and Safety Specification
Polynuclear Aromatic Hydrocarbons (PAHs)	1. PAHs are a class of compounds containing closed hydrocarbon rings. PAHs cause irritation to skin, eyes, and respiratory tract when direct contact occurs or inhalation of vapors or contaminated soil occurs. Some PAHs are probable human carcinogens while others are considered animal carcinogens and mutagens. 2. Avoid direct contact from PAHs to skin and eyes. This could be in the form of coal gasification by-products and associated contaminated soils. Avoid breathing off-gassing vapors of coal gasification by-products and associated contaminated soil. 3. Wear appropriate PPE when potential to skin, eye, or inhalation exposure can occur. This includes modified Level D, with upgrade to Level C depending on air monitoring results. Use cartridge respirator with organic vapor/HEPA cartridges. For supplied air, full face positive pressure demand type must be worn. Utilize wet methods to minimize PAH contaminated dust generation when excavating/mixing processes are underway. 4. PAHs are combustible. Avoid contact with open flames or other direct heating sources. 5. Ensure proper personal decontamination is conducted after site activities. Wash/rinse face/hands and any other exposed skin. Immediately rinse affected skin or eyes if contact occurs, and seek medical attention. Move to fresh air when inhalation exposure occurs and seek medical attention.
Heavy Metals	1. Main concern with heavy metals is inhalation exposure to the dust, as well as ingestion of heavy metals on food or from hand to mouth contact. 2. If the predicted exposure is in excess of 50% of the PEL, utilization of Level C should occur.

Table 6. Specific Criteria and Protocol for Specifying Health and Safety for Projects Involving Specific Chemical Agents or Other Industrial-Specific Conditions (Continued)

Potential Chemical Exposure or Exposure Scenario	Criteria and Protocol for Health and Safety Specification
Hydrogen Cyanide (HCN)	1. Hydrogen Cyanide gas may be formed when organocyanide or ferrocyanide compounds in coal gasification by-products are in highly acidic soil or come in contact with acidic solutions/water. 2. Avoid direct contact with coal gasification by-products or contaminated soils and or waters and hydrogen cyanide gas. Wear appropriate PPE - a minimum Modified Level D with tyvek (polyethylene) suits is required where contact with cyanide compounds is suspected. 3. **Hydrogen Cyanide is a highly toxic, lethal gas. It can cause death in minutes. Conduct air monitoring with a Dräger CMS Analyzer when working in the area of purifier waste. Supplied air respirators with positive pressure demand are required to work at the action level of 4 ppm.** 4. Inhalation of cyanide gas is an immediate medical emergency.
Hydrogen Sulfide (H_2S)	1. Avoid direct contact with coal gasification by-products or contaminated soils and or waters and hydrogen sulfide gas. Wear appropriate PPE - a minimum Modified Level D with tyvek (polyethylene) suits is required where contact with cyanide compounds is suspected. 2. **Hydrogen Sulfide is a highly toxic, lethal gas. It can cause death in minutes. Conduct air monitoring with a Dynamation Autocal AGM Model 502 or Jerome 631X-H_2S when working in the area of purifier waste. Supplied air respirators with positive pressure demand are required to work at the action level of 4 ppm.** 3. Inhalation of hydrogen sulfide gas is an immediate medical emergency.

4.0 CHEMICAL HAZARD CONTROL

4.1 PPE

Based upon the hazards that may be encountered during site activities, PPE as follows was selected. Only PPE that meets the following American National Standards Institute (ANSI) standards are to be worn.

- Eye protection - ANSI Z87.1-1989
- Head protection - ANSI Z89.1-1997
- Foot protection - ANSI Z41-1991

Employees must maintain proficiency in the use and care of PPE that is to be worn.

Level D is the minimum acceptable level for this site. Levels of protection are based on the activity of task to be conducted.

Table 7. PPE

Level	Requirements
Level D	■ Work Clothes will require, as a minimum, short sleeve shirts and long pants **(NO shorts and/or tank tops)** ■ Steel-toed boots ■ Approved safety glasses or goggles ■ Hard hat ■ Fluorescent vest, when vehicular traffic is on or adjacent to the site ■ Nitrile gloves for water sampling or handling
Modified Level D	**One or more of the following:** ■ Chemical resistance (acid or solvent) boot covers ■ Tyvek® suit, NBR outer and nitrile or butyl rubber (for HCN) inner gloves if skin contact with contaminants is possible. ■ Hearing protection (muffs and/or plugs).
Level C	■ Level D and Modified Level D ■ National Institute for Occupational Safety and Health (NIOSH)-approved half-face respirator with organic vapor/HEPA cartridge
Level B	■ Level D and Modified Level D ■ NIOSH approved self contained breathing device
Prior to use, all equipment must be inspected to ensure proper working condition.	

4.2 Site Control: Work Zones

Work zones will be established in order to:

- Delineate high-traffic locations,
- Identify hazardous locations, and
- Contain contamination within the smallest area possible.

Employees entering the work zone must wear the proper PPE for that area. Work and support zones will be established based on ambient air monitoring data, necessary security measures, and site-specific conditions. Work zones will be identified as either Hot Zone/Exclusion Zone; Decontamination Zone /Contamination Reduction Zone; or Clean Zone/Support Zone.

The following PPE requirements apply for Work Zones

- Hot Zone/Exclusion Zone requires Level D/Modified Level D/Level C/ Level B PPE
- Decontamination Zone/Contamination Reduction Zone requires Level D/Modified Level D PPE
- Clean Zone/Support Zone requires none

Listed are general guidelines for delineation of work zones. Contamination Reduction Zone will be developed for decontamination procedures listed in Section 4.4.

1. The Hot Zone/Exclusion Zone is identified as the Excavation Areas and inside transporter's trailer and/or roll off container.

2. The Decontamination Zone/Contamination Reduction Zone will be the areas where trucks will be loaded, the area for cleaning equipment and all other areas excluding the Hot Zone/Exclusion Zone within the chain link fence.

3. Clean Zone/Support Zone will be the Construction Trailer and areas outside the chain link fence.

Table 8. Site Security Measures

WORKING IN STREET OR ROADWAY

- Wear traffic vest and hardhat when vehicle hazard exists.
- Use cones, flag-mounted cones, caution tape and/or barricades.
- Use vehicle strobe light and block area with truck.
- Develop traffic patternization plan for high traffic situations:
    - use flag person,
    - use flashing arrow sign,
    - use "MEN WORKING" signs liberally,
    - obtain lane closing permits, and
    - engage police details.

WORKING AT EXCAVATION/TRENCHING SITES

- "Competent person" is required per OSHA 29 CFR 1926 Subpart P.
- Safe guard open excavations by restricting unauthorized access.
- Highlight work area using prominent warning signs (cones, saw horses/barricades and signs) placed a minimum of 10' back from excavation opening.
- Maintain zone definition along perimeter with **continuous string** of yellow orange caution tape.

EXCAVATIONS LEFT UNATTENDED OR OVERNIGHT

Use one of the following methods to address these situations:

- Surround entire perimeter with plastic or cloth construction net fencing. Anchor fence to ground using steel posts driven into ground. Space out posts no greater than 8 feet apart. Fence height minimum 4-feet high. Fence material must be of a quality capable of withstanding a pressure of 200 pounds. Place fence a minimum of 10 feet back from excavation opening.
- Place 8-foot long barricades affixed with flashing lights end to end with 4-foot high construction net fence attached to barricades.
- Utilize temporary curbing or concrete "jersey" barriers affixed with flashing signal lights or other effective warning signs.

4.3 Personal Decontamination Procedures

Operations conducted at this site have the potential to contaminate field equipment and PPE. To prevent the transfer of contamination to vehicles, administrative offices and personnel, the procedures presented in Table 10 must be followed. Specific decontamination requirements will be followed by utilizing the equipment for that purpose. Employees then must wash up and change into street clothes, leaving any contaminated clothing on-site for appropriate disposal. PPE must not be brought to employee residences.

Table 9. Personal Decontamination Procedures

Item	Examples	Procedure
Disposable PPE	Tyvek® suits, inner gloves, respirator cartridges	▪ Place PPE in lined 55 gallon barrels in the personal contamination reduction shed. ▪ Change out respirator cartridges on a daily basis and place cartridges in lined 55 gallon barrels in the personal contamination reduction shed.
Nondisposable PPE	Respirators	▪ Wipe out respirator with disinfecting pad prior to donning. ▪ Decontaminate on-site at the close of each day with a solution of an approved sanitizing powder and water.
	Boots and gloves	▪ Decontaminate in the personal contamination reduction area with a solution of detergent and water; rinse with water prior to leaving area.

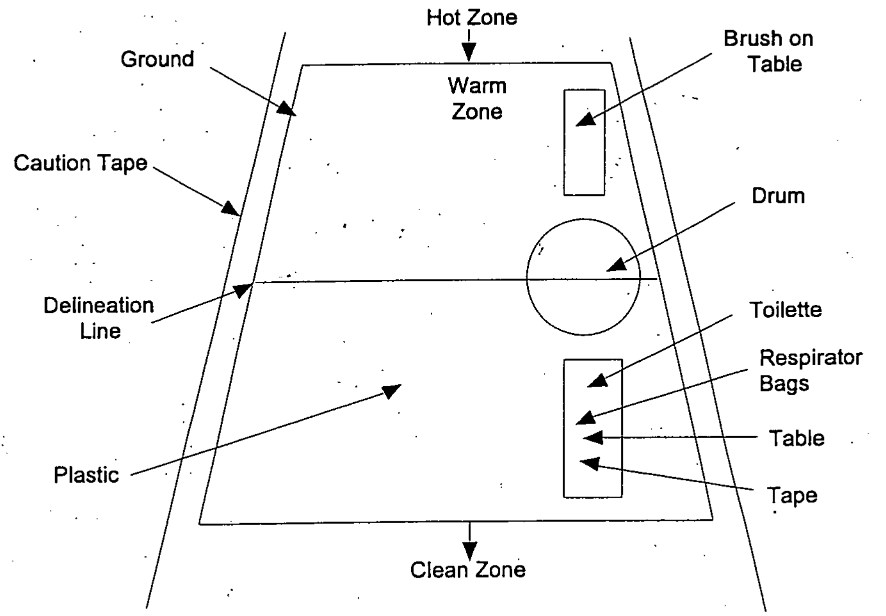
All water used in decontamination procedures should be stored in portable storage tanks until sufficient amount are collected to facilitate disposal or treatment. Disposable sampling and PPE will be placed in plastic bags and temporarily stored in designated drums. These drums shall be disposed of according to regulatory guidelines, if necessary.

4.4 Example Decontamination Diagram

If Level C or Level B PPE is required, a Contamination Reduction Zone will be constructed in a centralized common area with a travel path from the Exclusion Zone demarcated with three-foot high cones. The decontamination procedure for this project site is a two-stage process.

STAGE 1
- Gross contamination removal with a brush.
- Decontaminate boots with a solution of detergent and water.
- Rinse boots with water and remove boots
- Remove Tyvek suit and dispose in lined drum.
- Remove outer gloves and dispose in a drum.
- Walk to Stage 2.

STAGE 2
- Remove respirator.
- Remove cartridge and dispose in a drum.
- Clean respirator and insert into a bag.
- Remove inner gloves and dispose in drum.
- Wipe hands with a towellette and dispose in drum.
- Walk out of decontamination area.



5.0 CONTINGENCY PLANS

Table 10 (Sections 5.1 - 5.4) presents contingency plans for potential emergency situations.

Table 10. Contingency Plans for Site Emergencies

Situation	**Action**
5.1 Evacuation	1. Immediately notify all on-site personnel of an emergency requiring evacuation. 2. Leave the dangerous area and report to a designated rally point. 3. Notify EMS, as appropriate. 4. Account for all personnel. 5. Contact the Project Manager and the Program Manager as soon as possible. 6. Maintain site security and control measures for community safety until emergency responders arrive.
5.2 Medical Emergency	1. Survey the situation: ***Do Not Enter An Area That May Jeopardize Your Safety.*** ■ Establish the patient's level of consciousness. ■ Call for help. ■ Contact EMS and inform them of patient's condition. 2. Primary assessment (patient unconscious) ■ Arousal ■ Airway ■ Breathing ■ Circulation **Only Trained Personnel Should Perform CPR or First Aid.** 3. Secondary assessment (patient conscious) ■ Check for bleeding: Control with direct pressure. ■ Do not move patient (unless location is not secure). ■ Monitor vital signs. ■ Provide First Aid to the level of your training. ■ Contact the Project Manager and Program Manager as soon as possible. ■ Document the accident on either the NYSEG's Public Liability Accident Report or NYSEG's Report of Employee Injury Form

Table 10. Contingency Plans for Site Emergencies (Continued)

Situation	Action
5.3 Fire Emergency	1. **Evacuate the area.** 2. **Call 911** to notify fire department. 3. Extinguish small fires with an all-purpose extinguisher. 4. Contact the project manager and manager health and safety 5. Document the incident on NYSEG's Incident Report.
5.4 Spill/ Release	Prevent problems by documenting the location of underground lines (e.g., product, sewer, telephone) before starting site work. If you drill through a line or tank or another leak occurs, document the spill/release in writing. Include dates, times, actions taken, agreements reached and names of people involved. In the event of a spill/release, follow this plan. 1. Wear appropriate PPE; stay upwind of the spill/release. 2. Turn off equipment and other sources of ignition. 3. Turn off pumps and shut valves to stop the flow/leak. 4. Plug the leak or collect drippings in a bucket, when possible. 5. Place sorbent pads to collect product, if possible. 6. Call Fire Department immediately if fire emergency develops. 7. Inform project manager about the situation. 8. Determine damage can be repaired or if an emergency repair contractor is needed. 9. Based on agreements, contact emergency spill contractor for containment of free product. 10. Advise the project manager of spill discharge notification requirements and determine who will complete and submit forms. Do not submit or report to agencies without NYSEG's consent. Document each interaction with the NYSEG and regulators and note, in writing; name, title authorizations, refusals, decisions, and commitments to actions. 11. Do not transport or approve transportation of contaminated soils or product until proper manifests have been completed and approved. Be aware that soils/product may meet criteria for hazardous waste.
Notifications - a spill/release requires completion of a *Former MGP Site Spill Report* (Attachment B) & immediate notification to the Project Manager (within one (1) hour). NYSEG is under obligation to report to the proper government agencies. If the spill extends into waterways, the DEC (800-457-7362) and the Coast Guard's National Response Center (800) 424-8802 must be notified immediately.	

6.0 PROJECT PERSONNEL

The following management structure will be instituted for the purpose of successfully and safely completing this project.

Table 11. Responsibilities of On-Site Personnel

Title	General Description	Responsibilities
NYSEG project manager	Reports to NYSEG program manager. Has authority to direct response operations. Assume total control over site activities.	■ Prepares and organizes background review of the project, the work plan, the HASP, and the field team. ■ Obtains permission for site access and coordinates activities with appropriate officials. ■ Sees that the Work Plan is properly carried out and on schedule. ■ Briefs the field personnel on specific assignments. ■ Together with the SHSO sees that health and safety requirements are met. ■ Prepares final report.
NYSDOT contractor construction supervisor	Reports to NYSDOT engineer-in-charge (EIC). Has authority to direct response operations. Assumes total control over site activities.	■ Manages field operations. ■ Executes the Work Plan and schedule. ■ Enforces safety procedures. ■ Enforces site control. ■ Documents field activities and sample collection. ■ Notifies when necessary, local public emergency officials. ■ Submits NYSEG Public Liability Accident Report, NYSEG Report of Employee Injury, or NYSEG Incident Report and initiates follow up with project manager.

Table 11. Responsibilities of On-Site Personnel (Continued)

Title	General Description	Responsibilities
NYSDOT contractor site health & safety officer NYSDOT contractor construction supervisor	Advises the project manager on all aspects of health and safety on site. Stops work if site operations threaten worker or public health and safety. Informs health and safety specialist of any changes in site conditions or project status.	■ Refreshes field personnel for donning PPE. ■ Notifies field personnel when to upgrade their PPE ■ Periodically inspects protective clothing and equipment. ■ Sees that protective clothing and equipment are properly stored and maintained. ■ Monitors the workers for signs of stress, including heat stress, cold exposure, and fatigue. ■ Controls entry and exit at the access control points. ■ Implements the HASP. ■ Conducts periodic inspections to assess whether the HASP is being followed. ■ Enforces the "buddy" system. ■ Informed of emergency procedures, evacuation routes, and telephone number of local hospital, poison control center, fire department, and police department. ■ Notifies, when necessary, local public emergency officials. ■ Maintains communication with health and safety representative on site activities. ■ Coordinates emergency medical care. ■ Sets up decontamination lines and decontamination solutions appropriate for the chemical contaminants encountered. ■ Controls the decontamination of equipment, personnel, and samples from contaminated areas. ■ Facilitates the proper disposal of contaminated clothing and materials. ■ Maintains the availability of required equipment. ■ Advises NYSEG health services and medical personnel of potential exposures. ■ Notifies emergency response personnel in the event of an emergency.

Table 11. Responsibilities of On-Site Personnel (Continued)

Title	General Description	Responsibilities
NYSDOT contractor site workers	Reports to NYSDOT contractors construction supervisor for on-site activities. Work parties must comprise at least two people for high hazard operations.	■ Safely completes on-site tasks required to fulfill the work plan. ■ Complies with the HASP. ■ Notifies SHSO or supervisor of suspected unsafe conditions.

7.0 Visitor/Trainee Guidelines

NYSEG and NYSDOT is committed to providing a safe environment on all work sites for visitors, trainees, employees and/or passerby. In order to accomplish this, the following guidelines must be followed.

7.1 Visitors

Any person not actively participating in the work at the site is regarded as a "visitor" and must follow NYSEG's visitor/trainee guidelines. Visitors must be accompanied by a representative while on-site.

Sites must be marked with signs, placards, and/or barricades to designate hazardous boundaries. Visitors will not be allowed on any site that is not adequately marked.

7.2 Trainees

Trainees are employees of NYSEG, NYSDOT, and/or NYSDOT contractor who have not yet completed OSHA required safety training program. New hires and in-house company transfers will be considered trainees until safety training requirements are met.

Trainees will be permitted to visit NYSEG sites as observers as long as the following conditions are met:

- Trainees are supervised at all times while observing on-site.
- Trainees do not perform work functions of any type while on-site.
- Trainees do not handle any equipment, tools and/or supplies while on-site.
- Trainees do not enter any hazardous or Hot Zone or confined space areas while on-site.

NYSDOT contractor construction supervisors will be responsible for informing trainees of the above conditions and for ensuring that the conditions are met. NYSDOT contractor construction supervisors will also ensure that trainees will not be asked to violate the conditions listed above.

8.0 Job Safety Analysis

Table 12 Heavy Equipment

TASK - JOB STEPS	JOB HAZARD	CONTROL AND SAFEGUARD
Heavy Equipment Operations: a. Excavators b. Loaders c. Trucks d. Dozers e. Etc.	1. Employee run over or hit by moving equipment	1a. back up signals on equipment; 1b. traffic safety vest for all field personnel 1c. foot traffic restricted in areas of operation; 1d. establish standard hand signals for laborers assisting in equipment operations.
	2. Physical hazards; a. hit in head b. foreign body in eye c. foot injury	2a. hard hat; 2b. Safety glasses 2c. Steel toe shoes
	3. Overhead utilities/overhead obstacles	3. Minimum 10' distance, 1' distance if insulated

Table 13 Excavation of Contaminated Soils

JOB STEPS	JOB HAZARDS	SAFEGUARD AND PRECAUTIONS
Operate excavator or backhoe to remove contaminated soil	1. Underground utilities	1. Contact Dig Safely New York
	2. Vehicle/equip. traffic	2. Audible alarms (back-up, etc.) for heavy equipment
	3. Toxic or hazardous environments	3a. Competent person supervising
		3b. Level D personal protective equipment
		3c. Test for LEL (10% LEL action level) and PPM (2.5 PPM on PID for action level to Level C)
		3d. Prevent all skin contact
	4. Cave In	4a. Slope and shore per specification in OSHA standard 1926.650-652
	5. Fall hazard	5a. Secure opening of excavation when fall hazard exists (e.g. barricade openings)

Table 14 Soil Transportation

JOB STEPS	JOB HAZARDS	SAFEGUARD AND PRECAUTIONS
Soil Transfer and Soil Consolidation	1. Employee run over or hit by moving equipment.	1a. Back-up signals on equipment. 1b. Traffic safety vest for all field personnel. 1c. Restricted foot traffic in area. 1d. Establish hand signals for laborers assisting in equipment operations.
	2.. Physical Hazards (hit in head, foreign body in eye, foot injury, etc.)	2a. Hard hat, safety glasses, steel toe shoes, and work gloves
	3. Overhead utilities / overhead obstruction	3. Minimum 10' distance, 1' distance if insulated.
	4. Dust problems	4a. Monitor for ambient dust per Work Plan.. 4b. Wearing Level D PPE 4c. Spray dust with water
	5. Noise levels exceeding the OSHA PEL	5. Earmuffs and/or ear plugs effectively reduce noise levels
	6. Toxic vapors	6. Monitor for contaminants using real time air monitoring per Work Plan

9.0 Heat Stress

Heat stress is a significant potential hazard associated with the work task performed and the type and degree of protective equipment used in hot weather environments. Local weather conditions may produce conditions which will follow one of two protocols depending on whether impermeable clothing (Tyvek, saranex, rain gear, etc.) or permeable clothing (cotton coveralls) is worn. This section will apply to both hazardous and non-hazardous waste workers at the site.

9.1 Workers Wearing Permeable Clothing

The American Conference of Governmental Industrial Hygienist (ACGIH) have set Threshold Limit Values (TLVs) for worker exposure to heat stress in which it is believed that nearly all workers may be repeatedly exposed without adverse health effects. The TLVs assume that workers are acclimatized, fully clothed in permeable clothing with adequate water and salt intake, and capable of functioning effectively under given working conditions without exceeding a deep body temperature of 100.4 degree Fahrenheit (F). Measurement of wet bulb globe temperature (WBGT) has been found to be the most adequately measurable environmental factor in which to correlate with deep body temperature and other physiological responses to heat. The following table reviews the work/rest regimen to be followed by all permeably clothed workers based upon routinely measured WBGT.

Table 15 Heat Stress - Work/Rest Regimen

Work/Rest Regimen	Workload		
	Light	Moderate	Heavy
Continuous Work	86 (76)	80 (70)	77 (67)
75% work - 25% rest, each hour	87 (77)	82 (72)	78 (68)
50% work - 50% rest, each hour	89 (79)	85 (75)	82 (72)
25% work - 75 % rest, each hour	90 (80)	88 (78)	86 (76)

Values are given in degree F WBGT.

Rest means minimal physical activity. Rest should be accomplished in the shade. Any activity requiring only minimum activity can be performed during rest period.

( ) Parentheses indicate the 10 degree adjustment for working in impermeable protective clothing

9.2 Workers Wearing Impermeable Clothing

Workers who must wear impermeable clothing are held at a higher risk of suffering heat stress. Impermeable clothing impedes sweat evaporation, one of the body's major cooling mechanisms. It is the duty of each employee to alert or notify the Construction Supervisor (Site Safety & Health Officer) if symptoms of heat stress occur to their respective site personnel. Physiological and environmental monitoring of personnel wearing an impermeable protective equipment ensemble will commence when the ambient temperature rises above 70 degrees F. Environmental monitoring will be conducted continuously for as long as the ambient temperature stays above 70 degree F and physiological monitoring will be conducted immediately before and after each work period. Frequency of physiological monitoring will increase as the ambient temperature increases or if slow recovery rates are indicated. The break time must be sufficient to allow workers to recover from the effects of heat stress. This will be accomplished by measuring the recovery heat rate and oral temperature. The break time duration will be determined using the following methodology and criteria:

- Seat person being monitored,
- Measure pulse in the following sequence:
    - Pulse #1: 30 seconds to 1 minute after sitting, and
    - Pulse #2: 2 ½ to 3 minutes after sitting,

An excessive heat stress condition exists when any of the following conditions exists:

- Oral or ear temperature exceeds 99.5 degrees F,
- If pulse #2 is greater than 90 beats/minute, or
- Pulse #1 is greater than 100 beats/minute.

Worker cannot return to work until:

- Oral or ear temperature is below 99.5 degrees F.
- Pulse rate is below 90 beats/minute, and
- Recovery heart rate for workers with heart rates over 90 beats/minute is less than 10 beats/minute less than the original heart rate.

Adhering to the guidelines for heat stress prevention and monitoring will greatly minimize the possibility of the occurrence of heat stress. Site personnel must also be aware of the symptoms of heat-related disorders and be prepared to administer the appropriate treatments.

9.2.1 Heat Stress Prevention

A. **Provide plenty of fluids.** A 50 percent solution of fruit juice or similar solution in water, or plain water will be available. For workers performing work inside an exclusion zone, fluid intake may occur in the contamination reduction zone. Workers must first perform a partial decontamination process which will include removal of gloves and washing of hands and face prior to consumption of fluids.

B. **Work in pairs.** No activity where personnel are in Level C will be conducted alone.

C. **Provide cooling undergarments.** The amount and type of undergarments worn will be left to the preference of each individual unless prone to heat stress, especially heat rash. In this case, the worker can wear “long john” cotton type underwear to keep skin separated from chemical resistant clothing.

D. **Adjustment of the work schedule.** When practicable, the most labor-intensive tasks should be carried out during the coolest part of the day.

E. **Shaded or cooled rest areas.** Shaded or cooled rest areas will be provided when site environmental and/or workers physiological responses warrant.

9.2.2 Heat Stress Monitoring

Physiological monitoring of personnel wearing an impermeable protective ensemble will be conducted at regular intervals at the beginning and conclusion of the work period. Heart rate must be periodically measured for all site personnel when heat stress conditions (climate or wearing impermeable clothing) exist. Additional physiological monitoring such as body temperature and body water temperature (BWT) monitoring can be measured for extreme temperatures and when impermeable clothing is worn.

A. Heart rate must be measured by the radial pulse for 30 seconds as early as possible in the resting period and repeated approximately 3 minutes into the rest period.

The heart rate at the beginning of the rest period should not exceed 100 beats/minute. The heart rate also should not exceed 90 beats/minute after approximately 3 minutes of rest. If the heart rate does exceed the criteria, the next work period will be shortened by 33 percent, while the length of the rest period will remain the same. If heart rate still exceeds the criteria at the beginning of the next rest period, the following work will be shortened by 33 percent.

B. Body temperature can be measured orally with a clinical or disposable thermometer, in accordance with manufacturer's instructions, as early as possible in the rest period (before drinking liquid). Oral or ear temperature at the beginning of the rest period should not exceed 99.5 degrees F. If it does, the next work period will be shortened by 33 percent while the length of the rest period will remain the same. However, if the oral temperature exceeds 99.5 degrees F at the beginning of the next rest period, the following work period will be shortened 33 percent. A worker will not be permitted to wear semi-permeable or impermeable protective ensemble when his/her body temperature exceeds 99.5 degrees F.

C. Body water loss due to perspiration can be measured by having the worker weigh him/her self at the beginning and end of each work day. Similar clothing should be worn at both weighing. Body water loss should not exceed 1.5 percent total body weight in a work day.

Table 16 Heat Stress Monitoring

SUGGESTED FREQUENCY OF PHYSIOLOGICAL MONITORING FOR FIT AND ACCLIMATED WORKERS (1)		
Adjusted Temperature (2)	**Normal Work Ensemble (3)**	**Impermeable Ensemble (4)**
90 deg. F or above	After each 45 minutes of work	After each 15 minutes of work
87.5 deg. F - 90 deg. F	After each 60 minutes of work	After each 30 minutes of work
82.5 deg. F - 87.5 deg. F	After each 90 minutes of work	After each 60 minutes of work
77.5 deg. F - 82.5 deg. F	After each 120 minutes of work	After each 90 minutes of work
72.5 deg. F - 77.5 deg. F	After each 150 minutes of work	After each 120 minutes of work
Record monitoring on Heat Stress Monitoring Form Attachment B		

(1) For work levels of 250 kilocalories per hour

(2) Calculate the adjusted air temperature (T adj) using the following equation:

T adj (degree F) = T (degree F) + (13 X percent sunshine)

Measure the air temperature (T adj) using a standard mercury-in-glass thermometer with the bulb shielded from radiant heat.

(3) A normal work ensemble consists of cotton coveralls with long sleeves and pants.

(4) An impermeable work ensemble consists of impermeable coveralls with long sleeves and pants.

9.2.3 Heat Stress Recognition and Treatment

Any person who observes any of the following forms of heat stress either in themselves or in another worker, will report this information to his or her immediate supervisor or the NYSDOT contractor construction supervisor.

A. Heat rash (or prickly heat)

Cause: Continuous exposure to hot and humid air, aggravated by chafing clothing.

Symptoms: Eruption of red pimples around sweat ducts accompanied by intense itching and tingling.

Treatment: Remove sources of irritation and cool skin with water or wet cloths.

B. Heat Cramps or Heat Prostration

Cause: Profuse perspiration accompanied by inadequate replenishment of body water and electrolytes.

Symptoms: Sudden development of pain and/or muscle spasms in the abdominal region.

Treatment: Remove the worker to the contamination reduction zone. Remove protective clothing. Decrease body temperature and allow a period of rest in a cool location.

C. Heat Exhaustion - <u>SERIOUS</u>

Cause: Overexertion in a hot environment and profuse perspiration accompanied by inadequate replenishment of body water and electrolytes.

Symptoms: Muscular weakness, staggering gait, nausea, dizziness, shallow breathing.

Treatment: Perform the following while simultaneously making arrangements for transport to a medical facility.

Remove the worker to the contamination reduction zone. Remove protective clothing. Lie worker down on his/her back in a cool place, and raise the feet 6 to 12 inches. Keep warm, but loosen all clothing. If conscious, provide sips of a salt water solution consistency of one teaspoon salt in 12 ounces of water. Transport the worker to a medical facility.

D. Heat Stroke - EXTREMELY SERIOUS

Cause: Overexertion in a hot environment and profuse perspiration accompanied by inadequate replenishment of body water and electrolytes.

Symptoms: No perspiration, dry mouth, pain in the head, dizziness, nausea.

Treatment: Perform the following while making arrangements for transport to a medical facility.

Remove the worker to the contamination reduction zone. Remove protective clothing. Lie worker down in a cool place and raise the head and shoulders slightly. Cool without chilling. Apply ice bags or cold wet cloth to the head. Sponge bare skin with cool water or rubbing alcohol. If possible, place the worker in a tub of cool water. Do not give stimulants. Transport to a medical facility.

10.0 Cold Stress

If work on this project begins in the winter months, thermal injury due to cold exposure can become a problem for field personnel. Systemic cold exposure is referred to as hypothermia. Localized cold exposure is generally labeled frostbite.

A. **Hypothermia:** Hypothermia is defined as a decrease in the patient core temperature below 96 degrees F. The body temperature is normally maintained by central (brain and spinal cord) and peripheral (skin and muscle) activity. Interferences with any of these mechanisms can result in hypothermia, even in the absence of what normally is considered "cold" ambient temperature.

Symptoms: Shivering, apathy, listlessness, sleepiness, and unconsciousness.

B. **Frostbite:** Frostbite is both a general and medical term given to areas of local cold injury. Unlike systemic hypothermia, frostbite rarely occurs unless the ambient temperatures are less than freezing and usually less than 2 degrees F.

Symptoms: A sudden blanching or whitening of the skin; the skin has a waxy or white appearance and is firm to the touch; tissues are cold, pale, and solid.

Prevention of cold related illness can be aided by educating workers on recognizing the symptoms of frostbite and hypothermia and by identifying and limiting known risk factors. The workers should be provided with enclosed, heated environments on or adjacent to the site, dry changes of clothing and warm drinks.

To monitor the worker for cold related illness, start (oral) temperature recording at the job site:

- At the NYSDOT contractor construction supervisor's discretion when suspicion is based on changes in a worker's performance or mental status.
- At a worker's request.
- As screening measures, two times per shift, under unusually hazardous conditions (e.g., wind-chill less than 20 degrees F, or wind-chill less than 30 degrees F with precipitation).
- As a screening measure whenever any one worker on the site develops hypothermia.

Workers developing moderate hypothermia (a core temperature of 92 degrees F) should not return to work for at least 48 hours.

Table 17 Progressive Clinical Symptoms of Hypothermia

Core Temperature (degree F)	Symptoms
99.6	Normal rectal temperature
96.8	Metabolic increases
95.0	Maximum shivering
93.2	Victim conscious and responsive
91.4	Severe hypothermia
89.6 - 87.8	Consciousness clouded, blood pressure difficult to obtain, pupils dilated but react to light, shivering ceases
86.0 - 84.2	Progressive loss of consciousness, muscular rigidity increases, pulse and blood pressure difficult to get, respiratory decreases
78.8	Victim seldom conscious
64.4	Lowest accidental hypothermia victim to recover

11.0 Agreement and Acknowledgment Sheet

NYSEG and NYSDEC personnel have the authority to stop field activities if any activity is not performed in accordance with the requirements of this Health and Safety Plan (HASP). All NYSEG project personnel, NYSDOT contractor personnel, subcontractor personnel, and visitors are required to sign the Agreement and Acknowledgment Sheet prior to conducting field activities at this site.

AGREEMENT AND ACKNOWLEDGMENT STATEMENT
1. I have read and fully understand the HASP and my responsibilities. 2. I agree to abide by the provisions of the HASP.
Name: ____________ Signature: ____________ Company: ____________ Date: ____________
Name: ____________ Signature: ____________ Company: ____________ Date: ____________
Name: ____________ Signature: ____________ Company: ____________ Date: ____________
Name: ____________ Signature: ____________ Company: ____________ Date: ____________
Name: ____________ Signature: ____________ Company: ____________ Date: ____________
Name: ____________ Signature: ____________ Company: ____________ Date: ____________
Name: ____________ Signature: ____________ Company: ____________ Date: ____________

ATTACHMENT A

CHEMICALS OF CONCERN

Benzene

Pyrene

Phenol

Naphthalene

Coal Tar Pitch

Hydrogen Cyanide

Hydrogen Sulfide

ADDITIONAL
MATERIAL SAFETY DATA SHEETS

Bio-Solve™

Oxygen Release Compound (ORC®)

Nitrogen Balance Gas
with 0.0001 - 0.02% Hydrogen Cyanide

Material Safety Data Sheet Collection

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Issue Date: 2000-07

Benzene
MSDS 316
BEN2200

Section 1 - Chemical Product and Company Identification

Material Name: Benzene **CAS Number:** 71-43-2
Chemical Formula: C_6H_6
Structural Chemical Formula: C_6H_6
Synonyms: (6)ANNULENE; BENZEEN; BENZEN; BENZENE; BENZIN; BENZINE; BENZOL; BENZOL 90; BENZOLE; BENZOLENE; BENZOLO; BICARBURET OF HYDROGEN; CARBON OIL; COAL NAPHTHA; CYCLOHEXATRIENE; EPA PESTICIDE CHEMICAL CODE 008801; FENZEN; MINERAL NAPHTHA; MOTOR BENZOL; NITRATION BENZENE; PHENE; PHENYL HYDRIDE; POLYSTREAM; PYROBENZOL; PYROBENZOLE
General Use: Manufacture of chemicals including styrene, dyes, and many other organic chemicals. Has been used in artificial leather, linoleum, oil cloth, airplane dopes, lacquers; as solvent for waxes, resins, oils etc.
May also be a minor component of gasoline, petrol.
Exposure should be minimized by use in closed systems.
Handling procedures and control measures should be evaluated for exposure before commencement of use in plant operations.

Section 2 - Composition / Information on Ingredients

Name	CAS	%
benzene	71-43-2	99.9

OSHA PEL
TWA: 1 ppm; 3 mg/m^3; STEL: 5 ppm; 15 mg/m^3; from Table Z-2.

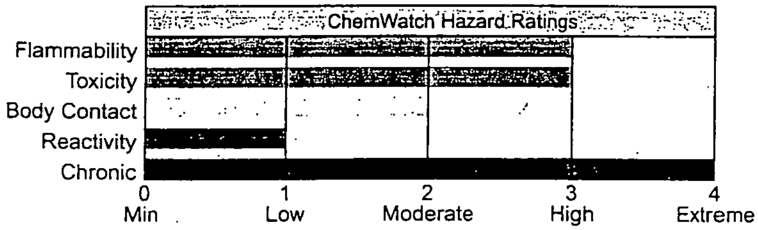
ACGIH TLV
No data found.

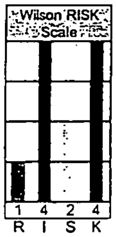
NIOSH REL
TWA: 0.1 ppm. STEL: 1 ppm.

IDLH Level
500 ppm.

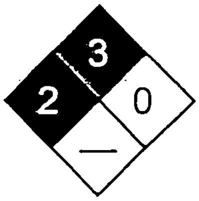
Section 3 - Hazards Identification

HMIS
③ Health
③ Flammability
⓪ Reactivity





ANSI Signal Word
Danger!



Fire Diamond

Flammable

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Colorless liquid; sweet odor. Irritating to eyes/skin/respiratory tract. Toxic. Also causes: headache, dizziness, drowsiness. Absorbed through the skin. Chronic: dermatitis, leukemia, bone marrow damage. Carcinogen. Reproductive effects. Flammable.

Potential Health Effects

Primary Entry Routes: inhalation, skin contact
Target Organs: blood, central nervous system (CNS), bone marrow, eyes, upper respiratory system, skin
Acute Effects
Inhalation: The vapor is discomforting to the upper respiratory tract and lungs and may be harmful if inhaled.
If exposure to highly concentrated solvent atmosphere is prolonged this may lead to narcosis, unconsciousness, even coma and possible death.

Acute effects from inhalation of high concentrations of vapor are pulmonary irritation, including coughing, with nausea; central nervous system depression - characterized by headache and dizziness, increased reaction time, fatigue and loss of coordination.

Inhalation hazard is increased at higher temperatures.

The symptoms of acute exposure to high vapor concentrations include confusion, dizziness, tightening of the leg muscles and pressure over the forehead followed by a period of excitement. If exposure continues the casualty quickly becomes stupefied and lapses into a coma with narcosis.

Effects of inhalation may include nausea, vomiting headache, dizziness, drowsiness, weakness, sometimes preceded by brief periods of exhilaration, or euphoria, irritability, malaise, confusion, ataxia, staggering, weak and rapid pulse, chest pain and tightness with breathlessness, pallor, cyanosis of the lips and fingertips and tinnitus. Severe exposures may produce blurred vision, shallow, rapid breathing, delirium, cardiac arrhythmias, unconsciousness, deep anesthesia, paralysis and coma characterized by motor restlessness, tremors and hyperreflexia (occasionally preceded by convulsions). Polyneuritis and persistent nausea, anorexia, muscular weakness, headache, drowsiness, insomnia and agitation may also occur. Two-three weeks after the exposure, nervous irritability, breathlessness and unsteady gait may still persist; cardiac distress and an unusual dicoloration of the skin may be evident for up to four weeks.

Hemotoxicity is not normally a feature of acute exposures although anemia, thrombocytopenia, petechial hemorrhage, and spontaneous internal bleeding have been reported. Fatal exposures may result from asphyxia, central nervous system depression, cardiac and respiratory failure and circulatory collapse; sudden ventricular fibrillation may also be fatal.

Death may be sudden or may be delayed for 24 hours. Central nervous system, respiratory or hemorrhagic complications may occur up to five days after the exposure and may be lethal; pathological findings include respiratory inflammation with edema, and lung hemorrhage, renal congestion, cerebral edema and extensive petechial hemorrhage in the brain, pleurae, pericardium, urinary tract, mucous membrane and skin.

Exposure to toxic levels has also produced chromosome damage.

Eye: The liquid is highly discomforting to the eyes, may be harmful following absorption and is capable of causing a mild, temporary redness of the conjunctiva (similar to wind-burn), temporary impairment of vision and/or other transient eye damage/ulceration.

The vapor is moderately discomforting to the eyes.

The material may produce severe irritation to the eye causing pronounced inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.

Skin: The liquid may produce skin discomfort following prolonged contact.

Defatting and/or drying of the skin may lead to dermatitis. Open cuts, abraded or irritated skin should not be exposed to this material.

Toxic effects may result from skin absorption.

The material may cause skin irritation after prolonged or repeated exposure and may produce a contact dermatitis (nonallergic). This form of dermatitis is often characterized by skin redness (erythema) and swelling (edema) which may progress to vesiculation, scaling and thickening of the epidermis. Histologically there may be intercellular edema of the spongy layer (spongiosis) and intracellular edema of the epidermis.

Ingestion: The liquid is discomforting to the gastrointestinal tract and may be harmful if swallowed.

Ingestion may result in nausea, pain, vomiting. Vomit entering the lungs by aspiration may cause potentially lethal chemical pneumonitis.

Carcinogenicity: NTP - Class 1, Known to be a carcinogen; IARC - Group 1, Carcinogenic to humans; OSHA - Listed as a carcinogen; NIOSH - Listed as carcinogen; ACGIH - Class A2, Suspected human carcinogen; EPA - Class A, Human carcinogen; MAK - Class A1, Capable of inducing malignant tumors as shown by experience with humans.

Chronic Effects: Liquid is an irritant and may cause burning and blistering of skin on prolonged exposure.

Chronic exposure may cause headache, fatigue, loss of appetite and lassitude with incipient blood effects including anemia and blood changes.

Benzene is a myelotoxicant known to suppress bone-marrow cell proliferation and to induce hematologic disorders in humans and animals.

Signs of benzene-induced aplastic anemia include suppression off leukocytes (leukopenia), red cells (anemia), platelets (thromocytopenia) or all three cell types (pancytopenia). Classic symptoms include weakness, purpura, and hemorrhage. The most significant toxic effect is insidious and often irreversible injury to the blood forming tissue. Leukemia may develop.

Section 4 - First Aid Measures

Inhalation: Remove to fresh air.

Lay patient down. Keep warm and rested.

If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital or doctor.

Eye Contact: Immediately hold the eyes open and flush continuously for at least 15 minutes with fresh running water.

Ensure irrigation under eyelids by occasionally lifting the upper and lower lids.

Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

Skin Contact: Immediately remove all contaminated clothing, including footwear (after rinsing with water).

Wash affected areas thoroughly with water (and soap if available).
Seek medical attention in event of irritation.

Ingestion: Contact a Poison Control Center.
Do NOT induce vomiting. Give a glass of water.

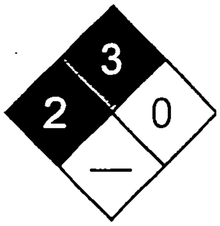
After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: For acute or short-term repeated exposures to petroleum distillates or related hydrocarbons:

1. Primary threat to life from pure petroleum distillate ingestion and/or inhalation is respiratory failure.
2. Patients should be quickly evaluated for signs of respiratory distress (e.g. cyanosis, tachypnea, intercostal retraction, obtundation) and given oxygen. Patients with inadequate tidal volumes or poor arterial blood gases (pO_2 <50 mm Hg or pCO_2 >50 mm Hg) should be intubated.
3. Arrhythmias complicate some hydrocarbon ingestion and/or inhalation and electrocardiographic evidence of myocardial injury has been reported; intravenous lines and cardiac monitors should be established in obviously symptomatic patients. The lungs excrete inhaled solvents, so that hyperventilation improves clearance.
4. A chest x-ray should be taken immediately after stabilization of breathing and circulation to document aspiration and detect the presence of pneumothorax.
5. Epinephrine (adrenalin) is not recommended for treatment of bronchospasm because of potential myocardial sensitization to catecholamines.
Inhaled cardioselective bronchodilators (e.g. Alupent, Salbutamol) are the preferred agents, with aminophylline a second choice.
6. Lavage is indicated in patients who require decontamination; ensure use of cuffed endotracheal tube in adult patients.
Consider complete blood count. Evaluate history of exposure.

Section 5 - Fire-Fighting Measures

Flash Point: -11 °C Closed Cup
Autoignition Temperature: 562 °C
LEL: 1.3% v/v
UEL: 7.1% v/v
Extinguishing Media: Foam, dry chemical powder, BCF (where regulations permit), carbon dioxide.
Water spray or fog - Large fires only.



Fire Diamond

General Fire Hazards/Hazardous Combustion Products: Liquid and vapor are highly flammable.
Severe fire hazard when exposed to heat, flame and/or oxidizers.
Vapor forms an explosive mixture with air.
Severe explosion hazard, in the form of vapor, when exposed to flame or spark. Vapor may travel a considerable distance to source of ignition.
Heating may cause expansion/decomposition with violent rupture of containers.
On combustion, may emit toxic fumes of carbon monoxide (CO).

Fire Incompatibility: Avoid contamination with oxidizing agents i.e. nitrates, oxidizing acids, chlorine bleaches, pool chlorine etc. as ignition may result.

Fire-Fighting Instructions: Contact fire department and tell them location and nature of hazard.
May be violently or explosively reactive. Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation.
Fight fire from a safe distance, with adequate cover.
If safe, switch off electrical equipment until vapor fire hazard removed.
Use water delivered as a fine spray to control fire and cool adjacent area.
Avoid spraying water onto liquid pools.
Do not approach containers suspected to be hot.
Cool fire-exposed containers with water spray from a protected location.
If safe to do so, remove containers from path of fire.
Equipment should be thoroughly decontaminated after use.

Section 6 - Accidental Release Measures

Small Spills: Remove all ignition sources. Clean up all spills immediately.
Avoid breathing vapors and contact with skin and eyes.
Control personal contact by using protective equipment.
Contain and absorb small quantities with vermiculite or other absorbent material. Wipe up. Collect residues in a flammable waste container.

Large Spills: Pollutant - contain spillage. Clear area of personnel and move upwind.
Contact fire department and tell them location and nature of hazard.
May be violently or explosively reactive. Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation.
No smoking, bare lights or ignition sources. Increase ventilation.

Stop leak if safe to do so. Water spray or fog may be used to disperse/absorb vapor. Contain spill with sand, earth or vermiculite.
Use only spark-free shovels and explosion proof equipment.
Collect recoverable product into labeled containers for recycling.
Absorb remaining product with sand, earth or vermiculite.
Collect solid residues and seal in labeled drums for disposal.
Wash area and prevent runoff into drains.
If contamination of drains or waterways occurs, advise emergency services.
Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Avoid all personal contact, including inhalation.
Wear protective clothing when risk of exposure occurs.
Use in a well-ventilated area. Prevent concentration in hollows and sumps.
DO NOT enter confined spaces until atmosphere has been checked.
Avoid smoking, bare lights, heat or ignition sources.
When handling, DO NOT eat, drink or smoke.
Vapor may ignite on pumping or pouring due to static electricity.
DO NOT use plastic buckets. Ground and secure metal containers when dispensing or pouring product. Use spark-free tools when handling.
Avoid contact with incompatible materials.
Keep containers securely sealed. Avoid physical damage to containers.
Always wash hands with soap and water after handling.
Work clothes should be laundered separately.
Use good occupational work practices. Observe manufacturer's storing and handling recommendations. Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions.
Recommended Storage Methods: Metal can; metal drum. Packing as recommended by manufacturer.
Check all containers are clearly labeled and free from leaks.
Storage Requirements: Store in original containers in approved flame-proof area.
No smoking, bare lights, heat or ignition sources.
DO NOT store in pits, depressions, basements or areas where vapors may be trapped. Keep containers securely sealed.
Store away from incompatible materials in a cool, dry well ventilated area.
Protect containers against physical damage and check regularly for leaks.
Observe manufacturer's storing and handling recommendations.
Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: Use in a well-ventilated area. Local exhaust ventilation usually required.
If risk of overexposure exists, wear NIOSH-approved respirator.
Correct fit is essential to obtain adequate protection. NIOSH-approved self contained breathing apparatus (SCBA) may be required in some situations.
Provide adequate ventilation in warehouse or closed storage area.

Personal Protective Clothing/Equipment

Eyes: Chemical goggles. Full face shield.
Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.
Hands/Feet: Nitrile gloves; Neoprene gloves.
Safety footwear.
Do NOT use this product to clean the skin.
Respiratory Protection:
Exposure Range >1 to 10 ppm: Air Purifying, Negative Pressure, Half Mask
Exposure Range >10 to 100 ppm: Air Purifying, Negative Pressure, Full Face
Exposure Range >100 to 1000 ppm: Supplied Air, Constant Flow/Pressure Demand, Full Face
Exposure Range >1000 to unlimited ppm: Self-contained Breathing Apparatus, Pressure Demand, Full Face
Cartridge Color: black
Note: must change cartridge at beginning of each shift
Other: Overalls. Eyewash unit. Barrier cream. Skin cleansing cream.
Glove Selection Index:

PE/EVAL/PE	A
PVA	A
TEFLON	A
VITON	A
VITON/NEOPRENE	A
NITRILE+PVC	C

A: Best selection
B: Satisfactory; may degrade after 4 hours continuous immersion
C: Poor to dangerous choice for other than short-term immersion

BUTYL	C
NITRILE	C
NEOPRENE	C
PVC	C
NATURAL RUBBER	C
BUTYL/NEOPRENE	C

Section 9 - Physical and Chemical Properties

Appearance/General Info: Clear, highly flammable liquid; floats on water. Characteristic aromatic odor. Highly volatile. Mixes with alcohol, chloroform, ether, carbon disulfide, carbon tetrachloride, glacial acetic acid, acetone and oils.

Physical State: Liquid
Vapor Pressure (kPa): 9.95 at 20 °C
Vapor Density (Air=1): 2.77
Formula Weight: 78.12
Specific Gravity (H_2O=1, at 4 °C): 0.879 at 20 °C
Water Solubility: 0.18 g/100 g of water at 25 °C
Evaporation Rate: Fast

pH: Not applicable
pH (1% Solution): Not applicable.
Boiling Point Range: 80.1 °C (176 °F)
Freezing/Melting Point Range: 5.5 °C (41.9 °F)
Volatile Component (% Vol): 100

Section 10 - Stability and Reactivity

Stability/Polymerization: Product is considered stable. Hazardous polymerization will not occur.
Storage Incompatibilities: Avoid reaction with oxidizing agents.

Section 11 - Toxicological Information

Unless otherwise specified data extracted from RTECS - Registry of Toxic Effects of Chemical Substances

TOXICITY
Oral (man) LD_{Lo}: 50 mg/kg
Oral (rat) LD_{50}: 930 mg/kg
Inhalation (rat) LC_{50}: 10000 ppm/7h
Inhalation (human) LC_{Lo}: 2000 ppm/5m
Inhalation (man) TC_{Lo}: 150 ppm/1y - I
Inhalation (human) TC_{Lo}: 100 ppm
Reproductive effector in rats

IRRITATION
Skin (rabbit): 20 mg/24 hr - mod
Eye (rabbit): 2 mg/24 hr - SEVERE

See NIOSH, *RTECS* CY 1400000, for additional data.

Section 12 - Ecological Information

Environmental Fate: If released to soil, it will be subject to rapid volatilization near the surface and that which does not evaporate will be highly to very highly mobile in the soil and may leach to groundwater. It may be subject to biodegradation based on reported biodegradation of 24% and 47% of the initial 20 ppm in a base-rich para-brownish soil in 1 and 10 weeks, respectively. It may be subject to biodegradation in shallow, aerobic groundwaters, but probably not under anaerobic conditions. If released to water, it will be subject to rapid volatilization; the half-life for evaporation in a wind-wave tank with a moderate wind speed of 7.09 m/sec was 5.23 hours; the estimated half-life for volatilization from a model river one meter deep flowing 1 m/sec with a wind velocity of 3 m/sec is estimated to be 2.7 hours at 20 °C. It will not be expected to significantly adsorb to sediment, bioconcentrate in aquatic organisms or hydrolyze. It may be subject to biodegradation based on a reported biodegradation half-life of 16 days in an aerobic river die-away test. In a marine ecosystem biodegradation occurred in 2 days after an acclimation period of 2 days and 2 weeks in the summer and spring, respectively, whereas no degradation occurred in winter. According to one experiment, it has a half-life of 17 days due to photodegradation which could contribute to removal in situations of cold water, poor nutrients, or other conditions less conductive to microbial degradation. If released to the atmosphere, it will exist predominantly in the vapor phase. Gas-phase will not be subject to direct photolysis but it will react with photochemically produced hydroxyl radicals with a half-life of 13.4 days calculated using an experimental rate constant for the reaction. The reaction time in polluted atmospheres which contain nitrogen oxides or sulfur dioxide is accelerated with the half-life being reported as 4-6 hours. Products of photooxidation include phenol, nitrophenols, nitrobenzene, formic acid, and peroxyacetyl nitrate. It is fairly soluble in water and is removed from the atmosphere in rain.

Ecotoxicity: LC_{50} Clawed toad (3-4 wk after hatching) 190 mg/l/48 hr /Conditions of bioassay not specified; LC_{50} Morone saxatilis (bass) 5.8 to 10.9 ppm/96 hr /Conditions of bioassay not specified; LC_{50} Poecilia reticulata (guppy) 63 ppm/14 days /Conditions of bioassay not specified; LC_{50} Salmo trutta (brown trout yearlings) 12 mg/l/1 hr (static bioassay); LD_{50} Lepomis macrochirus (bluegill sunfish) 20 mg/l/24 to 48 hr /Conditions of bioassay not specified; LC_{100} Tetrahymena pyriformis (ciliate) 12.8 mmole/l/24 hr /Conditions of bioassay not specified; LC_{50} Cancer magister (crab larvae) stage 1, 108 ppm/96 hr /Conditions of bioassay not specified; LC_{50} Crangon franciscorum (shrimp) 20 ppm/96 hr /Conditions of bioassay not specified.

Henry's Law Constant: 5.3×10^{-3}

BCF: eels 3.5

Biochemical Oxygen Demand (BOD): 1.2 lb/lb, 10 days

Octanol/Water Partition Coefficient: $\log K_{ow} = 2.13$

Soil Sorption Partition Coefficient: K_{oc} = woodburn silt loam 31 to 143

Section 13 - Disposal Considerations

Disposal: Consult manufacturer for recycling options and recycle where possible.
Follow applicable federal, state, and local regulations.
Incinerate residue at an approved site.
Recycle containers where possible, or dispose of in an authorized landfill.

Section 14 - Transport Information

DOT Transportation Data (49 CFR 172.101):

Shipping Name: BENZENE
Hazard Class: 3.1
ID No.: 1114
Packing Group: II
Label: Flammable Liquid[3]

Additional Shipping Information:

Section 15 - Regulatory Information

EPA Regulations:
RCRA 40 CFR: Listed U019 Toxic Waste; Ignitable Waste
CERCLA 40 CFR 302.4: Listed per CWA Section 311(b)(4); per RCRA Section 3001; per CWA Section 307(a); per CAA Section 112 10 lb (4.535 kg)
SARA 40 CFR 372.65: Listed
SARA EHS 40 CFR 355: Not listed
TSCA: Listed

Section 16 - Other Information

Research Date:............................1999-11 **Review Date:** 2000-07

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Issue Date: 2000-07

Pyrene
MSDS 711
PYR1640

Section 1 - Chemical Product and Company Identification

Material Name: Pyrene **CAS Number:** 129-00-0
Chemical Formula: $C_{16}H_{10}$
Synonyms: BENZO(DEF)PHENANTHRENE; BENZO(D,E,F)PHENANTHRENE; COAL TAR PITCH VOLATILES:PYRENE; PYREN; BETA-PYRENE; PYRENE; PYRENE
General Use: Laboratory reference standard.
Occurs in coal tar or in destructive hydrogenation of hard coals.

Section 2 - Composition / Information on Ingredients

Name	CAS	%
pyrene	129-00-0	>98

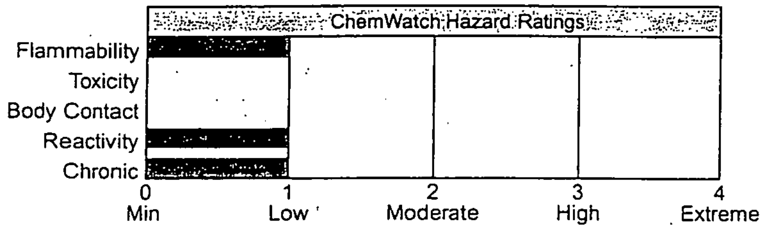
OSHA PEL
TWA: 0.2 mg/m³.

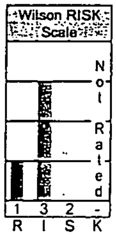
NIOSH REL
No data found.

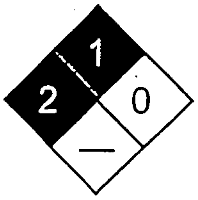
ACGIH TLV
No data found.

Section 3 - Hazards Identification

HMIS
② Health
① Flammability
⓪ Reactivity







Fire Diamond

ANSI Signal Word
Caution

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Colorless solid. Irritating to eyes/skin/respiratory tract. Also causes: conjunctival irritation, dermal irritation, ingestion may irritate and burn esophagus/gastrointestinal tract.

Potential Health Effects

Primary Entry Routes: inhalation, ingestion, skin contact
Target Organs: skin, eyes, respiratory system
Acute Effects
Inhalation: The dust may be discomforting to the upper respiratory tract and may be fatal if inhaled.
Persons with impaired respiratory function, airway diseases, and conditions such as emphysema or chronic bronchitis may incur further disability if excessive concentrations of particulate are inhaled.
Animal inhalation studies have demonstrated hepatic, pulmonary and intragastric pathologic changes. The levels of neutrophil, leukocyte and erythrocytes decreased.
Eye: The dust may be discomforting to the eyes and is capable of causing a mild, temporary redness of the conjunctiva (similar to wind-burn), temporary impairment of vision and/or other transient eye damage/ulceration.
Skin: The material may be mildly discomforting to the skin.
Open cuts, abraded or irritated skin should not be exposed to this material.
Toxic effects may result from skin absorption.

The material may cause skin irritation after prolonged or repeated exposure and may produce a contact dermatitis (nonallergic). This form of dermatitis is often characterized by skin redness (erythema) and swelling (edema) which may progress to vesiculation, scaling and thickening of the epidermis. Histologically there may be intercellular edema of the spongy layer (spongiosis) and intracellular edema of the epidermis.

Skin application resulted in hyperemia (blood engorgement), weight loss and hematopoietic (blood cell development) changes. Contact dermatitis was also evident.

Ingestion: The solid/dust is discomforting to the gastrointestinal tract and harmful if swallowed.

Considered an unlikely route of entry in commercial/industrial environments.

Carcinogenicity: NTP - Not listed; IARC - Group 3, Not classifiable as to carcinogenicity to humans; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Class D, Not classifiable as to human carcinogenicity; MAK - Not listed.

Chronic Effects: Chronic exposure to pyrene results increase in blood leukocytes (leukocytosis).

The so-called polycyclic aromatic hydrocarbons (PAHs) comprise a large family; some members occur in coal tar, tobacco smoke, petroleum and air pollution. Some substituted derivatives have been identified, in animal studies, as amongst the most highly active carcinogens.

Rodent species are sensitive to some PAHs with skin application producing cancerous growths. Injection produces soft tissue tumors (sarcomas) in rats and mice.

Administration of PAHs to Rhesus monkey on the other hand has not yet proved successful in yielding tumors and there is inadequate date to support the proposition that individual PAHs produce cancer in humans. There are however a number of epidemiology and mortality studies that show increased incidence of cancer in humans exposed to mixtures of PAHs. Evidence exists of lung and genito-urinary cancer mortality amongst coke-oven workers and skin tumors in workers exposed to creosote. Exposures to other chemical mixtures containing PAHs such as cigarette smoke, coal tar, coal tar pitch and bitumens, have been associated with increased incidences of lung cancer in humans. Anthracene, the basic unit on which most PAHs are built, is not carcinogenic whereas benz[a]anthracene appears to have weak carcinogenicity. Additions of other benzene rings to select positions on the benz[a]anthracene skeleton results in agents with powerful carcinogenicity (e.g. dibenz[a,h]anthracene and benz[a]pyrene). Further substitution of methyl groups in position on the rings enhances carcinogenicity (7,12 dimethylbenz[a]anthracene is one of the most powerful PAH carcinogens known). Biotransformation to produce soluble metabolites suitable for excretion appears to transform some PAHs to reactive electrophiles (as epoxides) which bind to DNA. Initiation of carcinogenesis is thought to rely upon such interactions.

Section 4 - First Aid Measures

Inhalation: Remove to fresh air.

Encourage patient to blow nose to ensure clear breathing passages. Rinse mouth with water. Consider drinking water to remove dust from throat.

Lay patient down. Keep warm and rested.

Seek medical attention if irritation or discomfort persist.

Eye Contact: Immediately hold the eyes open and flush with fresh running water.

Ensure irrigation under the eyelids by occasionally lifting upper and lower lids. If pain persists or recurs seek medical attention.

Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

Skin Contact: Immediately remove all contaminated clothing, including footwear (after rinsing with water).

Wash affected areas thoroughly with water (and soap if available).

Seek medical attention in event of irritation.

Ingestion: Contact a Poison Control Center.

If more than 15 minutes from a hospital, induce vomiting, preferably using Ipecac Syrup APF.

Note: DO NOT INDUCE VOMITING in an unconscious person.

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

Note to Physicians: Treat symptomatically.

Section 5 - Fire-Fighting Measures

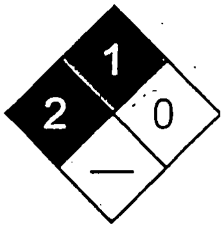
Flash Point: Not available; probably combustible

Extinguishing Media: Foam, dry chemical powder, BCF (where regulations permit), carbon dioxide.

Water spray or fog - Large fires only.

General Fire Hazards/Hazardous Combustion Products: Solid which exhibits difficult combustion or is difficult to ignite.

Avoid generating dust, particularly clouds of dust in a confined or unventilated space. Dust may form an explosive mixture with air, and any source of ignition, i.e. flame or spark, will cause fire or explosion.



Fire Diamond

Dry dust can be charged electrostatically by turbulence, pneumatic transport, pouring, in exhaust ducts and during transport. Build-up of electrostatic charge may be prevented by bonding and grounding.

Powder handling equipment such as dust collectors, dryers and mills may require additional protection measures such as explosion venting.

Fire Incompatibility: Avoid contamination with oxidizing agents i.e. nitrates, oxidizing acids, chlorine bleaches, pool chlorine etc. as ignition may result.

Fire-Fighting Instructions: Contact fire department and tell them location and nature of hazard.
Wear breathing apparatus plus protective gloves for fire only. Prevent, by any means available, spillage from entering drains or waterways.
Use fire fighting procedures suitable for surrounding area.
Do not approach containers suspected to be hot.
Cool fire-exposed containers with water spray from a protected location.
If safe to do so, remove containers from path of fire.
Equipment should be thoroughly decontaminated after use.

Section 6 - Accidental Release Measures

Small Spills: Clean up all spills immediately. Avoid contact with skin and eyes.
Wear protective clothing, gloves, safety glasses and dust respirator.
Use dry clean-up procedures and avoid generating dust.
Vacuum up or sweep up. Place in clean drum then flush area with water.

Large Spills: Clear area of personnel and move upwind.
Contact fire department and tell them location and nature of hazard.
Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or waterways.
No smoking, bare lights or ignition sources. Increase ventilation.
Stop leak if safe to do so.
Water spray or fog may be used to disperse/absorb vapor.
Contain or absorb spill with sand, earth or vermiculite.
Collect recoverable product into labeled containers for recycling.
Collect solid residues and seal in labeled drums for disposal.
Wash area and prevent runoff into drains.
After clean-up operations, decontaminate and launder all protective clothing and equipment before storing and reusing.
If contamination of drains or waterways occurs, advise emergency services.

Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Avoid all personal contact, including inhalation.
Wear protective clothing when risk of overexposure occurs.
Use in a well-ventilated area. Prevent concentration in hollows and sumps.
DO NOT enter confined spaces until atmosphere has been checked.
DO NOT allow material to contact humans, exposed food or food utensils.
Avoid smoking, bare lights or ignition sources. When handling, DO NOT eat, drink or smoke. Avoid contact with incompatible materials.
Keep containers securely sealed when not in used. Avoid physical damage to containers. Always wash hands with soap and water after handling. Working clothes should be laundered separately.
Launder contaminated clothing before reuse.
Use good occupational work practices. Observe manufacturer's storing/handling recommendations. Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions are maintained.

Recommended Storage Methods: Glass container; plastic container.
Metal can; metal drum. Packing as recommended by manufacturer.
Check all containers are clearly labeled and free from leaks.

Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: Local exhaust ventilation usually required.
If risk of overexposure exists, wear NIOSH-approved respirator.
Correct fit is essential to obtain adequate protection. NIOSH-approved self contained breathing apparatus (SCBA) may be required in some situations.
Provide adequate ventilation in warehouse or closed storage area.

Personal Protective Clothing/Equipment

Eyes: Safety glasses with side shields; chemical goggles.
Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.

Hands/Feet: Wear chemical protective gloves, eg. PVC. Wear safety footwear.

Other: Overalls. PVC apron. PVC protective suit may be required if exposure severe.

Eyewash unit. Ensure there is ready access to a safety shower.

Section 9 - Physical and Chemical Properties

Appearance/General Info: Colorless crystalline solid when pure. Contamination by tetracene results in slight yellowing. Solid and solutions have slight blue fluorescence.

Physical State: Divided solid
Vapor Pressure (kPa): Negligible
Formula Weight: 202.24
Specific Gravity (H_2O=1, at 4 °C): 1.271
Water Solubility: 0.135 mg/L (+ or - 0005 mg/L) in water
pH: Not applicable
pH (1% Solution): Not applicable
Boiling Point Range: 393 °C (739 °F) at 760 mm Hg
Freezing/Melting Point Range: 156 °C (312.8 °F)
Volatile Component (% Vol): Negligible

Section 10 - Stability and Reactivity

Stability/Polymerization: Product is considered stable. Hazardous polymerization will not occur.
Storage Incompatibilities: Avoid reaction with oxidizing agents.

Section 11 - Toxicological Information

TOXICITY	IRRITATION
Oral (rat) LD_{50}: 2700 mg/kg	Skin (rabbit): 500 mg/24h - mild
Inhalation (rat) LC_{50}: 170 mg/m^3	
Oral (mouse) LD_{50}: 800 mg/kg	
Intraperitoneal (mouse) LD_{50}: 514 mg/kg	

Conjunctival irritation, excitement and muscle contraction recorded.
NOTE: Substance has been shown to be mutagenic in various assays, or belongs to a family of chemicals producing damage or change to cellular DNA.

See NIOSH, *RTECS* UR 2450000, for additional data.

Section 12 - Ecological Information

Environmental Fate: Although environmental concentrations are highest near sources, its presence in places distant from primary sources indicates that it is reasonably stable in the atmosphere and capable of long distance transport. When released to air it may be subject to direct photolysis, although adsorption to particulates apparently can retard this process. Half-lives for reaction of vapor phase with atmospheric pollutants are: O3, 0.67 days, NO2, 14 days; estimated half-life for reaction with photochemically produced hydroxyl radicals is 1.12 days. If released to water, it will adsorb very strongly to sediments and particulate matter, bioconcentrate in aquatic organisms slightly to moderately, but will not hydrolyze. It may be subject to significant biodegradation, and direct photolysis may be important near the surface of waters. Evaporation may be important with a half-life of 4.8 to 39.2 days predicted for evaporation from a river 1 m deep, flowing at 1 m/sec with a wind velocity of 3 m/sec; half-life for evaporation from a model pond was 1176 days. Adsorption to sediments and particulates will limit evaporation. If released to soil it will be expected to adsorb very strongly to the soil and will not be expected to appreciably leach to the groundwater, although its presence in groundwater illustrates that it can be transported there. It will not be expected to hydrolyze or significantly evaporate from soils and surfaces. It may be subject to appreciable biodegradation in soils.
Ecotoxicity: TLm (Median threshold limit) Mosquito fish 0.0026 mg/l/96 hr at 24-27 °C in a static bioassay
Henry's Law Constant: calculated at 5.42 x10^{-5}
BCF: rainbow trout 72
Octanol/Water Partition Coefficient: log K_{ow} = 4.88
Soil Sorption Partition Coefficient: K_{oc} = soils 57 to 764

Section 13 - Disposal Considerations

Disposal: Recycle wherever possible or consult manufacturer for recycling options.
Follow applicable federal, state, and local regulations.
Bury residue in an authorized landfill.
Recycle containers where possible, or dispose of in an authorized landfill.

Section 14 - Transport Information

DOT Transportation Data (49 CFR 172.101):

Shipping Name: TOXIC SOLID, ORGANIC, N.O.S.
Hazard Class: 6.1(b)
ID No.: 2811
Packing Group: III
Label: Harmful[6]

Additional Shipping Information:

Section 15 - Regulatory Information

EPA Regulations:
RCRA 40 CFR: Not listed
CERCLA 40 CFR 302.4: Listed per CWA Section 307(a) 5000 lb (2268 kg)
SARA 40 CFR 372.65: Not listed 1000/10000 lb
SARA EHS 40 CFR 355: Listed 5,000 lb
TSCA: Listed

Section 16 - Other Information

Research Date: ....1999-11 **Review Date:** 2000-07

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Material Safety Data Sheet Collection
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Phenol
MSDS 355
PHE3200

Section 1 - Chemical Product and Company Identification 54

Material Name: Phenol **CAS Number:** 108-95-2
Chemical Formula: C_6H_6O
Structural Chemical Formula: C_6H_5OH
Synonyms: ACIDE CARBOLIQUE; BAKER'S P AND S LIQUID AND OINTMENT; BENZENOL; CARBOLIC ACID; CARBOLSAURE; FENOL; FENOLO; HYDROXYBENZENE; IZAL; MONOHYDROXYBENZENE; MONOPHENOL; OXYBENZENE; PHENIC ACID; PHENOL; PHENOL ALCOHOL; PHENOLE; PHENOL,MOLTEN; PHENYL ALCOHOL; PHENYL HYDRATE; PHENYL HYDROXIDE; PHENYLIC ACID; PHENYLIC ALCOHOL
General Use: Used as a general disinfectant, either in solution or mixed with slaked lime, etc., for toilets, stables, cesspools, floors, drains, etc.; for the manufacture of colorless or light-colored artificial resins.
Also used in many medicinal and industrial compounds and dyes; as a reagent in chemical analysis.

Section 2 - Composition / Information on Ingredients

Name	CAS	%
phenol	108-95-2	>99

OSHA PEL
TWA: 5 ppm; 19 mg/m^3; skin.

ACGIH TLV
No data found.

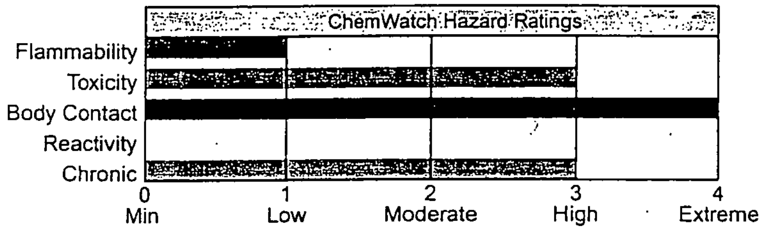
NIOSH REL
TWA: 5 ppm; 19 mg/m^3. STEL: 15.6 ppm; 60 mg/m^3; 15-minute, skin.

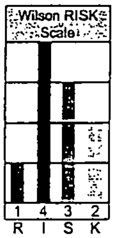
IDLH Level
250 ppm.

DFG (Germany) MAK
TWA: 5 ppm; 19 mg/m^3.

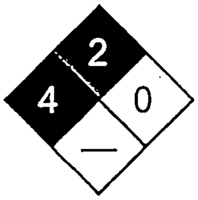
Section 3 - Hazards Identification

HMIS
3 Health
2 Flammability
0 Reactivity





ANSI Signal Word
Danger!



Fire Diamond


Poison


Corrosive

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

White, crystalline solid; medicinal odor. Poison! Corrosive, causes severe burns to the eyes (blindness)/skin/respiratory tract. Also causes: severe neurological effects (shock and coma), liver and kidney damage. Absorbed through the skin. Combustible.

Potential Health Effects

Primary Entry Routes: skin absorption, eye contact, ingestion, inhalation
Target Organs: liver, kidneys, nervous system, skin
Acute Effects
Inhalation: The vapor is extremely discomforting to the upper respiratory tract, may cause severe mucous membrane damage and may be harmful if inhaled.

Pulmonary absorption may lead to systemic toxicity affecting the cardiovascular and central nervous system.

Inhalation of phenol and some of its derivatives may produce profuse perspiration, intense thirst, nausea, vomiting, diarrhea, cyanosis, hyperactivity, stupor, falling blood pressure, hypernea, abdominal pain, hemolysis, convulsions, coma and pulmonary edema with pneumonia. Respiratory failure and kidney damage may follow.

Inhalation of the vapor causes a sore throat, coughing, shortness of breath and labored breathing.

Systemic effects include paleness, weakness, headache, sweating, ringing of the ears, shock, cyanosis, excitement, dark colored urine, frothing of the nose and mouth.

Pulmonary inflammation and pneumonia, inflammation and necrosis of the myocardium, hepatic centro-lobular necrosis, renal proximal tube swelling and edema and globular degeneration and hind-limb paralysis was observed in guinea-pigs exposed 29 times for 7 hours/day, five days/week to concentrations ranging from 26 to 52 ppm.

Eye: The material is highly corrosive to the eyes and is capable of causing severe burns and capable of causing severe damage with loss of sight.

The vapor from heated material is highly discomforting to the eyes.

The vapor when concentrated has pronounced eye irritation; this gives some warning of high vapor concentrations. If eye irritation occurs seek to reduce exposure with available control measures, or evacuate area.

The material may produce severe irritation to the eye causing pronounced inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.

Some phenol derivatives may produce mild to severe eye irritation with redness, pain and blurred vision. Permanent eye injury may occur; recovery may also be complete or partial.

Skin: The solid/dust is corrosive to the skin, may cause blisters or burns or severe burns and is it is rapidly absorbed by the skin.

Toxic effects may result from skin absorption.

Phenol and some of its derivatives may produce mild to severe skin irritation on repeated or prolonged contact, producing second and third degree chemical burns. Rapid cutaneous absorption may lead to systemic toxicity affecting the cardiovascular and central nervous system.

Absorption through the skin may result in profuse perspiration, intense thirst, nausea, vomiting, diarrhea, cyanosis (following the formation of methemoglobin), hyperactivity, stupor, falling blood pressure, hypernea, abdominal pain, hemolysis, convulsions, coma and pulmonary edema followed by pneumonia. Respiratory failure and kidney damage may follow.

The material may produce severe skin irritation after prolonged or repeated exposure, and may produce a contact dermatitis (nonallergic).

This form of dermatitis is often characterized by skin redness (erythema) and swelling (edema) which may progress to vesiculation, scaling and thickening of the epidermis.

Histologically there may be intercellular edema of the spongy layer (spongiosis) and intracellular edema of the epidermis.

Prolonged contact is unlikely, given the severity of response, but repeated exposures may produce severe ulceration.

Contact with the skin causes a white, wrinkled discoloration followed by a severe burn or systemic poisoning if not promptly and properly removed.

Intense burning and pain from skin contact may be delayed. Extreme dangers are posed by percutaneous absorption.

In one case a 32 year old male who spilled a solution of phenol over his scalp, face, neck, shoulders and back, died 10 minutes later.

There was coagulation necrosis of the skin, left eye and acute dermatitis veneta with acute passive congestion of the lungs, liver, spleen, kidneys.

Skin absorption occurs at low vapor pressure, without apparent discomfort and proceeds with the same efficiency as absorption by inhalation.

Damage to the lungs has been described following percutaneous absorption.

Methemoglobinemia and hemolytic anemia are frequently documented.

Ingestion: The material is corrosive to the gastrointestinal tract, may cause severe mucous membrane damage and may be fatal if swallowed.

Ingestion may result in nausea, abdominal irritation, pain and diarrhea.

Ingestion of phenol causes blotches on the lips and in the mouth.

Some phenol derivatives may produce mild to severe damage within the gastrointestinal tract. Phenolic groups with ortho and para positions free from substitution are reactive; this is because the ortho and para positions on the aromatic ring are highly activated by the phenolic hydroxyl group and are therefore readily substituted.

Severe phenol ingestions cause hypotension, coma, ventricular dysrhythmias, seizures and white coagulative chemical burns.

Absorption may result in profuse perspiration, intense thirst, nausea, vomiting, diarrhea, cyanosis (following the formation of methemoglobin), hyperactivity, stupor, falling blood pressure, hypernea, abdominal pain, hemolysis, convulsions, coma and pulmonary edema followed by pneumonia.

Respiratory failure and kidney damage may follow. Phenol does not uncouple oxidative phosphorylation like dinitrophenol and pentachlorophenol and thus does not cause a heat exhaustion-like syndrome.

Carcinogenicity: NTP - Not listed; IARC - Group 3, Not classifiable as to carcinogenicity to humans; OSHA - Not listed; NIOSH - Not listed; ACGIH - Class A4, Not classifiable as a human carcinogen; EPA - Class D, Not classifiable as to human carcinogenicity; MAK - Not listed.

Chronic Effects: Prolonged exposure to some derivatives of phenol may produce dermatitis, anorexia, weight loss, weakness, muscle aches and pain, liver damage, dark urine, ochronosis, skin eruptions, diarrhea, nervous disorders with headache, salivation, fainting, increased skin and scleral pigmentation, vertigo and mental disorders. Liver and kidney damage may also ensue. Chronic phenol toxicity was first noted in medical personnel in the late 1800s when 5 and 10% phenol was used as a skin disinfectant. The term carbolic (phenol) marasmus was given to this syndrome.

Chronic phenol poisoning is very rarely reported, but symptoms include vomiting, difficulty in swallowing, diarrhea, lack of appetite, headache, fainting, dizziness, dark urine, mental disturbances, and possibly skin rash. Death due to liver and kidney damage may occur.

Repeated exposure of animals to phenol vapor at concentrations ranging from 26 to 52 ppm has produced respiratory, cardiovascular, hepatic, renal and neurologic toxicity.

Administration of phenol in the drinking water of mice (2500 ppm for 103 weeks) produced an increased incidence of leukemia and lymphomas.

Phenol has been studied in initiation/promotion protocols with a number of polycyclic hydrocarbons and has been shown to have promoting activity in the two-stage skin model.

Section 4 - First Aid Measures

Inhalation: Remove to fresh air.

Lay patient down. Keep warm and rested.

If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital or doctor.

Eye Contact: Immediately hold the eyes open and flush continuously for at least 15 minutes with fresh running water. Ensure irrigation under eyelids by occasionally lifting the upper and lower lids.

Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

Skin Contact: If spilled on skin remove contaminated clothing, swab repeatedly with glycerin, PEG (polyethylene glycol), or PEG/ methylated spirit mixture or if necessary with methylated spirit alone.

Contamination of skin with phenol and some of its derivatives may produce rapid collapse and death. After skin contamination, keep patient under observation for at least 24-48 hours. Phenol-decontaminating fluid is more effective than water in removing phenol from the skin and retarding absorption; olive oil or vegetable oil may also be used; do not use mineral oil. Alcohols (methylated spirit, for example) may enhance absorption and their use alone may be ill-advised; some authorities, however, continue to advise the use of such treatment. Rapid water dilution of phenol burns may increase systemic absorption by decreasing the extent of the coagulum and thus allowing greater absorption.

Transport to hospital (or doctor).

Ingestion: Contact a Poison Control Center.

Do NOT induce vomiting. Give a glass of water.

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

Note to Physicians: * Provide preplacement and annual medical examinations for employees exposed to phenol. Persons with a history of convulsive disorders or abnormalities of the skin, respiratory tract, liver or kidneys would be expected to be at increased risk from exposure. Examination of the liver, kidneys and respiratory tract should be stressed. A urinalysis should be performed including at a minimum, specific gravity, albumin, glucose, and a microscopic on centrifuged sediment.

For acute or short-term repeated exposures to phenols/ cresols:

1.Phenol is absorbed rapidly through lungs and skin. Massive skin contact may result in collapse and death.
2.Ingestion may result in ulceration of upper respiratory tract; perforation of esophagus and/or stomach, with attendant complications, may occur. Esophageal stricture may occur.
3.An initial excitory phase may present. Convulsions may appear as long as 18 hours after ingestion. Hypotension and ventricular tachycardia that require vasopressor and antiarrhythmic therapy, respectively, can occur.
4.Respiratory arrest, ventricular dysrhythmias, seizures and metabolic acidosis may complicate severe phenol exposures so the initial attention should be directed towards stabilization of breathing and circulation with ventilation, intubation, intravenous lines, fluids and cardiac monitoring as indicated.
5.Vegetable oils retard absorption; do NOT use paraffin oils or alcohols. Gastric lavage, with endotracheal intubation, should be repeated until phenol odor is no longer detectable; follow with vegetable oil. A saline cathartic should then be given. ALTERNATELY: Activated charcoal (1g/kg) may be given. A cathartic should be given after oral activated charcoal.
6.Severe poisoning may require slow intravenous injection of methylene blue to treat methemoglobinemia.
7.Renal failure may require hemodialysis.
8.Most absorbed phenol is biotransformed by the liver to ethereal and glucoronide sulfates and is eliminated almost completely after 24 hours

BIOLOGICAL EXPOSURE INDEX - BEI

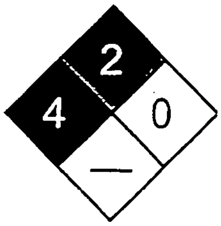
These represent the determinants observed in specimens collected from a healthy worker who has been exposed to the Exposure Standard (ES or TLV):

Determinant	Index	Sampling Time	Comments
Total phenol	250 mg/gm	End of shift	B, NS

in blood	creatinine

B: Background levels occur in specimens collected from subjects NOT exposed
NS: Non-specific determinant; also seen after exposure to other materials.

Section 5 - Fire-Fighting Measures



Fire Diamond

Flash Point: 79 °C Closed Cup
Autoignition Temperature: 715 °C
LEL: 1.7% v/v
UEL: 8.6% v/v
Extinguishing Media: Carbon dioxide; dry chemical powder.
Alcohol stable foam.
General Fire Hazards/Hazardous Combustion Products: Combustible. Moderate fire hazard when exposed to heat, flame or oxidizers.
Vapor may readily form an explosive mixture with air.
Decomposes on heating and produces toxic fumes of carbon monoxide (CO), carbon dioxide (CO_2).
Fire Incompatibility: Avoid reaction with strong oxidizing agents and halogens.
Reaction with calcium hypochlorite is exothermic and produces toxic fumes which may ignite. Hot phenol is corrosive to many metals, including aluminum, lead, magnesium and zinc.
Do not heat phenol above 60 °C.
Fire-Fighting Instructions: Contact fire department and tell them location and nature of hazard.
May be violently or explosively reactive. Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation.
Use water delivered as a fine spray to control the fire and cool adjacent area.
Avoid spraying water onto liquid pools.
Cool fire-exposed containers with water spray from a protected location.
If safe to do so, remove containers from path of fire.

Section 6 - Accidental Release Measures

Small Spills: POLLUTANT -contain spillageEnvironmental hazard - contain spillage.
Wear protective clothing, impervious gloves and safety glasses.
Avoid breathing vapors and contact with skin and eyes.
Use dry clean-up procedures and avoid generating dust.
Place spilled material in clean, dry, sealable, labeled container.
Wash area down with large quantity of water and prevent runoff into drains.
Large Spills: POLLUTANT -contain spillageEnvironmental hazard - contain spillage.
Clear area of personnel and move upwind.
Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or waterways.
If contamination of drains or waterways occurs, advise emergency services.
Shut off all possible sources of ignition and increase ventilation.
Stop leak if safe to do so.
Use dry clean-up procedures and avoid generating dust.
Collect recoverable product into labeled containers for recycling.
Collect residues and seal in labeled drums for disposal.
Wash area down with large quantity of water and prevent runoff into drains.
After clean-up operations, decontaminate and launder all protective clothing and equipment before storing and reusing.
Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions are maintained.
Use good occupational work practices.
Avoid breathing vapors and contact with skin and eyes.
Use in a well-ventilated area.
Wear personal protective equipment when handling.
Avoid contact with incompatible materials.
Avoid smoking, bare lights or ignition sources.
Vapor may travel a considerable distance to source of ignition.
Avoid thermal shock.
Avoid physical damage to containers.

Handle and open container with care.
When handling, DO NOT eat, drink or smoke.
Wash hands with soap and water after handling.
Work clothes should be laundered separately: NOT at home.

Recommended Storage Methods: Polylined drum. Stainless steel.
Steel drum.
Check that containers are clearly labeled.

Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: General exhaust is adequate under normal operating conditions.
Local exhaust ventilation may be required in specific circumstances.
If risk of overexposure exists, wear NIOSH-approved respirator.
Correct fit is essential to obtain adequate protection.
Provide adequate ventilation in warehouse or closed storage areas.

Personal Protective Clothing/Equipment

Eyes: Chemical goggles. Full face shield.
Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.

Hands/Feet: Neoprene gloves; PVC gloves.
Rubber boots.

Respiratory Protection:
Exposure Range >5 to 50 ppm: Air Purifying, Negative Pressure, Half Mask
Exposure Range >50 to <250 ppm: Air Purifying, Negative Pressure, Full Face
Exposure Range 250 to unlimited ppm: Self-contained Breathing Apparatus, Pressure Demand, Full Face
Cartridge Color: black with dust/mist prefilter (use P100 or consult supervisor for appropriate dust/mist prefilter)

Other: Acid-resistant overalls.
PVC apron.
Hard hat with brim.
Ensure there is ready access to a safety shower.
Eyewash unit.

Glove Selection Index:

BUTYL	A
BUTYL/NEOPRENE	A
NATURAL+NEOPRENE	A
NEOPRENE/NATURAL	A
PE/EVAL/PE	A
VITON	A
VITON/NEOPRENE	A
NEOPRENE	A
TEFLON	A
NATURAL RUBBER	B
NITRILE	C
NAT+NEOPR+NITRILE	C
PVA	C
PVC	C

A: Best selection
B: Satisfactory; may degrade after 4 hours continuous immersion
C: Poor to dangerous choice for other than short-term immersion

Section 9 - Physical and Chemical Properties

Appearance/General Info: White, crystalline solid with a characteristic sharp medicinal, sweet, tangy odor, which is detectable above 0.05 ppm. Phenol turns pink or red if it contains impurities, or if it is exposed to heat or light. Soluble in benzene. Very soluble in alcohol, chloroform, ether, glycerol, carbon disulfide, petrolatum, volatile and fixed oils, aqueous alkali hydroxides.

Physical State: Divided solid
Vapor Pressure (kPa): 101.33 at 181 °C
Vapor Density (Air=1): 3.24
Formula Weight: 94.11
Specific Gravity (H_2O=1, at 4 °C): 1.06 at 20 °C
Water Solubility: 1 g/15 ml water
Boiling Point Range: 181.8 °C (359 °F) at 760 mm Hg
Freezing/Melting Point Range: 40.9 °C (105.62 °F)
Volatile Component (% Vol): 100

Section 10 - Stability and Reactivity

Stability/Polymerization: Product is considered stable under normal handling conditions.
Hazardous polymerization will not occur.

Storage Incompatibilities: Segregate from strong oxidizers, halogens, calcium hypochlorite, and metals such as aluminum, lead, zinc, magnesium.

Section 11 - Toxicological Information

Unless otherwise specified data extracted from RTECS - Registry of Toxic Effects of Chemical Substances

TOXICITY	IRRITATION
Oral (rat) LD_{50}: 317 mg/kg	Skin (rabbit): 500 mg/24hr - SEVERE
Oral (human) LD_{Lo}: 140 mg/kg	Skin (rabbit): 500 mg open -SEVERE
Inhalation (rat) LC_{50}: 316 mg/m^3	Eye (rabbit): 5 mg - SEVERE
Dermal (rabbit) LD_{50}: 850 mg/kg	Eye (rabbit): 100 mg rinse - mild

See NIOSH, *RTECS* SJ 3325000, for additional data.

Section 12 - Ecological Information

Environmental Fate: If released to the environment, the primary removal mechanism is biodegradation which is generally rapid (days). Since it is a benchmark chemical for biodegradability studies, there is a large body of information on its degradation which concludes that it rapidly degrades in sewage, soil, fresh water and seawater. Acclimation of resident populations of microorganisms is rapid. Under anaerobic conditions degradation is slower and microbial adaptation periods longer. If released to soil, it will readily leach and biodegrade. The biodegradation in soil is generally rapid with half-lives of under 5 days even in subsurface soils. Biodegradation is sufficiently rapid that most groundwater is generally free of this pollutant. The exception would be in the cases of spills where high concentrations destroy degrading microbial populations. Biodegradation is also the primary removal process when released into water (half-lives are of the order of hours to days) although sensitized photolysis may also be important. In one study using estuarine water, the combination of biodegradation and photolysis resulted in a half-life in summer and winter of 39 and 94 hr, respectively. Since the pKa is 9.994, it will be partially dissociated at higher pHs in water and moist soils and its transport and reactivity may be pH-dependent. It does not bioconcentrate in aquatic organisms. In the atmosphere, it occurs as a vapor and reacts with photochemically-produced hydroxyl radicals resulting in a half-life of approximately 15 hours. During the nighttime, it reacts with nitrate radicals with a resulting half-life of 12 minutes. It has also been shown to be readily removed from the atmosphere by rain.

Ecotoxicity: LC_{50} Crangon crangon 5600 mg/l 3 min, 20 mg/l 1 hr, 80 mg/l 3 hr, 40 mg/l 6-24 hr, 30 mg/l 48-72 hr, 25 mg/l 96 hr in sea water at 15 °C /Conditions of bioassay not specified; LC_{50} Rainbow trout 5.6-11.3 mg/l/24 hr in a static bioassay; LC_{50} Ophicephalus punctatus 46.0 mg/l/48 hr in a static bioassay; TLm Mercenaria mercenaria (hard clam) egg 5.263 x10^4 ppb/48 hr in a static bioassay; Algae: Microcystis aeruginosa inhibition of cell multiplication noted at 4.6 mg/l /Conditions of bioassay not specified; Protozoa: Vorticella campanula perturbation level 3 mg/l /Conditions of bioassay not specified ; Arthropoda: LD_0 Daphnia magna 16 mg/l /Conditions of bioassay not specified; Arthropoda: TLm Daphnia magna (young) 17/7 mg/l 25-50 hr /Conditions of bioassay not specified ; TLm Roach 15 mg/l/24 hr /Conditions of bioassay not specified

Henry's Law Constant: 3.33 x10^{-7}

BCF: goldfish 1.9

Biochemical Oxygen Demand (BOD): 200%, 5 days

Octanol/Water Partition Coefficient: log K_{OW} = 1.46

Soil Sorption Partition Coefficient: K_{OC} = 1 to 3

Section 13 - Disposal Considerations

Disposal: Follow applicable federal, state, and local regulations.

Incinerate contaminated waste at an approved site.

Phenol may be recovered by charcoal absorption, solvent extraction or steam stripping. A concentration of 1% by weight is required for economical recovery.

Recycle containers wherever possible, otherwise dispose of in an authorized landfill.

Section 14 - Transport Information

DOT Transportation Data (49 CFR 172.101):

Shipping Name: PHENOL, SOLID **Additional Shipping Information:** CARBOLIC ACID, SOLID
Hazard Class: 6.1(a)
ID No.: 1671
Packing Group: II
Label: Poison[6]

Section 15 - Regulatory Information

EPA Regulations:
RCRA 40 CFR: Listed U188 Toxic Waste
CERCLA 40 CFR 302.4: Listed per CWA Section 311(b)(4); per RCRA Section 3001; per CWA Section 307(a) 1000 lb (453.5 kg)
SARA 40 CFR 372.65: Listed 500/10000 lb
SARA EHS 40 CFR 355: Listed 1,000 lb
TSCA: Listed

Section 16 - Other Information

Research Date:..............................1999-11 **Review Date:** 2000-07

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Material Safety Data Sheet Collection

Naphthalene **MSDS No. 624**

Date of Preparation: 11/87 Revision: A, 9/97

Section 1 - Chemical Product and Company Identification

Product/Chemical Name: Naphthalene

Chemical Formula: $C_{10}H_8$

CAS Number: 91-20-3

Synonyms: Albocarbon; camphor tar; Dezodorator; Mighty 150; moth balls; moth flakes; naftalen (Polish); naphthalin; naphthaline; naphthalinum; naphthene; NTM; tar camphor; white tar

Derivation: From coal tar; from petroleum fractions after various catalytic processing operations.

General Use: Used as a moth repellent, an antiseptic, toilet bowl deodorant, heat transfer agent, fungicide, smokeless powder, cutting fluid, lubricant, wood preservative; an intermediate for naphthol, phthalic anhydride, chlorinated naphthalenes, Tertralin, Decalin, naphthyl and naphthol derivatives, and dyes; in synthetic resins, synthetic tanning, textile chemicals, scintillation counters, and emulsion breakers.

Vendors: Consult the latest *Chemical Week Buyers' Guide.* (73)

Section 2 - Composition / Information on Ingredients

Naphthalene, ca 100% wt. Grade: By melting point, 165 °F (74 °C) min (crude) to greater than 174 °F (79 °C) (refined); scintillation 176-177 °F (80-81 °C)

OSHA PELs	ACGIH TLVs	NIOSH RELs	IDLH Level
8-hr TWA: 10 ppm (50 mg/m^3); *Vacated 1989 Final Rule Limit:* 15-min. STEL: 15 ppm (79 mg/m^3)	TWA: 10 ppm (52 mg/m^3) STEL: 15 ppm (79 mg/m^3)	10-hr TWA: 10 ppm (50 mg/m^3); 15-min. STEL: 15 ppm (75 mg/m^3)	500 ppm **DFG (Germany) MAK** 10 ppm (50 mg/m^3)

Section 3 - Hazards Identification

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Naphthalene is a white crystalline solid with a 'moth ball' or coal-tar odor. It is toxic by ingestion. Irritating to skin, eyes, and respiratory system. Naphthalene is a combustible solid. Dust may form explosive mixtures in air if subjected to an ignition source.

Wilson Risk Scale	
R	1
I	3
S	2*
K	2

*Skin absorption

HMIS	
H	2†
F	2
R	0
PPE‡	

†Chronic Effects

‡Sec. 8

Potential Health Effects

Primary Entry Routes: Inhalation, skin absorption, skin and/or eye contact

Target Organs: Blood (red blood cell effects), eyes, skin, central nervous system (CNS), liver and kidneys

Acute Effects

Inhalation: Vapor inhalation causes headache, confusion, nausea, sometimes vomiting, loss of appetite, extensive sweating, dysuria (painful urination), hematuria (blood in the urine), and hemolysis (destruction of red blood cells).

Eye: Irritation, conjunctivitis, and corneal injury upon prolonged contact.

Skin: Irritation and hypersensitivity dermatitis.

Ingestion: Unlikely. However, ingestion causes irritation of the mouth and stomach, hemolytic anemia with hepatic and renal lesions and vesical congestion, kidney failure, hematuria, jaundice, depression of CNS, nausea, vomiting, abdominal pain, blue face, lips, or hands, rapid and difficult breathing, headache, confusion, excitement, malaise, fever, perspiration, urinary tract pain, dizziness, convulsions, coma, and death. Symptoms may appear 2 to 4 hours after exposure.

Carcinogenicity: IARC, NTP, and OSHA do not list naphthalene as a carcinogen. EPA-D, Not Classifiable as to Human Carcinogenicity; MAK-B, Justifiably suspected of having carcinogenic potential; TLV-A4, Not Classifiable as a Human Carcinogen.

Medical Conditions Aggravated by Long-Term Exposure: Diseases of the blood, liver and kidneys; individuals with a hereditary deficiency of the enzyme glucose-6-phosphate dehydrogenase in red blood cells are particularly susceptible to the hemolytic properties of naphthalene metabolites.

Chronic Effects: May cause optical neuritis, corneal injuries, cataracts, kidney damage.

Other: There are two reports of naphthalene crossing the placenta in humans.

Section 4 - First Aid Measures

Inhalation: Remove exposed person to fresh air and support breathing as needed. Contact a physician immediately if symptoms of systemic poisoning are present.

Eye Contact: *Do not* allow victim to rub or keep eyes tightly shut. Gently lift eyelids and flush immediately and continuously with flooding amounts of water for at least 15 min. Consult a physician or ophthalmologist if pain, irritation, swelling, or photophobia persist.

Skin Contact: *Quickly* remove contaminated clothing. Rinse with flooding amounts of water for at least 15 min. Wash exposed area thoroughly with soap and water. For reddened or blistered skin, consult a physician. Contact a physician immediately if symptoms of systemic poisoning are present.

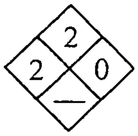
Ingestion: Never give anything by mouth to an unconscious or convulsing person. Contact a poison control center. Unless the poison control center advises otherwise, have the *conscious and alert* person drink 1 to 2 glasses of water, then induce vomiting. Contact a physician immediately.

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

Note to Physicians: Obtain baseline CBC, electrolytes, liver and renal function rests, glucose-6-phosphatase dehydrogenase level, urinalysis, and benzidine dipstick to check for hemoglobinuria. Urinary metabolite, 1-naphthol or mercapturic acid, may help confirm the diagnosis.

Section 5 - Fire-Fighting Measures

NFPA



Flash Point: 174 °F (79 °C); 190 °F (88 °C)
Flash Point Method: OC; CC
Burning Rate: Data not found.
Autoignition Temperature: 979 °F (526 °C)
LEL: 0.9% v/v
UEL: 5.9% v/v
Flammability Classification: Combustible solid

Extinguishing Media: Use dry chemical, foam, carbon dioxide (CO_2), or water spray. Water or foam may cause frothing. Use water spray to keep fire-exposed containers cool.

Unusual Fire or Explosion Hazards: Volatile solid that gives off flammable vapors when heated. Dust may explode in air if an ignition source is provided.

Hazardous Combustion Products: Toxic vapors including carbon monoxide.

Fire-Fighting Instructions: Move containers from the fire area if it can be done without risk. Otherwise cool fire-exposed containers until well after the fire is extinguished. *Do not* release runoff from fire control methods to sewers or waterways.

Fire-Fighting Equipment: Because fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode. Wear full protective clothing (see Sec. 8). Structural clothing is permeable, remain clear of smoke, water fall out, and water run off.

Section 6 - Accidental Release Measures

Spill /Leak Procedures: Notify safety personnel, evacuate all unnecessary personnel, remove heat and ignition sources. Isolate and ventilate area, deny entry, stay upwind. Stop leak if you can do it without risk. Use spark-proof tools and explosion proof equipment. Cleanup personnel should wear personal protective equipment to protect against exposure (see Sec. 8).

Small Spills: *Do not* sweep! Carefully scoop up or vacuum (with a HEPA filter). Absorb liquid spill with an inert, noncombustible absorbent such as sand or vermiculite.

Large Spills

Containment: For large spills, dike far ahead of liquid spill for later disposal. *Do not* release into sewers or waterways.

Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: To avoid vapor inhalation use only with ventilation sufficient to reduce airborne concentrations to nonhazardous levels. Avoid skin and eye contact. Wear personal protective clothing and equipment to prevent any contact with skin and eyes (see Sec. 8). Practice good personal hygiene procedures to prevent inadvertently ingesting this material.

Storage Requirements: Store in tightly closed, explosion-proof containers in a cool, well-ventilated area away from heat, ignition sources, and incompatibles (see Sec. 10). May be stored under nitrogen gas. Protect containers against physical damage. Use monitoring equipment to measure the extent of vapor present in any storage facility containing naphthalene because of potential fire and explosion hazards.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: Where feasible, enclose operations to avoid vapor and dust dispersion into the work area. Ventilate at the site of chemical release. During the fractional distillation of naphthalene and in any operation entailing the heating or volatilization of naphthalene, enclosed apparatus should be employed.

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

Administrative Controls: Educate workers about the health and safety hazards associated with naphthalene. Train in work practices which minimize exposure. Consider preplacement and periodic medical exams with emphasis on the eyes, skin, liver, kidneys, CBC (RBC count, WBC count, differential count of a stained smear, hemoglobin, and hematocrit), and urinalysis including at a minimum specific gravity, albumin, glucose, and a microscopic examination on centrifuged sediment.

Respiratory Protection: Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a MSHA/NIOSH-approved respirator. Select respirator based on its suitability to provide adequate worker protection for given working conditions, level of airborne contamination, and presence of sufficient oxygen. 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.* If respirators are used, OSHA requires a written respiratory protection program that includes at least: medical certification, training, fit-testing, periodic environmental monitoring, maintenance, inspection, cleaning, and convenient, sanitary storage areas.

Protective Clothing/Equipment: Wear chemically protective gloves, boots, aprons, and gauntlets to prevent skin contact. Teflon® is recommended. *Do not* use butyl rubber, natural rubber, neoprene or polyvinyl chloride. Wear chemical dust-proof safety goggles and face shield, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Contact lenses are not eye protective devices. Appropriate eye protection must be worn instead of, or in conjunction with contact lenses.

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

Contaminated Equipment: Separate contaminated work clothes from street clothes. Launder before reuse. Remove naphthalene from your shoes and clean personal protective equipment.

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 - Physical and Chemical Properties

Physical State: Crystalline solid

Appearance and Odor: White, volatile flakes, cakes, cubes, spheres, or powder; strong coal-tar or moth ball odor

Odor Threshold: 0.084 ppm to 0.3 ppm

Vapor Pressure: 0.05 mm Hg at 68 °F (20 °C); 1.0 mm Hg at 127 °F (53 °C)

Formula Weight: 128.2

Density: 1.145 g/cm^3 at 68 °F (20 °C)

Saturated Vapor Concentration: 100 ppm at 77 °F (25 °C) (approx.)

Water Solubility: Insoluble [31.7 mg/L at 68 °F (20 °C)]

Other Solubilities: Benzene, absolute alcohol; very soluble in ether, chloroform, carbon disulfide, hydronaphthalenes, fixed and volatile oils

Boiling Point: 424 °F (218 °C)

Melting Point: 176 °F (80.2 °C)

Volatility: Volatilizes appreciably at room temperature; volatile with steam

Octanol/Water Partition Coefficient: $\log K_{ow} = 3.30$

Section 10 - Stability and Reactivity

Stability: Naphthalene is stable at room temperature in closed containers under normal storage and handling conditions. It volatilizes at room temperature.

Polymerization: Hazardous polymerization cannot occur.

Chemical Incompatibilities: Include aluminum chloride, benzoyl chloride, chromic acid, chromium trioxide, oxidizers. Explosive reaction with dinitrogen pentaoxide. Melted naphthalene will attack some forms of plastics.

Conditions to Avoid: Exposure to heat and ignition sources, incompatibles.

Hazardous Decomposition Products: Thermal oxidative decomposition of naphthalene can produce toxic fumes including carbon monoxide.

Section 11- Toxicological Information

Toxicity Data:*

Acute Effects:

Human (child), oral, LD_{Lo}: 100 mg/kg

Man, unreported, LD_{Lo}: 74 mg/kg

Rat, oral, LD_{50}: 490 mg/kg

Reproductive Effects:

Rat, oral: 4500 mg/kg administered on gestational days 6-15 produced fetotoxicity and other developmental abnormalities.

Section 11- Toxicological Information, *continued*

Toxicity Data:*

Acute Effects: *continued*
Mouse, oral, LD_{50}: 533 mg/kg
Rat, inhalation, LC_{50}: >340 mg/m^3 produced lacrimation and somnolence.

Genetic Effects:
Hamster, ovary: 15 mg/L induced sister chromatid exchange.

Tumorigenicity:
Mouse, inhalation: 30 ppm/6 hr/2 yr administered intermittently produced toxic effects: tumorigenic - neoplastic by RTECS criteria; lungs, thorax, or respiration - tumors.

Skin Effects:
Rabbit, skin, open Draize test: 495 mg produced mild irritation.

Eye Effects:
Rabbit, eye, standard Draize test: 100 mg produced mild irritation.

*See *NIOSH RTECS* (QJ0525000) for additional toxicity data.

Section 12 - Ecological Information

Ecotoxicity: *Oncorhynchus gorbuscha* (pink salmon): 1.37 ppm/96 hr at 39 °F (4 °C). *Pimephales promelas* (fathead minnow): 7.76 mg/L/24 hr.

Environmental Fate: If released to the atmosphere, naphthalene rapidly photodegrades with a half-life of 3-8 hr. Volatilization, photolysis, adsorption, and biodegradation are important loss mechanisms for naphthalene discharged into water. Depending on local conditions, the half-lives range from a couple of days to a few months. If released on land, it is adsorbed moderately to soil, undergoes biodegradation; but in some cases biodegradation may still occur if conditions are aerobic. Bioconcentration occurs to a moderate extent, but is a temporary problem since depuration and metabolism readily proceed in aquatic organisms.

Section 13 - Disposal Considerations

Disposal: Consider rotary kiln or fluidized bed incineration. Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.

Container Cleaning and Disposal: Handle empty containers carefully as hazardous residues may still remain.

Section 14 - Transport Information

DOT Transportation Data (49 CFR 172.101):

Shipping Name: Naphthalene, crude or Naphthalene, refined
Shipping Symbols: Not listed
Hazard Class: 4.1
ID No.: UN1334
Packing Group: III
Label: FLAMMABLE SOLID
Special Provisions (172.102): A1

Packaging Authorizations
a) **Exceptions:** 173.151
b) **Non-bulk Packaging:** 173.213
c) **Bulk Packaging:** 173.240

Quantity Limitations
a) **Passenger, Aircraft, or Railcar:** 25 kg
b) **Cargo Aircraft Only:** 100 kg

Vessel Stowage Requirements
a) **Vessel Stowage:** A
b) **Other:** Not listed

Section 15 - Regulatory Information

EPA Regulations:
Listed as a RCRA Hazardous Waste (40 CFR 261.33). Hazardous Waste Number: U165
Listed as a CERCLA Hazardous Substance (40 CFR 302.4) specific per RCRA, Sec. 3001; CWA, Sec. 311 (b)(4); CWA, Sec. 307(a); CAA, Sec. 112
CERCLA Final Reportable Quantity (RQ), 100 lb (45.4 kg)
Listed as a SARA Toxic Chemical (40 CFR 372.65)
SARA EHS (Extremely Hazardous Substance) (40 CFR 355): Not listed

OSHA Regulations:
Air Contaminant (29 CFR 1910.1000, Table Z-1, Z-1-A): Not listed

Section 16 - Other Information

References: 73, 99, 103, 124, 139, 140, 167, 168, 179, 190, 196, 197, 200, 220

PC-W6

Prepared By ....S Fleming, BS/MJ Wurth, BS
Industrial Hygiene Review................DJ Wilson, CIH
Medical Review..................................G Kelafant, MD

Occupational Health Guideline for Coal Tar Pitch Volatiles

INTRODUCTION

This guideline is intended as a source of information for employees, employers, physicians, industrial hygienists, and other occupational health professionals who may have a need for such information. It does not attempt to present all data; rather, it presents pertinent information and data in summary form.

SUBSTANCE IDENTIFICATION

Anthracene

- Formula: $C_{14}H_{10}$
- Synonyms: None
- Appearance and odor: Pale green solid with a faint aromatic odor.

Phenanthrene

- Formula: $C_{14}H_{10}$
- Synonyms: None
- Appearance and odor: Colorless solid with a faint aromatic odor.

Pyrene

- Formula: $C_{16}H_{10}$
- Synonyms: None
- Appearance: Bright yellow solid

Carbazole

- Formula: $C_{12}H_9N$
- Synonyms: None
- Appearance and odor: Colorless solid with a faint aromatic odor.

Benzo(a)pyrene

- Formula: $C_{20}H_{12}$
- Synonyms: BaP, 3,4-benzopyrene
- Appearance and odor: Colorless solid with a faint aromatic odor.

PERMISSIBLE EXPOSURE LIMIT (PEL)

The current OSHA standard for coal tar pitch volatiles is 0.2 milligram of coal tar pitch volatiles per cubic meter of air (mg/m³) averaged over an eight-hour work shift. NIOSH has recommended that the permissible exposure limit for coal tar products be reduced to 0.1 mg/m³ (cyclohexane-extractable fraction) averaged over a work shift of up to 10 hours per day, 40 hours per week, and that coal tar products be regulated as occupational carcinogens. The NIOSH Criteria Document for Coal Tar Products and NIOSH Criteria Document for Coke Oven Emissions should be consulted for more detailed information.

HEALTH HAZARD INFORMATION

- **Routes of exposure**

Coal tar pitch volatiles can affect the body if they are inhaled or if they come in contact with the eyes or skin.

- **Effects of overexposure**

Repeated exposure to coal tar pitch volatiles has been associated with an increased risk of developing bronchitis and cancer of the lungs, skin, bladder, and kidneys. Pregnant women may be especially susceptible to exposure effects associated with coal tar pitch volatiles. Repeated exposure to these materials may also cause sunlight to have a more severe effect on a person's skin. In addition, this type of exposure may cause an allergic skin rash.

- **Reporting signs and symptoms**

A physician should be contacted if anyone develops any signs or symptoms and suspects that they are caused by exposure to coal tar pitch volatiles.

- **Recommended medical surveillance**

The following medical procedures should be made available to each employee who is exposed to coal tar pitch volatiles at potentially hazardous levels:

These recommendations reflect good industrial hygiene and medical surveillance practices and their implementation will assist in achieving an effective occupational health program. However, they may not be sufficient to achieve compliance with all requirements of OSHA regulations.

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service Centers for Disease Control
National Institute for Occupational Safety and Health

U.S. DEPARTMENT OF LABOR
Occupational Safety and Health Administration

September 1978

1. Initial Medical Examination:

—A complete history and physical examination: The purpose is to detect pre-existing conditions that might place the exposed employee at increased risk, and to establish a baseline for future health monitoring. Examination of the oral cavity, respiratory tract, bladder, and kidneys should be stressed. The skin should be examined for evidence of chronic disorders, for premalignant and malignant lesions, and evidence of hyperpigmentation or photosensitivity.

—Urinalysis: Coal tar pitch volatiles are associated with an excess of kidney and bladder cancer. A urinalysis should be obtained to include at a minimum specific gravity, albumin, glucose, and a microscopic on centrifuged sediment, as well as a test for red blood cells.

—Urinary cytology: Coal tar pitch volatiles are associated with an excess of kidney and bladder cancer. Employees having 5 or more years of exposure or who are 45 years of age or older should have a urinary cytology examination.

—Sputum cytology: Coal tar pitch volatiles are associated with an excess of lung cancer. Employees having 10 or more years of exposure or who are 45 years of age or older should have a sputum cytology examination.

—14" x 17" chest roentgenogram: Coal tar pitch volatiles are associated with an excess of lung cancer. Surveillance of the lungs is indicated.

—FVC and FEV (1 sec): Coal tar pitch volatiles are reported to cause an excess of bronchitis. Periodic surveillance is indicated.

—A complete blood count: Due to the possibility of benzene exposure associated with coal tar pitch volatiles, a complete blood count is considered necessary to search for leukemia and aplastic anemia.

—Skin disease: Coal tar pitch volatiles are defatting agents and can cause dermatitis on prolonged exposure. Persons with pre-existing skin disorders may be more susceptible to the effects of these agents.

2. Periodic Medical Examination: The aforementioned medical examinations should be repeated on an annual basis, and semi-annually for employees 45 years of age or older or with 10 or more years' exposure to coal tar pitch volatiles.

- **Summary of toxicology**

Coal tar pitch volatiles (CTPV) are products of the destructive distillation of bituminous coal and contain polynuclear aromatic hydrocarbons (PNA's). These hydrocarbons sublime readily, thereby increasing the amounts of carcinogenic compounds in working areas. Epidemiologic evidence suggests that workers intimately exposed to the products of combustion or distillation of bituminous coal are at increased risk of cancer at many sites. These include cancer of the respiratory tract, kidney, bladder, and skin. In a study of coke oven workers, the level of exposure to CTPV and the length of time exposed were related to the development of cancer. Coke oven workers with the highest risk of cancer were those employed exclusively at topside jobs for 5 or more years, for whom the increased risk of dying from lung cancer was 10-fold; all coke oven workers had a 7-½-fold increase in risk of dying from kidney cancer. Although the causative agent or agents of the cancer in coke oven workers is unidentified, it is suspected that several PNA's in the CTPV generated during the coking process are involved. Certain industrial populations exposed to coal tar products have a demonstrated risk of skin cancer. Substances containing PNA's which may produce skin cancer also produce contact dermatitis; examples are coal tar, pitch, and cutting oils. Although allergic dermatitis is readily induced by PNA's in guinea pigs, it is only rarely reported in humans from occupational contact with PNA's; these have resulted largely from the therapeutic use of coal tar preparations. Components of pitch and coal tar produce cutaneous photosensitization; skin eruptions are usually limited to areas exposed to the sun or ultraviolet light. Most of the phototoxic agents will induce hypermelanosis of the skin; if chronic photodermatitis is severe and prolonged, leukoderma may occur. Some oils containing PNA's have been associated with changes of follicular and sebaceous glands which commonly take the form of acne. There is evidence that exposures to emissions at coke ovens and gas retorts may be associated with an increased occurrence of chronic bronchitis. Coal tar pitch volatiles may be associated with benzene, an agent suspected of causing leukemia and known to cause aplastic anemia.

CHEMICAL AND PHYSICAL PROPERTIES

- **Physical data—Anthracene**

1. Molecular weight: 178.2
2. Boiling point (760 mm Hg): 340 C (644 F)
3. Specific gravity (water = 1): 1.24
4. Vapor density (air = 1 at boiling point of anthracene): 6.15
5. Melting point: 217 C (423 F)
6. Vapor pressure at 20 C (68 F): Less than 1 mm Hg
7. Solubility in water, g/100 g water at 20 C (68 F): Insoluble
8. Evaporation rate (butyl acetate = 1): Not applicable

- **Physical data—Phenanthrene**

1. Molecular weight: 178.2
2. Boiling point (760 mm Hg): 340 C (644 F)
3. Specific gravity (water = 1): 1.18
4. Vapor density (air = 1 at boiling point of phenanthrene): 6.15
5. Melting point: 100.5 C (213 F)
6. Vapor pressure at 20 C (68 F): Less than 1 mm Hg
7. Solubility in water, g/100 g water at 20 C (68 F): Insoluble
8. Evaporation rate (butyl acetate = 1): Not applicable

- **Physical data—Pyrene**

1. Molecular weight: 202.3
2. Boiling point (760 mm Hg): Greater than 360 C (greater than 680 F)

3. Specific gravity (water = 1): 1.28
4. Vapor density (air = 1 at boiling point of pyrene): 6.9
5. Melting point: 150.4 C (303 F)
6. Vapor pressure at 20 C (68 F): Less than 1 mm Hg
7. Solubility in water, g/100 g water at 20 C (68 F): Insoluble
8. Evaporation rate (butyl acetate = 1): Not applicable

- **Physical data—Carbazole**

1. Molecular weight: 167.2
2. Boiling point (760 mm Hg): 355 C (671 F)
3. Specific gravity (water = 1): Greater than 1
4. Vapor density (air = 1 at boiling point of carbazole): 5.8
5. Melting point: 246 C (475 F)
6. Vapor pressure at 20 C (68 F): Less than 1 mm Hg
7. Solubility in water, g/100 g water at 20 C (68 F): Insoluble
8. Evaporation rate (butyl acetate = 1): Not applicable

- **Physical data—Benzo(a)pyrene**

1. Molecular weight: 252.3
2. Boiling point (760 mm Hg): Greater than 360 C (greater than 680 F)
3. Specific gravity (water = 1): Greater than 1
4. Vapor density (air = 1 at boiling point of benzo(a)pyrene): 8.7
5. Melting point: 179 C (354 F)
6. Vapor pressure at 20 C (68 F): Less than 1 mm Hg
7. Solubility in water, g/100 g water at 20 C (68 F): Insoluble
8. Evaporation rate (butyl acetate = 1): Not applicable

- **Reactivity**

1. Conditions contributing to instability: None hazardous
2. Incompatibilities: Contact with strong oxidizers may cause fires and explosions.
3. Hazardous decomposition products: None
4. Special precautions: None

- **Flammability**

1. Flash point: Anthracene: 121 C (250 F) (closed cup); Others: Data not available
2. Autoignition temperature: Anthracene: 540 C (1004 F); Others: Data not available
3. Flammable limits in air, % by volume: Anthracene: Lower: 0.6; Others: Data not available
4. Extinguishant: Foam, dry chemical, and carbon dioxide

- **Warning properties**

Grant states that "coal tar and its various crude fractions appear principally to cause reddening and squamous eczema of the lid margins, with only small erosions of the corneal epithelium and superficial changes in the stroma, which disappear in a month following exposure. Chronic exposure of workmen to tar fumes and dust has been reported to cause conjunctivitis and discoloration of the cornea in the palpebral fissure, either near the limbus or, in extreme cases, across the whole cornea. Occasionally, epithelioma of the lid margin has been attributed to contact with coal tar."

MONITORING AND MEASUREMENT PROCEDURES

- **General**

Measurements to determine employee exposure are best taken so that the average eight-hour exposure is based on a single eight-hour sample or on two four-hour samples. Several short-time interval samples (up to 30 minutes) may also be used to determine the average exposure level. Air samples should be taken in the employee's breathing zone (air that would most nearly represent that inhaled by the employee).

- **Method**

Coal tar products may be sampled by collection on a glass fiber filter with subsequent ultrasonic extraction and weighing. An analytical method for coal tar pitch volatiles is in the *NIOSH Manual of Analytical Methods*, 2nd Ed., Vol. 1, 1977, available from the Government Printing Office, Washington, D.C. 20402 (GPO No. 017-033-00267-3).

RESPIRATORS

- Good industrial hygiene practices recommend that engineering controls be used to reduce environmental concentrations to the permissible exposure level. However, there are some exceptions where respirators may be used to control exposure. Respirators may be used when engineering and work practice controls are not technically feasible, when such controls are in the process of being installed, or when they fail and need to be supplemented. Respirators may also be used for operations which require entry into tanks or closed vessels, and in emergency situations. If the use of respirators is necessary, the only respirators permitted are those that have been approved by the Mine Safety and Health Administration (formerly Mining Enforcement and Safety Administration) or by the National Institute for Occupational Safety and Health.
- In addition to respirator selection, a complete respiratory protection program should be instituted which includes regular training, maintenance, inspection, cleaning, and evaluation.

PERSONAL PROTECTIVE EQUIPMENT

- Employees should be provided with and required to use impervious clothing, gloves, face shields (eight-inch minimum), and other appropriate protective clothing necessary to prevent skin contact with condensed coal tar pitch volatiles, where skin contact may occur.
- If employees' clothing may have become contaminated with coal tar pitch volatiles, employees should change into uncontaminated clothing before leaving the work premises.
- Clothing contaminated with coal tar pitch volatiles

should be placed in closed containers for storage until it can be discarded or until provision is made for the removal of coal tar pitch volatiles from the clothing. If the clothing is to be laundered or otherwise cleaned to remove the coal tar pitch volatiles, the person performing the operation should be informed of coal tar pitch volatiles's hazardous properties.

- Employees should be provided with and required to use splash-proof safety goggles where condensed coal tar pitch volatiles may contact the eyes.

SANITATION

- Workers subject to skin contact with coal tar pitch volatiles should wash with soap or mild detergent and water any areas of the body which may have contacted coal tar pitch volatiles at the end of each work day.
- Employees who handle coal tar pitch volatiles should wash their hands thoroughly with soap or mild detergent and water before eating, smoking, or using toilet facilities.
- Areas in which exposure to coal tar pitch volatiles may occur should be identified by signs or other appropriate means, and access to these areas should be limited to authorized persons.

COMMON OPERATIONS AND CONTROLS

The following list includes some common operations in which exposure to coal tar pitch volatiles may occur and control methods which may be effective in each case:

Operation	Controls
Liberation from extraction and packaging from coal tar fraction of coking	Process enclosure; local exhaust ventilation; general dilution ventilation; personal protective equipment
Use as a binding agent in manufacture of coal briquettes used for fuel; use as a dielectric in the manufacture of battery electrodes, electric-arc furnace electrodes, and electrodes for alumina reduction	Process enclosure; local exhaust ventilation; general dilution ventilation; personal protective equipment
Use in manufacture of roofing felts and papers and roofing	Process enclosure; local exhaust ventilation; general dilution ventilation; personal protective equipment
Use for protective coatings for pipes for underground conduits and drainage; use as a coating on concrete as waterproofing and corrosion-resistant material; use in road paving and sealing	Process enclosure; local exhaust ventilation; general dilution ventilation; personal protective equipment
Use in manufacture and repair of refractory brick; use in production of foundry cores; use in manufacture of carbon ceramic items	Process enclosure; local exhaust ventilation; general dilution ventilation; personal protective equipment

EMERGENCY FIRST AID PROCEDURES

In the event of an emergency, institute first aid procedures and send for first aid or medical assistance.

- **Eye Exposure**

If condensed coal tar pitch volatiles get into the eyes, wash eyes immediately with large amounts of water, lifting the lower and upper lids occasionally. If irritation is present after washing, get medical attention. Contact lenses should not be worn when working with these chemicals.

- **Skin Exposure**

If condensed coal tar pitch volatiles get on the skin, wash the contaminated skin using soap or mild detergent and water. Be sure to wash the hands before eating or smoking and to wash thoroughly at the close of work.

- **Breathing**

If a person breathes in large amounts of coal tar pitch volatiles, move the exposed person to fresh air at once. If breathing has stopped, perform artificial respiration. Keep the affected person warm and at rest. Get medical attention as soon as possible.

- **Rescue**

Move the affected person from the hazardous exposure. If the exposed person has been overcome, notify someone else and put into effect the established emergency rescue procedures. Do not become a casualty. Understand the facility's emergency rescue procedures and know the locations of rescue equipment before the need arises.

SPILL AND DISPOSAL PROCEDURES

- Persons not wearing protective equipment and clothing should be restricted from areas of releases until cleanup has been completed.
- If coal tar pitch volatiles are released in hazardous concentrations, the following steps should be taken:

1. Ventilate area of spill.

2. Collect released material in the most convenient and safe manner for reclamation or for disposal in sealed containers in a secured sanitary landfill.

- Waste disposal method:

Coal tar pitch volatiles may be disposed of in sealed containers in a secured sanitary landfill.

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RESPIRATORY PROTECTION FOR COAL TAR PITCH VOLATILES

Condition	Minimum Respiratory Protection* Required Above 0.2 mg/m^3
Particulate and Vapor Concentration	
2 mg/m^3 or less	A chemical cartridge respirator with an organic vapor cartridge(s) and with a fume or high-efficiency filter. Any supplied-air respirator. Any self-contained breathing apparatus.
10 mg/m^3 or less	A chemical cartridge respirator with a full facepiece and an organic vapor cartridge(s) and with a fume or high-efficiency filter. A gas mask with a chin-style or a front- or back-mounted organic vapor canister and with a full facepiece and a fume or high-efficiency filter. Any supplied-air respirator with a full facepiece, helmet, or hood. Any self-contained breathing apparatus with a full facepiece.
200 mg/m^3 or less	A Type C supplied-air respirator operated in pressure-demand or other positive pressure or continuous-flow mode. A powered air-purifying respirator with an organic vapor cartridge and a high-efficiency particulate filter.
400 mg/m^3 or less	A Type C supplied-air respirator with a full facepiece operated in pressure-demand or other positive pressure mode or with a full facepiece, helmet, or hood operated in continuous-flow mode.
Greater than 400 mg/m^3 or entry and escape from unknown concentrations	Self-contained breathing apparatus with a full facepiece operated in pressure-demand or other positive pressure mode. A combination respirator which includes a Type C supplied-air respirator with a full facepiece operated in pressure-demand or other positive pressure or continuous-flow mode and an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.
Fire Fighting	Self-contained breathing apparatus with a full facepiece operated in pressure-demand or other positive pressure mode.
Escape	Any gas mask providing protection against organic vapors and particulates, including pesticide respirators which meet the requirements of this class. Any escape self-contained breathing apparatus.

*Only NIOSH-approved or MSHA-approved equipment should be used.

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Item Details

Material Safety Data Sheet

acc. to OSHA and ANSI

Printing date 03/11/2002 Reviewed on 05/05/1999

- ## 1 Identification of substance:
  - Product details:
  - Trade name: Iron (III) hexacyanoferrate (II)
  - Stock number: 39259
  - Manufacturer/Supplier:
    Alfa Aesar, A Johnson Matthey company
    Johnson Matthey Catalog Company, Inc.
    30 Bond Street
    Ward Hill, MA 01835-8099
    Emergency Phone: (978) 521-6300
    CHEMTREC: (800) 424-9300
    Web Site: www.alfa.com
  - Information department: Health, Safety and Environmental Department
  - Emergency information:
    During normal hours the Health, Safety and Environmental Department. After normal hours call Chemtrec at (800) 424-9300.

- ## 2 Composition/Data on components:
  - Chemical characterization:
    Description: (CAS#)
    Iron (III) hexacyanoferrate (II) (CAS# 14038-43-8), 100%
  - Identification number(s):
  - EINECS Number: 237-875-5

- ## 3 Hazards identification

- **Hazard description:** Xn Harmful
- **Information pertaining to particular dangers for man and environment**
  R 20/21/22 Harmful by inhalation, in contact with skin and if swallowed.

4 First aid measures

- **After inhalation**
  Supply fresh air. If required, provide artificial respiration. Keep patient warm.
  Seek immediate medical advice.
- **After skin contact**
  Immediately wash with water and soap and rinse thoroughly.
  Seek immediate medical advice.
- **After eye contact**
  Rinse opened eye for several minutes under running water.
  Then consult a doctor.
- **After swallowing** Seek immediate medical advice.
- **Information for doctor**
- **The following symptoms may occur:**
  Nausea
  Breathing difficulty
  Headache

5 Fire fighting measures

- **Suitable extinguishing agents**
  Product is not flammable. Use fire fighting measures that suit the surrounding fire.
- **Special hazards caused by the material, its products of combustion or resulting gases:**
  In case of fire, the following can be released:
  Hydrogen cyanide (HCN)
  Metal oxide
- **Protective equipment:**
  Wear self-contained respirator.
  Wear fully protective impervious suit.

6 Accidental release measures

- **Person-related safety precautions:**
  Wear protective equipment. Keep unprotected persons away.
  Ensure adequate ventilation
- **Measures for environmental protection:**
  Do not allow material to be released to the environment without proper governmental permits.

- **Measures for cleaning/collecting:**
  Dispose contaminated material as waste according to item 13.
  Ensure adequate ventilation.
- **Additional information:**
  See Section 7 for information on safe handling
  See Section 8 for information on personal protection equipment.
  See Section 13 for disposal information.

7 Handling and storage

- Handling
- **Information for safe handling:**
  Keep container tightly sealed.
  Store in cool, dry place in tightly closed containers.
  Ensure good ventilation at the workplace.
- **Information about protection against explosions and fires:**
  The product is not flammable

- Storage
- **Requirements to be met by storerooms and receptacles:**
  No special requirements.
- **Information about storage in one common storage facility:**
  Do not store together with acids.
  Store away from oxidizing agents.
- **Further information about storage conditions:**
  Protect from exposure to light.
  Keep container tightly sealed.
  Store in cool, dry conditions in well sealed containers.

8 Exposure controls and personal protection

- **Additional information about design of technical systems:**
  Properly operating chemical fume hood designed for hazardous chemicals and having an average face velocity of at least 100 feet per minute.

Components with limit values that require monitoring at the workplace:

Cyanides (as CN)

	mg/m3
Austria TWA	5 (skin)
Denmark TWA	5 (skin)
Finland TWA	5; 10-STEL
France TWA	5 (skin)
Hungary TWA	0.3; 0.6-STEL (skin)
Ireland TWA	5 (skin)

Netherlands TWA	5 (skin)
Poland TWA	0.3
Sweden TWA	5-STEL (skin)
Switzerland TWA	5; 10-STEL (skin)
OSHA PEL	5 (skin)

Iron salts, soluble (as Fe)

	mg/m3
ACGIH TLV	1
United Kingdom TWA	1; 2-STEL
Ireland TWA	1; 2-STEL

- o **Additional information:** No data

- o **Personal protective equipment**
- o **General protective and hygienic measures**

The usual precautionary measures for handling chemicals should be followed.
Keep away from foodstuffs, beverages and feed.
Remove all soiled and contaminated clothing immediately.
Wash hands before breaks and at the end of work.
Avoid contact with the eyes and skin.

- o **Breathing equipment:**

Use suitable respirator when high concentrations are present.

- o **Protection of hands:** Impervious gloves
- o **Eye protection:** Safety glasses
- o **Body protection:** Protective work clothing.

• 9 Physical and chemical properties:

- o **Form:** Crystalline
- o **Color:** Dark blue
- o **Odor:** Odorless

o Method	Value/Range Unit
o **Change in condition**	
o **Melting point/Melting range:**	Not determined
o **Boiling point/Boiling range:**	Not determined
o **Sublimation temperature / start:**	Not determined
o **Flash point:**	Not applicable
o **Flammability (solid, gaseous)**	Product is not flammable.
o **Ignition temperature:**	Not determined
o **Decomposition temperature:**	Not determined
o **Danger of explosion:**	

Product does not present an explosion hazard.

- **Explosion limits:**
- **Lower:** Not determined
- **Upper:** Not determined

- **Vapor pressure:** Not determined

- **Density:** at 20 ° C 1.8 g/cm^3

- **Solubility in / Miscibility with**
- **Water:** Soluble

10 Stability and reactivity

- **Thermal decomposition / conditions to be avoided:**
  Decomposition will not occur if used and stored according to specifications.
- **Materials to be avoided:**
  Acids
  Oxidizing agents
  Ammonia
  Light
- **Dangerous reactions** Contact with acids releases toxic gases
- **Dangerous products of decomposition:**
  Hydrogen cyanide (prussic acid)
  Metal oxide fume

11 Toxicological information

- **Acute toxicity:**
  LD/LC50 values that are relevant for classification:

  Oral: LD50: >8000 mg/kg (mus)
  LD50: >8000 mg/kg (rat)
- **Primary irritant effect:**
- **on the skin:** Irritant to skin and mucous membranes.
- **on the eye:** Irritating effect.
- **Sensitization:** No sensitizing effects known.
- **Other information (about experimental toxicology):**
  Mutagenic effects have been observed on tests with bacteria.
- **Subacute to chronic toxicity:**
  Cyanides cause symptoms of salivation, nausea without vomiting, anxiety, confusion, vertigo, giddiness, lower jaw stiffness, convulsions, opisthotonos, paralysis, coma, cardiac arrhythmias and respiratory failure. They typically cause death through asphyxia. Skin contact may cause itching, macular, papular and vesicular eruptions.
  Iron compounds may cause vomiting, diarrhea, pink urine, black stool, and liver damage. May cause damage to the

black stool, and liver damage. May cause damage to the kidneys. Irritating to the respiratory tract, they may cause pulmonary fibrosis if dusts are inhaled.
Iron compounds may cause vomiting, diarrhea, pink urine, black stool, and liver damage. May cause damage to the kidneys. Irritating to the respiratory tract, they may cause pulmonary fibrosis if dusts are inhaled.

- **Additional toxicological information:**
  Danger through skin absorption.
  To the best of our knowledge the acute and chronic toxicity of this substance is not fully known.
  No classification data on carcinogenic properties of this material is available from the EPA, IARC, NTP, OSHA or ACGIH.

12 Ecological information:

- **General notes:**
  Do not allow material to be released to the environment without proper governmental permits.

13 Disposal considerations

- **Product:**
- **Recommendation**
  Consult state, local or national regulations for proper disposal.

- **Uncleaned packagings:**
- **Recommendation:**
  Disposal must be made according to official regulations.

14 Transport information

Not a hazardous material for transportation.

- DOT regulations:
- Hazard class: None

- Land transport ADR/RID (cross-border)
- ADR/RID class: None

- Maritime transport IMDG:
- IMDG Class: None

- Air transport ICAO-TI and IATA-DGR:
- ICAO/IATA Class: None

- Transport/Additional information:
  Not dangerous according to the above specifications.

15 Regulations

- **Product related hazard informations:**
- **Hazard symbols:** Xn Harmful
- **Risk phrases:**
  20/21/22 Harmful by inhalation, in contact with skin and if swallowed.
- **Safety phrases:** 36 Wear suitable protective clothing.
- **National regulations**
  All components of this product are listed in the U.S. Environmental Protection Agency Toxic Substances Control Act Chemical Substance Inventory.
- **Information about limitation of use:**
  For use only by technically qualified individuals.
  This product is subject to the reporting requirements of section 313 of the Emergency Planning and Community Right to Know Act of 1986 and 40CFR372.

16 Other information:

Employers should use this information only as a supplement to other information gathered by them, and should make independent judgement of suitability of this information to ensure proper use and protect the health and safety of employees. This information is furnished without warranty, and any use of the product not in conformance with this Material Safety Data Sheet, or in combination with any other product or process, is the responsibility of the user.

- **Contact:** Darrell R. Sanders

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Material Safety Data Sheets Collection:

Sheet No. 52
Hydrogen Sulfide

Issued: 7/79 Revision: B, 9/92

Section 1. Material Identification

Hydrogen Sulfide (H_2S) Description: Formed as a byproduct of many industrial processes (breweries, tanneries, slaughter houses), around oil wells, where petroleum products are used, in decaying organic matter, and naturally occurring in coal, natural gas, oil, volcanic gases, and sulfur springs. Derived commercially by reacting iron sulfide with dilute sulfuric or hydrochloric acid, or by reacting hydrogen with vaporized sulfur. Used in the production of various inorganic sulfides and sulfuric acid, in agriculture as a disinfectant, in the manufacture of heavy water, in precipitating sulfides of metals; as a source of hydrogen and sulfur, and as an analytical reagent.

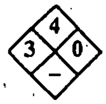
Other Designations: CAS No. 7783-06-4, dihydrogen monosulfide, hydrosulfuric acid, sewer gas, stink damp, sulfuretted hydrogen, sulfur hydride.

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

Cautions: Hydrogen sulfide is a highly flammable gas and reacts vigorously with oxidizing materials. It is highly toxic and can be instantly fatal if inhaled at concentrations of 1000 ppm or greater. Be aware that the sense of smell becomes rapidly fatigued at 50 to 150 ppm, and that its strong rotten-egg odor is not noticeable even at very high concentrations.

R	2
I	4
S	3
K	3

NFPA



HMIS

H	3
F	4
R	0

PPE*
* Sec. 8

Section 2. Ingredients and Occupational Exposure Limits

Hydrogen sulfide: 98.5% *technical*, 99.5% *purified*, and CP *(chemically pure grade)*

1991 OSHA PELs
8-hr TWA: 10 ppm (14 mg/m^3)
15-min STEL: 15 ppm (21 mg/m^3)

1990 IDLH Level
300 ppm

1990 NIOSH REL
10-min Ceiling: 10 ppm (15 mg/m^3)

1992-93 ACGIH TLVs
TWA: 10 ppm (14 mg/m^3)
STEL: 15 ppm (21 mg/m^3)

1990 DFG (Germany) MAK
TWA: 10 ppm (15 mg/m^3)
Category V: Substances having intense odor
Peak exposure limit 20 ppm, 10 min momentary value, 4/shift

1985-86 Toxicity Data*
Human, inhalation, LC_{Lo}: 600 ppm/30 min; toxic effects not yet reviewed
Man, inhalation, LD_{Lo}: 5700 µg/kg caused coma and pulmonary edema or congestion.
Rat, intravenous, LD_{50}: 270 µg/kg; no toxic effect noted

* See NIOSH, *RTECS* (MX1225000), for additional toxicity data.

Section 3. Physical Data

Boiling Point: -76 °F (-60 °C)
Freezing Point: -122 °F (-86 °C)
Vapor Pressure: 18.5 atm at 68 °F (20 °C)
Vapor Density (Air = 1): 1.175
pH: 4.5 (freshly prepared saturated aqueous solution)
Viscosity: 0.01166 cP at 32 °F/0 °C and 1 atm
Liquid Surface Tension (est): 30 dyne/cm at -77.8 °F/-61 °C
Molecular Weight: 34.1
Density: 1.54 g/L at 32 °F (0 °C)
Water Solubility: Soluble*; 1g/187 mL (50 °F/10 °C), 1g/242 mL (68 °F/20 °C), 1g/ 314 mL (86 °F/30 °C)
Other Solubilities: Soluble in ethyl alcohol, gasoline, kerosine, crude oil, and ethylene glycol.
Odor threshold: 0.06 to 1.0 ppm†

Appearance and Odor: Colorless gas with a rotten-egg smell.

* H_2S solutions are not stable. Absorbed oxygen causes turbidity and precipitation of sulfur. In a 50:50 mixture of water and glycerol, H_2S is stable.
† Sense of smell becomes rapidly fatigued and can not be relied upon to warn of continuous H_2S presence.

Section 4. Fire and Explosion Data

Flash Point: None reported	**Autoignition Temperature:** 500 °F (260 °C)	**LEL:** 4.3% v/v	**UEL:** 46% v/v

Extinguishing Media: Let small fires burn unless leak can be stopped immediately. For large fires, use water spray, fog, or regular foam. **Unusual Fire or Explosion Hazards:** H_2S burns with a blue flame giving off sulfur dioxide. Its burning rate is 2.3 mm/min. Gas may travel to a source of ignition and flash back. **Special Fire-fighting Procedures:** Because fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode. Structural firefighter's protective clothing is not effective for fires involving H_2S. If possible without risk, stop leak. Use unmanned device to cool containers until well after fire is out. Withdraw immediately if you hear a rising sound from venting safety device or notice any tank discoloration due to fire. Do not release runoff from fire control methods to sewers or waterways.

Section 5. Reactivity Data

Stability/Polymerization: H_2S is stable at room temperature in closed containers under normal storage and handling conditions. Hazardous polymerization cannot occur. **Chemical Incompatibilities:** Hydrogen sulfide attacks metals forming sulfides and is incompatible with 1,1-bis(2-azidoethoxy) ethane + ethanol, 4-bromobenzenediazonium chloride, powdered copper + oxygen, metal oxides, finely divided tungsten or copper, nitrogen trichloride, silver fulminate, rust, soda-lime, and all other oxidants. **Conditions to Avoid:** Exposure to heat and contact with incompatibles. **Hazardous Products of Decomposition:** Thermal oxidative decomposition of hydrogen sulfide can produce toxic sulfur dioxide .

Section 6. Health Hazard Data

Carcinogenicity: The IARC,(164) NTP,(169) and OSHA(164) do not list hydrogen sulfide as a carcinogen. **Summary of Risks:** H_2S combines with the alkali present in moist surface tissues to form caustic sodium sulfide, causing irritation of the eyes, nose, and throat at low levels (50 to 100 ppm). Immediate death due to respiratory paralysis occurs at levels greater than 1000 ppm. Heavy exposure has resulted in neurological problems, however recovery is usually complete. H_2S exerts most of it's toxicity on the respiratory system. It inhibits the respiratory enzyme cytochrome oxidase, by binding iron and blocking the necessary oxydo-reduction process. Electrocardiograph changes after over-exposure have suggested direct damage to the cardiac muscle, however some authorities debate this. **Medical Conditions Aggravated by Long-Term Exposure:** Eye and nervous system disorders. **Target Organs:** Eyes, respiratory system and central nervous system. **Primary Entry Routes:** Inhalation, eye and skin contact. **Acute Effects:** Inhalation of low levels can cause headache, dizziness, nausea, cramps, vomiting, diarrhea, sneezing, staggering, excitability, pale

Continued on next page

Section 6. Health Hazard Data, *continued*

complexion, dry cough, muscular weakness, and drowsiness. Prolonged exposure to 50 ppm, can cause rhinitis, bronchitis, pharyngitis, and pneumonia. High level exposure leads to pulmonary edema (after prolonged exposure to 250 ppm), asphyxia, tremors, weakness and numbing of extremeties, convulsions, unconsciousness, and death due to respiratory paralysis. Concentrations near 100 ppm may be odorless due to olfactory fatigue, thus the victim may have no warning. Lactic acidosis may be noted in survivors. The gas does not affect the skin although the liquid (compressed gas) can cause frostbite. The eyes are very susceptible to H_2S keratoconjunctivitis known as 'gas eye' by sewer and sugar workers. This injury is characterized by palpebral edema, bulbar conjunctivitis, mucous-puss secretions, and possible reduction in visible capacity. **Chronic Effects:** Chronic effects are not well established. Some authorities have reported repeated exposure to cause fatigue, headache, inflammation of the conjunctiva and eyelids, digestive disturbances, weight loss, dizziness, a grayish-green gum-line, and irritability. Others say these symptoms result from recurring acute exposures. There is a report of encephalopathy in a 20 month old child after low-level chronic exposure. **FIRST AID Eyes:** *Do not* allow victim to rub or keep eyes tightly shut. Gently lift eyelids and flush immediately and continuously with flooding amounts of water. Treat with boric acid or isotonic physiological solutions. Serious exposures may require adrenaline drops. Olive oil drops (3 to 4) provides immediate treatment until transported to an emergency medical facility. Consult a physician immediately. **Skin:** *Quickly* remove contaminated clothing and rinse with flooding amounts of water. For frostbite, rewarm in 107.6°F (42 °C) water until skin temperature is normal. *Do not* use dry heat. **Inhalation:** Remove exposed person to fresh air and administer 100% oxygen. Give hyperbaric oxygen if possible. **Ingestion:** Unlikely since H_2S is a gas above -60 °C. **Note to Physicians:** The efficacy of nitrite therapy is unproven. Normal blood contains < 0.05 mg/L H_2S; reliable tests need to be taken within 2 hr of exposure.

Section 7. Spill, Leak, and Disposal Procedures

Spill/Leak: Immediately notify safety personnel, isolate and ventilate area, deny entry, and stay upwind. Shut off all ignition sources. Use water spray to cool, dilute, and disperse vapors. Neutralize runoff with crushed limestone, agricultural (slaked) lime, or sodium bicarbonate. If leak can't be stopped in place, remove cylinder to safe, outside area and repair or let empty. Follow applicable OSHA regulations (29 CFR 1910.120). **Ecotoxicity Values:** Bluegill sunfish, TLm = 0.0448 mg/L/96 hr at 71.6 °F/22 °C; fathead minnow, TLm = 0.0071 to 0.55 mg/L/96 hr at 6 to 24 °C. **Environmental Degradation:** In air, hydrogen sulfides residency (1 to 40 days) is affected by temperature, humidity, sunshine, and the presence of other pollutants. It does not undergo photolysis but is oxidated by oxygen containing radicals to sulfur dioxide and sulfates. In water, H_2S converts to elemental sulfur. In soil, due to its low boiling point, much of H_2S evaporates quickly if spilled. Although, if soil is moist or precipitation occurs at time of spill, H_2S becomes slightly mobile due to its water solubility. H_2S does not bioaccumulate but is degraded rapidly by certain soil and water bacteria. **Disposal:** Aerate or oxygenate with compressor. For in situ amelioration, carbon removes some H_2S. Anion exchanges may also be effective. A potential candidate for rotary kiln incineration (1508 to 2912 °F/820 to 1600 °C) or fluidized bed incineration (842 to 1796 °F/450 to 980 °C). 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): No. U135
SARA Toxic Chemical (40 CFR 372.65): Not listed
Listed as a SARA Extremely Hazardous Substance (40 CFR 355), TPQ: 500 lb
Listed as a CERCLA Hazardous Substance* (40 CFR 302.4): Final Reportable Quantity (RQ), 100 lb (45.4 kg) [* per RCRA, Sec. 3001 & CWA, Sec. 311 (b)(4)]

OSHA Designations

Listed as an Air Contaminant (29 CFR 1910.1000, Table Z-1-A & Z-2)
Listed as a Process Safety Hazardous Material (29 CFR 1910.119), TQ: 1500 lb

Section 8. Special Protection Data

Goggles: Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Because contact lens use in industry is controversial, establish your own policy. **Respirator:** Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a MSHA/NIOSH-approved respirator. For < 100 ppm, use a supplied-air respirator (SAR) or SCBA. For < 250 ppm, use a SAR operated in continuous-flow mode. For < 300 ppm, use a SAR or SCBA with a full facepiece. 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.* If respirators are used, OSHA requires a respiratory protection program that includes at least: a written program, medical certification, training, fit-testing, periodic environmental monitoring, maintenance, inspection, cleaning, and convenient, sanitary storage areas. **Other:** Wear chemically protective gloves, boots, aprons, and gauntlets to prevent skin contact. Polycarbonate, butyl rubber, polyvinyl chloride, and neoprene are suitable materials for PPE. **Ventilation:** Provide general & local exhaust ventilation systems to maintain airborne concentrations below the OSHA PEL (Sec. 2). Local exhaust ventilation is preferred because it prevents contaminant dispersion into the work area by controlling it at its source.(103) **Safety Stations:** Make available in the work area emergency eyewash stations, safety/quick-drench showers, and washing facilities. **Contaminated Equipment:** Separate contaminated work clothes from street clothes and launder before reuse. Clean PPE. **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: Prevent physical damage to containers. Store in steel cylinders in a cool, dry, well-ventilated area away from incompatibles (Sec. 5). Install electrical equipment of Class 1, Group C. Outside or detached storage is preferred. **Engineering Controls:** To reduce potential health hazards, use sufficient dilution or local exhaust ventilation to control airborne contaminants and to keep levels as low as possible. Enclose processes and continuously monitor H_2S levels in the plant air. Keep pipes clear of rust as H_2S can ignite if passed through rusty pipes. Purge and determine H_2S concentration before entering a confined area that may contain H_2S. The worker entering the confined space should have a safety belt and life line and be observed by a worker from the outside. Follow applicable OSHA regulations (1910.146) for confined spaces. H_2S can be trapped in sludge in sewers or process vessels and may be released during agitation. Calcium chloride or ferrous sulfate should be added to neutralize process wash water each time H_2S formation occurs. Control H_2S emissions with a wet flare stack/scrubbing tower. **Administrative Controls:** Consider preplacement and periodic medical exams of exposed workers emphasizing the eyes, nervous and respiratory system.

Transportation Data (49 CFR 172.101)

DOT Shipping Name: Hydrogen sulfide, liquefied
DOT Hazard Class: 2.3
ID No.: UN1053
DOT Packaging Group: --
DOT Label: Poison Gas, Flammable Gas
Special Provisions (172.102): 2, B9, B14

Packaging Authorizations
Exceptions: --
Non-bulk Packaging: 304
Bulk Packaging: 314, 315

Vessel Stowage Requirements
Vessel Stowage: D
Other: 40

Quantity Limitations
Passenger, Aircraft, or Railcar: Forbidden
Cargo Aircraft Only: Forbidden

MSDS Collection References: 26, 73, 89, 100, 101, 103, 124, 126, 127, 132, 136, 140, 148, 149, 153, 159, 163, 164, 168, 171, 180
Prepared by: M Gannon, BA; **Industrial Hygiene Review:** PA Roy, MPH, CIH; **Medical Review:** AC Darlington, MPH, MD

MATERIAL SAFETY DATA SHEET

THE WESTFORD CHEMICAL CORPORATION
P.O. Box 798
Westford, Massachusetts 01886 USA
Phone: (508) 392-0689
Fax: (508) 692-3487
Emergency Phone: 1-800-225-3909

Ref. No.: 2001
Date: 3-15-97

SECTION I - IDENTITY

Name:	BIO SOLVE®
CAS #:	138757-63-8
D.O.T. Class:	Not Regulated/Non Hazardous
Formula:	Proprietary
Chemical Family:	Bio/Surfactant, Biodegradable
HMIS Code:	Health 1, Fire 0, Reactivity 0
HMIS Key:	4 = Extreme, 3 = High, 2 = Moderate, 1 = Slight, 0 = Insignificant

SECTION II - PHYSICAL & CHEMICAL CHARACTERISTICS

Fire and Explosion Data

Boiling Point	: 265° F
Specific Gravity	: 1.006 +/- .01
Surface Tension	: 6% Solution 29.1 Dyne/cm at 25°C
Percent Volatile by Vol.	: NA
Flammable Limit	: NA
Reactivity with Water	: No
Auto-Ignite Temperature	: NA
Evaporation Rate	: >1 as compared to Water
Appearance	: Clear Liquid unless Dyed
Odor	: Pleasant Fragrance
Fire Extinguisher Media	: NA

Melting Point	: 32°F
Vapor Pressure mm/Hg	: NA
Vapor Density Air = 1	: NA
Viscosity/Concentrate:	: 490 Centipoise
6% Solution	: 15 Centipoise
Solubility in Water	: Complete
Flash Point	: NA
Freeze Temperature	: 28° F
Storage	: 35° – 120°
Freeze Harm:	: None
Shelf Life	: Unlimited-Unopened
pH	: 8.81 +/- .5
Pounds per Gallon	: 8.37

<u>Special Fire Fighting Procedures</u>:

Special Fire Fighting Procedures	: NA
Unusual Fire and Explosion Hazards	: None
Solvent for Clean-Up	: Water

SECTION III - PHYSICAL HAZARDS

Stability	: Stable
Polymerization	: No
Incompatible Substances	: None Known
Hazardous Decomposition Products	: NA

SECTION IV - HEALTH HAZARDS

Threshold Limit Values: NA

Signs and Symptoms of Over Exposure -

Acute :	Moderate eye irritation. Skin: Causes redness, edema, drying of skin.
Chronic:	Pre-existing skin and eye disorders may be aggravated by contact with this product.

Medical Conditions Generally Aggravated by Exposure: Unknown

Carcinogen: No

Emergency First Aid Procedures -

Eyes :	Flush thoroughly with water for 15 minutes. Get medical attention.
Skin :	Remove contaminated clothing. Wash exposed areas with soap and water. Wash clothing before reuse. Get medical attention if irritation develops.
Ingestion :	Get medical attention.
Inhalation :	None considered necessary.

SECTION V - SPECIAL PROTECTION INFORMATION

Respiratory Protection :	Not necessary
Ventilation Required :	Normal
Local Exhaust Required :	No
Protective Clothing :	Gloves, safety glasses, wash clothing before reuse.

SECTION IV - SPECIAL PRECAUTIONS AND SPILL/LEAK PROCEDURES

Precautions to be taken in Handling and Storage: Use good normal hygiene.

Precautions to be taken in case of Spill or Leak -

Small spills, in an undiluted form, contain. Soak up with absorbent materials.

Large spills, in an undiluted form, dike and contain. Remove with vacuum truck or pump to storage/salvage vessel. Soak up residue with absorbent materials.

Waste Disposal Procedures -

Dispose in an approved disposal area or in a manner which complies with all local, state, and federal regulations.

The Information on this Material Safety Data Sheet reflects the latest information and data that we have on hazards, properties, and handling of this product under the recommended conditions of use. Any use of this product or method of application which is not described on the label or in the Product Data Sheet is the responsibility of the user.

This Material Safety Data Sheet was prepared to comply with the OSHA Hazardous Communication Regulation and Massachusetts Right to Know Law.

SECTION VII - HAZARDOUS INGREDIENTS

Massachusetts Right to Know Law or 29 C.F.R. (Code of Federal Regulations) 1910.1000 require listing of hazardous ingredients.

This product does not contain any hazardous ingredient as defined by CERCLA, Massachusetts Right to Know Law and California's Prop. 65.

BioSolve® InfoSheet

Vapor Suppression

Spill Response

Always use BioSolve in accordance with State, Federal or Local Approvals.

BioSolve has an amazing ability to suppress or eliminate Volatile Organic Compounds (VOC's). Unlike a foam that suppresses vapor only as long as the blanket lasts, BioSolve's unique properties encapsulate and emulsify the hydrocarbon giving long term vapor suppression.

BioSolve, diluted to a 3% to 6% solution can be applied with any water applicator. Special equipment is not required. Since BioSolve is not a foam, it can be applied on high wind days as well as hillsides. For large sites, applicators can include foam eductors, water trucks, and sprinkler systems, for smaller jobs, a hand pump sprayer, water extinguisher, or garden hose with a fertilizer attachment on the nozzle works quite well.

Because BioSolve applies like water, it's applications are almost endless. In Underground Storage Tanks (UST's), BioSolve is used in the "Triple Rinse" washing procedure. BioSolve eliminates the recurrence of vapor release often associated with UST removals. Because BioSolve is a unique biosurfactant, it not only suppresses the vapor but cleans the tank right down to the metal. BioSolve can be used with any pressure washer with tremendous efficiency.

Water Based
Biodegradable

Fast--Suppresses VOC's within seconds!

Cost Effective--Lasts a long time

Simple-- Applies like water

Versatile--Replaces a variety of other chemicals.

Drum washers/recyclers find that BioSolve is ideal to handle a wide range of contaminated drums. A 6% solution of BioSolve is high pressure sprayed into the drums to wash them out. BioSolve's double action of encapsulation and cleaning, effectively cleans the drums in a one step application. BioSolve is so effective it is even used to clean out **mercaptan** drums with little to no odor release. Because *BioSolve enhances the bioremediation of organic compounds, it makes it possible to dispose of wash water to a plant's activated sludge pond.*

In refinery and on oil production platforms, BioSolve is proving an effective agent for suppressing VOC vapor in open drain systems during Turnarounds and Workover Operations

BioSolve is commonly utilized by Haz Mat, Emergency Response, and Fire Departments nationwide to suppress VOC vapors and odors. Many departments report that BioSolve inducted into the sanitary sewers effectively eliminates the explosion hazard when gas leaks into the municipal sewer systems. NOTE: *Always follow State and Federal guidlines and approvals before using in sewers.* We have on file a variety of letters from Fire Depts. and Sanitation Districts regarding this procedure. These are available upon request.

Additional uses: BioSolve is also being utilized in bilge cleaning, vessel cleanups, cutting washers, soil & sludge washing and more...........

Distributed By:

The Westford Chemical Corp. 1-800-225-3909 or (508) 392-0689
FAX (508) 692-3487

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BioSolve® InfoSheet

Dilution & Application Rates

BioSolve is a concentrate and MUST BE DILUTED prior to use

Always use BioSolve in accordance with State, Federal or Local Approvals.

The following dilution rates have been found to be effective in most BioSolve applications. However, since site specific conditions vary, adjusting dilution rates slightly *may be necessary for optimum efficency.*

Vapor Suppression	
Soil	3% - 6%
Tank Washout	
Fuels, Light Oils	3%
Heavy Oils	6%
Soil,Rock,Sludge Washing	1% - 3%
Emergency Response Spills	6%
Fire	6%
Bioremediation	
Fuels, Light Oils	3%
Heavy Oils, Crudes	6%
Food Grease Traps	5%

Protocols Available for Most Applications

BioSolve is water based and does not react like a solvent. BioSolve emulsifies, encapsulates, and disperses. Once it is understood that these are the only three actions of BioSolve, adjustments can be made in the dilution and / or the application method to attain the desired result. Protocols are available for many BioSolve applications.

These applications rates vary and may need to be adjusted to site specific conditions. BioSolve can eliminate working hazards and, in many cases, the waste discharge can be treated in the plant's activated sludge ponds.

Application	Rates
Vapor Suppression	Call regarding site specific conditions
Bioremediations	Call regarding site specific conditions
Tank Washouts	Use through standard pressure washer
Fire Emergency Response	1 gallon of BioSolve concentrate to 6 gallons of hydrocarbon
Soil/Sludge Washing	Site specific
Spills Small	Mix 3 part water to1 part BioSolve. Apply to spill, agitate with full pressure water stream
Large	Educt Through Foam Eductor at 6%

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FAX (508) 692-3487

Distributed By:

WSB4twcc.Rev. 10/94

MATERIAL SAFETY DATA SHEET

Last Revised : October 21, 1996

SECTION 1 - MATERIAL IDENTIFICATION

SUPPLIER:

REGENESIS Bioremediation Products
27130A Paseo Espada, Suite 1407
San Juan Capistrano, CA 92675
714-443-3136 phone
714-443-3140 fax

CHEMICAL DESCRIPTION:

A mixture of Magnesium Peroxide [MgO_2], Magnesium Oxide [MgO], and Magnesium Hydroxide [$Mg(OH)_2$]

CHEMICAL FAMILY:

Inorganic Chemicals

PRODUCT NAME:

Oxygen Release Compound (ORC®)

PRODUCT USE:

Used for environmental remediation of contaminated soil and groundwater

SECTION 2 - CHEMICAL IDENTIFICATION

CHEMICAL CHARACTERIZATION

Magnesium Peroxide [MgO_2]CAS Reg. No.		14452-57-4
Magnesium Oxide [MgO]:	CAS Reg. No.	1309-42-8
Magnesium Hydroxide (($Mg(OH)_2$):	CAS Reg. No.	1309-42-8

FORM :	powder
COLOR:	white
ODOR:	odorless
ASSAY:	25 - 35% Magnesium Peroxide (MgO_2)

SECTION 3 - PHYSICAL AND TECHNICAL SAFETY DATA

MELTING POINT:	Not Determined
BOILING POINT:	Not Determined
DENSITY:	.6 - .8 g/cc
BULK DENSITY:	---
VAPOR PRESSURE:	Data not available

VISCOSITY:	--
SOLUBILITY:	Reacts with water. Soluble in acid
pH VALUE:	Approx. 10 in saturated solution
FLASH POINT:	Not applicable
SELF-IGNITION TEMPERATURE:	Not applicable
EXPLOSION LIMITS % BY VOLUME:	--
THERMAL DECOMPOSITION:	Spontaneous decomposition possible about 150° C
HAZARDOUS DECOMPOSITION PRODUCTS:	Not known
HAZARDOUS REACTIONS:	Hazardous polymerization will not occur
FURTHER INFORMATION:	Non-combustible, but will support combustion

SECTION 4 - REACTIVITY DATA

STABILITY:	Product is stable unless heated above 150°C. Magnesium Peroxide reacts with water to slowly release oxygen. React by product is magnesium hydroxide
CONDITIONS TO AVOID:	Heat above 150°C. Open flames
INCOMPATIBILITY:	Strong Acids Strong chemical agents
HAZARDOUS POLYMERIZATION:	None known

SECTION 5 - REGULATIONS

PERMISSIBLE EXPOSURE LIMITS IN AIR:	Not established. Should be treated as a nuisance dust.

SECTION 6 - PROTECTIVE MEASURES, STORAGE, AND HANDLING

TECHNICAL PROTECTIVE MEASURES

STORAGE:	Keep container tightly closed. Keep away from combustible material
HANDLING:	Use only in well-ventilated areas

PERSONAL PROTECTIVE EQUIPMENT

RESPIRATORY PROTECTION:	Recommended (HEPA Filters)
HAND PROTECTION:	Wear suitable gloves
EYE PROTECTION:	Use chemical safety goggles
OTHER:	--
INDUSTRIAL HYGIENE:	Avoid contact with skin and eyes
PROTECTION AGAINST FIRE AND EXPLOSION:	—
DISPOSAL:	Dispose via sanitary landfill per state/local

	authority
FURTHER INFORMATION:	Not flammable, but may intensify fire

SECTION 7 - MEASURES IN CASE OF ACCIDENTS AND FIRE

AFTER SPILLAGE/LEAKAGE/GAS LEAKAGE:	Collect in suitable containers. Wash remainder with copious quantities of water.
EXTINGUISHING MEDIA	
SUITABLE:	Carbon dioxide, dry chemicals, foam
NOT TO BE USED:	—
FURTHER INFORMATION:	Self contained breathing apparatus or approved gas mask should be worn due to small particle size. Use extinguishing media appropriate for surrounding fire.
FIRST AID:	After contact with skin, wash immediately with plenty of water and soap. In case of contact with eyes, rinse immediately with plenty of water and seek medical attention.
FURTHER INFORMATION:	---

SECTION 8 - INFORMATION ON TOXICOLOGY

TOXICITY DATA:	Data not available

SECTION 9 - INFORMATION ON ECOLOGY

WATER POLLUTION HAZARD RATING (WGK):	0

SECTION 10 - FURTHER INFORMATION

After the reaction of magnesium peroxide to form oxygen the resulting material, magnesium hydroxide is mildly basic. The amounts of magnesium oxide (magnesia) and magnesium hydroxide in the initial product have an effect similar to lime, but with lower alkalinity.

The information contained in this document is the best available to the supplier at the time of writing, but is provided without warranty of any kind. Some possible hazards have been determined by analogy to similar classes of material. The items in this document are subject to change and clarification as mor information becomes available.

Dräger

MATERIAL SAFETY DATA SHEET

Prepared to U.S. OSHA, CMA, ANSI and Canadian WHMIS Standards

1. PRODUCT IDENTIFICATION

CHEMICAL NAME; CLASS: NON-FLAMMABLE GAS MIXTURE

Containing the Following Component in a Nitrogen Balance Gas:
Hydrogen Cyanide: 0.0001- 0.02%

SYNONYMS: Not Applicable
CHEMICAL FAMILY NAME: Not Applicable
FORMULA: Not Applicable
DRAEGER'S P/N's: 4594962

Note: The Material Safety Data Sheet is for this gas mixture supplied in cylinders with 33 cubic feet (935 liters) or less gas capacity (DOT - 39 cylinders). This MSDS has been developed for various gas mixtures with the composition of components within the ranges listed in Section 2 (Composition and Information on Ingredients). Refer to the product label for information on the actual composition of the product.

PRODUCT USE:	Calibration of Monitoring and Research Equipment
SUPPLIER:	**DRAEGER SAFETY Inc.**
ADDRESS:	101 Technology Drive Pittsburgh, PA 15275-1057
DRAEGER Phone #	412-787-8383
MANUFACTURER'S NAME:	AIR LIQUIDE AMERICA CORPORATION
EMERGENCY PHONE:	CHEMTREC: 1-800-424-9300
BUSINESS PHONE:	1-410-228-6400
General MSDS Information	1-713/868-0440
Fax on Demand:	1-800/231-1366

2. COMPOSITION and INFORMATION ON INGREDIENTS

CHEMICAL NAME	CAS #	mole %	EXPOSURE LIMITS IN AIR					
			ACGIH		OSHA			OTHER
			TLV ppm	STEL ppm	PEL ppm	STEL ppm	IDLH ppm	
Hydrogen Cyanide	74-90-8	0.0001 - 0.020%	NE	4.7, C, SKIN	10, SKIN	4.7, SKIN (Vacated 1989 PEL)	50	NIOSH REL: 4.7 ppm ST; SKIN DFG MAK: 10 ppm
Nitrogen	7727-37-9	Balance	There are no specific exposure limits for Nitrogen. Nitrogen is a simple asphyxiant (SA). Oxygen levels should be maintained above 19.5%.					

NE = Not Established. C = Ceiling Limit. See Section 16 for Definitions of Terms Used. A4 = Not Classifiable as a Human Carcinogen.

NOTE : All WHMIS required information is included. It is located in appropriate sections based on the ANSI Z400.1-1993 format.

3. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW: This product is a colorless gas which is odorless. Hydrogen Cyanide (a component of this gas mixture) is an extremely toxic gas; even brief over-exposures to relatively low doses may have significant health consequences. Acute low-level exposure can cause symptoms such as cyanosis, headache, dizziness, unsteadiness of gait, a feeling of suffocation and nausea. Additionally, releases of this product may produce oxygen-deficient atmospheres (especially in confined spaces or other poorly-ventilated environments); individuals in such atmospheres may be asphyxiated.

HAZARDOUS MATERIAL INFORMATION SYSTEM

HEALTH	(BLUE)	3
FLAMMABILITY	(RED)	0
REACTIVITY	(YELLOW)	0
PROTECTIVE EQUIPMENT		B

EYES	RESPIRATORY	HANDS	BODY
See Section 8			

For routine industrial applications

SYMPTOMS OF OVER-EXPOSURE BY ROUTE OF EXPOSURE: The most significant route of over-exposure for this product is by inhalation, as well as eye and skin absorption.

INHALATION: Due to the small size of an individual cylinder of this product, no unusual health effects from over-exposure to the product are anticipated under routine circumstances of use. The health hazards associated with this gas mixture are the potential for over-exposure to Hydrogen Cyanide (a component of this gas mixture) and oxygen displacement if this product is released in small, poorly-ventilated areas (i.e. enclosed or confined spaces).

Hydrogen Cyanide is an extremely toxic gas. It is anticipated that, due to the low concentration (1-200 ppm) of Hydrogen Cyanide and the fact this gas mixture is quickly dissipated, employees will not be exposed to levels above those listed in Section 2 (Composition and Information on Ingredients). However, because Hydrogen Cyanide can produce significant health effects at relatively low levels, individuals using this product must be aware of the symptoms of over-exposure.

Hydrogen Cyanide is a protoplasmic poison, combining in tissues with the enzymes associated with oxidation, thereby rendering oxygen unavailable to these tissues, and causing death by chemical asphyxiation. Exposure to low concentrations of this gas can cause headache, vertigo, irritation of the throat, difficulty breathing, reddening of eyes, salivation, nausea and vomiting. Chronic, low level exposure to Hydrogen Cyanide over long periods of time may lead to fatigue and weakness.

Exposures to high concentrations of Hydrogen Cyanide gas produces symptoms including tachypnea (causing increased intake of cyanide), then dyspnea, weakness of arms and legs, paralysis, unconsciousness, convulsions and respiratory arrest. Exposure to 150 ppm for one-half to one hour may endanger life. In cases where the victim recovers, there is rarely any residual injury or disability. The action of Hydrogen Cyanide in cases of high concentration exposure is extremely rapid.

Specific effects, based on the concentration of Hydrogen Cyanide, are presented below:

CONCENTRATION OF HYDROGEN CYANIDE	OBSERVED EFFECT
2-5 ppm	Detectable odor threshold.
18-36 ppm	Slight symptoms after several hours.
45-54 ppm	Tolerated for 0.5-1 hour without immediate or delayed effects.
110-135 ppm	Dangerous to life or fatal after 0.5-1 hour.
133 ppm	Fatal after 30 minutes.
180 ppm	Fatal after 10 minutes.
270 ppm	Immediately fatal.
NOTE:	This gas mixture contains 1-200 ppm Hydrogen Cyanide. Data pertinent to higher concentrations of Hydrogen Cyanide are provided to give complete information on effects observed in humans after over-exposures have occurred.

Additionally, under some circumstances, an oxygen-deficient environment may occur. Individuals breathing such an atmosphere may experience symptoms which include headaches, ringing in ears, dizziness, drowsiness, unconsciousness, nausea, vomiting, and depression of all the senses. The effects associated with various levels of oxygen are listed on the following page.

3. HAZARD IDENTIFICATION (Continued)

CONCENTRATION OF OXYGEN	OBSERVED EFFECT
12-16% Oxygen:	Breathing and pulse rate increased, muscular coor-dination slightly disturbed.
10-14% Oxygen:	Emotional upset, abnormal fatigue, disturbed respiration.
6-10% Oxygen:	Nausea, vomiting, collapse, or loss of consciousness.
Below 6%:	Convulsive movements, possible respiratory collapse, and death.

CONTACT WITH THE EYES AND SKIN: Contact with the skin is not irritating, however, Hydrogen Cyanide (a component of this gas mixture) can be absorbed through intact skin and may be absorbed though eyes. The symptoms of such absorption are the same as by inhalation. Contact of the gas mixture with the eyes may be slightly irritating.

HEALTH EFFECTS OR RISKS FROM EXPOSURE: An Explanation in Lay Terms Over-exposure to this gas mixture may cause the following health effects:

ACUTE: Due to the small size of the individual cylinder of this product, no unusual health effects from exposure to the product are anticipated under routine circumstances of use. Hydrogen Cyanide (a component of this gas mixture) is an extremely toxic gas; even brief over-exposures to relatively low doses may have significant health consequences. Acute low-level exposure can cause symptoms such as cyanosis, headache, dizziness, unsteadiness of gait, a feeling of suffocation and nausea. Contact with the eyes with Hydrogen Cyanide can cause irritation.

CHRONIC: There are a wide range of chronic symptoms that are thought to occur with chronic, low-level cyanide compound exposure. These include persistent runny nose, weakness, dizziness, giddiness, headache, nausea, abdominal pain, vomiting, throat irritation, changes in the perception of taste and smell, muscle cramps, weight loss, flushing of the face and enlargement of the thyroid gland. As these symptoms are not exclusive to cyanide exposure, the symptoms of chronic cyanide toxicity are not conclusive. Some evidence exists that low-level, long-term exposure to Hydrogen Cyanide on the eyes will result in damage to the nerves of the eyes.

TARGET ORGANS: Respiratory system, skin, eyes, enzymes associated with oxidation.

4. FIRST-AID MEASURES

RESCUERS SHOULD NOT ATTEMPT TO RETRIEVE VICTIMS OF EXPOSURE TO THIS PRODUCT WITHOUT ADEQUATE PERSONAL PROTECTIVE EQUIPMENT. At a minimum, SelfContained Breathing Apparatus must be worn.

No unusual health effects are anticipated after exposure to this product, due to the small cylinder size. If any adverse symptom develops after over-exposure to this product, remove victim(s) to fresh air as quickly as possible. Only trained personnel should administer supplemental oxygen and/or cardio-pulmonary resuscitation if necessary.

A complete Cyanide Antidote Kit should be available near all areas of use. Personnel should be trained in the use of the kit to administer first-aid in advance of medical assistance. The kit should contain at least the following:

- Two boxes (2 dozen) of amyl nitrite pearls.
- Two ampoules of sterile sodium nitrite solution (10 mL of a 3% solution in each).
- Two ampoules of sterile sodium thiosulfate solution (50 mL of a 25% solution of each).
- Two 10 mL sterile syringes.
- Two 50 mL sterile syringes.
- Two sterile intravenous needles.
- One tourniquet.
- Twelve gauze pads.
- One bottle of 70% alcohol.
- One ampoule file.

Because of the special hazard of Cyanide compounds, special treatment procedures are administered to victims of exposure to Hydrogen Cyanide. Personnel should be trained to administer initial first-aid treatment to victims of Hydrogen Cyanide poisoning prior to response from medical professionals. If victim has difficulty breathing, is becoming confused and/or is losing consciousness, administer amyl nitrite. Crush one pearl of amyl nitrite onto a cloth and hold to the victim's nose 15 to 30 seconds of each minute. Use a new pearl every 5 minutes (0.3 mg size), or every 3 minutes (0.18 mg size). While amyl nitrite is being administered, if possible, monitor blood pressure. If blood pressure of the victim drops below 80/60, stop amyl nitrite treatment and obtain advice of professional medical personnel immediately. Administration of oxygen should only be done by trained personnel. If cardiac arrest occurs, begin CPR, again by trained personnel. While waiting for response by professional medical personnel, provide general supportive measures to victim such as keeping them warm and quiet. Take copy of label and MSDS to physician or other health professional with victim(s). **Physicians should refer to Section 11 (Toxicological Information) for specific recommendations to physicians.**

4. FIRST-AID MEASURES (Continued)

Victim(s) who experience any adverse effect after over-exposure to this product must be taken for medical attention. Rescuers should be taken for medical attention if necessary. Take a copy of the label and the MSDS to physician or other health professional with victim(s).

5. FIRE-FIGHTING MEASURES

FLASH POINT, (method): Not applicable.

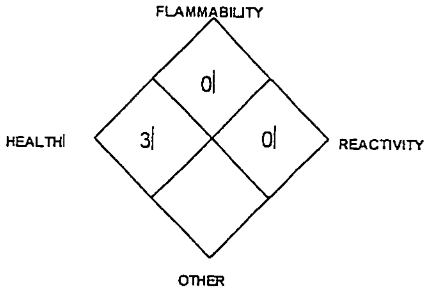
AUTOIGNITION TEMPERATURE: Not applicable.

FLAMMABLE LIMITS (in air by volume, %):
Lower (LEL): Not applicable.
Upper (UEL): Not applicable.

FIRE EXTINGUISHING MATERIALS: Non-flammable gas mixture. Use extinguishing media appropriate for surrounding fire.

UNUSUAL FIRE AND EXPLOSION HAZARDS: Hydrogen Cyanide is toxic to humans in relatively low concentrations, and in the concentrations present in this gas mixture, poses a potential hazard to fire-fighters. This gas mixture is not flammable; however, containers, when involved in fire, may rupture or burst in the heat of the fire.

NFPA RATING



Explosion Sensitivity to Mechanical Impact: Not sensitive.
Explosion Sensitivity to Static Discharge: Not sensitive.

SPECIAL FIRE-FIGHTING PROCEDURES: Structural firefighters must wear Self-Contained Breathing Apparatus and full protective equipment.

6. ACCIDENTAL RELEASE MEASURES

LEAK RESPONSE: Due to the small size and content of the cylinder, an accidental release of this product presents significantly less risk of over-exposure to Hydrogen Cyanide, an oxygen-deficient environment, and other safety hazards than a similar release from a larger cylinder. However, as with any chemical release, extreme caution must be used during emergency response procedures. In the event of a release in which the atmosphere is unknown, and in which other chemicals are potentially involved, evacuate immediate area. Such releases should be responded to by trained personnel using pre-planned procedures. Proper protective equipment should be used. In case of a leak, clear the affected area, protect people, and respond with trained personnel.

Allow the gas mixture to dissipate. If necessary, monitor the surrounding area (and the original area of the release) for oxygen. A colorimetric tube is available for Hydrogen Cyanide. The level of Hydrogen Cyanide must be at acceptable levels (less than 50% of the TLV; TLV = 4.7 ppm C) and Oxygen levels must be above 19.5% before non-emergency personnel are allowed to re-enter area.

If leaking incidentally from the cylinder, contact your supplier.

7. HANDLING and USE

WORK PRACTICES AND HYGIENE PRACTICES: Be aware of any signs of dizziness or fatigue, especially if work is done in a poorly ventilated area; exposures to harmful or fatal concentrations of this product could occur without any significant warning symptoms, due to Hydrogen Cyanide over-exposure and oxygen deficiency. If necessary, areas in which this gas mixture is used should be monitored with very sensitive gas detection instruments. Detection of Hydrogen Cyanide concentrations below 50% of the TLV level of 4.7 ppm C should trigger immediate response and corrective action. Detection of higher levels should initiate an alarm calling for evacuation of all personnel with the potential to be exposed. Do not attempt to repair, adjust, or in any other way modify cylinders containing this gas mixture. If there is a malfunction or another type of operational problem, contact nearest distributor immediately.

STORAGE AND HANDLING PRACTICES: Cylinders should be firmly secured to prevent falling or being knocked-over. Cylinders must be protected from the environment, and preferably kept at room temperature (approximately 21°C; 70°F). Cylinders should be stored in dry, well-ventilated areas, away from sources of heat, ignition, and direct sunlight. Protect cylinders against physical damage.

7. HANDLING and USE (Continued)

Full and empty cylinders should be segregated. Use a first-in, first-out inventory system to prevent full containers from being stored for long periods of time. These cylinders are not refillable. **WARNING! Do not refill DOT 39 cylinders. To do so may cause personal injury or property damage.**

SPECIAL PRECAUTIONS FOR HANDLING GAS CYLINDERS: WARNING! Compressed gases can present significant safety hazards. During cylinder use, use equipment designed for these specific cylinders. Ensure all lines and equipment are rated for proper service pressure.

PROTECTIVE PRACTICES DURING MAINTENANCE OF CONTAMINATED EQUIPMENT: Follow practices indicated in Section 6 (Accidental Release Measures). Make certain that application equipment is locked and tagged-out safely. Always use product in areas where adequate ventilation is provided.

8. EXPOSURE CONTROLS - PERSONAL PROTECTION

VENTILATION AND ENGINEERING CONTROLS: No special ventilation systems or engineering controls are needed under normal circumstances of use. As with all chemicals, use this product in well-ventilated areas. If this product is used in a poorly-ventilated area, install automatic monitoring equipment to detect the levels of Hydrogen Cyanide and Oxygen.

RESPIRATORY PROTECTION: No special respiratory protection is required under normal circumstances of use. Maintain Hydrogen Cyanide levels below 50% of the TLV (TLV = 4.7 ppm C) and oxygen levels above 19.5% in the workplace. Use supplied air respiratory protection when Hydrogen Cyanide levels exceed 50% of the TLV (TLV = 4.7 ppm C), oxygen levels are below 19.5%, or during emergency response to a release of this product. During an emergency situation, before entering the area, check the concentration of Hydrogen Cyanide and Oxygen. If respiratory protection is required, follow the requirements of the Federal OSHA Respiratory Protection Standard (29 CFR 1910.134), or equivalent State standards.

EYE PROTECTION: Safety glasses.

HAND PROTECTION: No special protection is needed under normal circumstances of use.

BODY PROTECTION: No special protection is needed under normal circumstances of use.

9. PHYSICAL and CHEMICAL PROPERTIES

Unless otherwise specified, the following information is for Nitrogen, the main component of this gas mixture.

GAS DENSITY @ 32°F (0°C) and 1 atm: 0.072 lbs/ ft^3 (1.153 kg/m^3).
BOILING POINT: -320.4°F (-195.8°C)
FREEZING/MELTING POINT @ 10 psig -210°C (-345.8°F)
SPECIFIC GRAVITY (air = 1) @ 70°F (21.1°C): 0.906
SOLUBILITY IN WATER vol/vol @ 32°F (0°C) and 1 atm: 0.023
EVAPORATION RATE (nBuAc = 1): Not applicable.
ODOR THRESHOLD: 0.2-5 ppm (Hydrogen Cyanide)
VAPOR PRESSURE @ 70°F (21.1°C) psig: Not applicable.
COEFFICIENT WATER/OIL DISTRIBUTION: Not applicable.
APPEARANCE AND COLOR: This product is a colorless gas mixture which is odorless.
HOW TO DETECT THIS SUBSTANCE (warning properties): In terms of leak detection, fittings and joints can be painted with a soap solution to detect leaks, which will be indicated by a bubble formation.

pH: Not applicable.
MOLECULAR WEIGHT: 28.01
EXPANSION RATIO: Not applicable.
SPECIFIC VOLUME (ft^3/lb): 13.8

10. STABILITY and REACTIVITY

STABILITY: Normally stable in gaseous state. Pure Hydrogen Cyanide is very unstable as it is sensitive to heat, light and moisture; however, due to the low concentration of this component in the gas mixture, this is not a potential hazard.

DECOMPOSITION PRODUCTS: When heated to combustion, Hydrogen Cyanide emits toxic fumes of carbon monoxide, carbon dioxide and nitrogen oxides. Nitrogen does not decompose, per se, but can react with other compounds in the heat of a fire.

10. STABILITY and REACTIVITY (Continued)

MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: Titanium will burn in Nitrogen (the main component of this product). Lithium reacts slowly with Nitrogen at ambient temperatures. Hydrogen Cyanide will attack some forms of plastics and rubber. Hydrogen Cyanide can react with many other compounds, but not usually violently unless the other chemical is also highly reactive.

HAZARDOUS POLYMERIZATION: Will not occur. Hydrogen Cyanide may polymerize explosively; however, due to the low concentration of this component in the gas mixture, this is not a potential hazard.

CONDITIONS TO AVOID: Contact with incompatible materials. Cylinders exposed to high temperatures or direct flame can rupture or burst.

11. TOXICOLOGICAL INFORMATION

TOXICITY DATA: The following toxicology data are available for the components of this product:

NITROGEN: There are no specific toxicology data for Nitrogen. Nitrogen is a simple asphyxiant, which acts to displace oxygen in the environment.

HYDROGEN CYANIDE:
Oral-Human LDLo: 570 µg/kg
Inhalation-Man TCLo: 500 mg/m3/3 minutes C Human Toxicology.
Inhalation-Human LCLo : 200 ppm/5 minutes
Inhalation-Human LCLo: 120 mg/m3/1 hour
Inhalation-Human LCLo: 200 mg/m3/10
Inhalation-Man LCLo: 400 mg/m3/2 minutes
Subcutaneous-Human LDLo: 1 mg/kg
Intravenous-Human LD50: 1 mg/kg
Intravenous-Man TDLo : 55 µg/kg: Pulmonary system effects
Unreported-Man LDLo: 1471 µg/kg

HYDROGEN CYANIDE (Continued):
Intramuscular-Rabbit, adult LD50: 486 mg/kg
Ocular-Rabbit, adult LD50: 1040 µg/kg Inhalation-Rat LC50: 160 ppm/30
Intravenous-Rat LD50: 810 µg/kg
Oral-Mouse LD50: 3700 µg/kg
Inhalation-Mouse LC50: 323 ppm/5 minutes
Intraperitoneal-Mouse LD50: 2990 µg/kg
Subcutaneous-Mouse LDLo: 3 mg/kg
Intravenous-Mouse LD50: 990 µg/kg
Intramuscular-Mouse LD50: 2700 µg/kg
Oral-Dog, adult LDLo: 4 mg/kg
Inhalation-Dog, adult LC50: 616 mg/m3/1 minute
Subcutaneous-Dog, adult LDLo: 1700 µg/kg
Intravenous-Dog, adult LD50: 1340 µg/kg
Inhalation-Monkey LC50: 1616 mg/m3/1 minutes

SUSPECTED CANCER AGENT: The components of this gas mixture are not found on the following lists: FEDERAL OSHA Z LIST, NTP, CAL/OSHA, and IARC; therefore, they are not considered to be, nor suspected to be, cancer-causing agents by these agencies.

IRRITANCY OF PRODUCT: Hydrogen Cyanide (a component of this gas mixture) may be irritating to contaminated eyes.

SENSITIZATION TO THE PRODUCT: This gas mixture is not known to cause sensitization in humans.

REPRODUCTIVE TOXICITY INFORMATION: Listed below is information concerning the effects of this product and its components on the human reproductive system.

Mutagenicity: No mutagenicity effects have been described for this gas mixture.
Embryotoxcity: No embryotoxic effects have been described for this gas mixture.
Teratogenicity: No teratogenicity effects have been described for this gas mixture.
Reproductive Toxicity: No reproductive toxicity effects have been described for gas mixture.

A mutagen is a chemical which causes permanent changes to genetic material (DNA) such that the changes will propagate through generation lines. An embryotoxin is a chemical which causes damage to a developing embryo (i.e. within the first eight weeks of pregnancy in humans), but the damage does not propagate across generational lines. A teratogen is a chemical which causes damage to a developing fetus, but the damage does not propagate across generational lines. A reproductive toxin is any substance which interferes in any way with the reproductive process.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Any respiratory disorder may be aggravated by over-exposure to gas mixtures containing. Additionally, skin and eye conditions may be aggravated by Hydrogen Cyanide exposures.

RECOMMENDATIONS TO PHYSICIANS: Administer oxygen. Victims of exposure to Hydrogen Cyanide must be monitored closely. IN CASES OF SEVERE HYDROGEN CYANIDE EXPOSURE: Administer amyl nitrate inhalations. If victim does not respond, inject, intravenously, 0.3 grams sodium nitrite (10 mL of a 3% solution at a rate of 2.5-5.0 mL/minute), followed at once by 12.5 grams of sodium thiosulfate intravenously (50 mL of a 25% solution injected at about the same rate as the sodium nitrite solution). The same needle and vein can be used for both injections. Watch victim continuously for 24-48 hours. If symptoms recur or persist, repeat the sodium nitrite and sodium thiosulfate therapy at one-half the original dose.

BIOLOGICAL EXPOSURE INDICES (BEIs): Currently, Biological Exposure Indices (BEIs) are not applicable for the components of this gas mixture.

12. ECOLOGICAL INFORMATION

ENVIRONMENTAL STABILITY: The gas will be dissipated rapidly in well-ventilated areas. The following environmental data are applicable to the components of this product.

NITROGEN: Water Solubility = 2.4 volumes Nitrogen/100 volumes water at 0°C. 1.6 volumes Nitrogen/100 volumes water at 20°C.

EFFECT OF MATERIAL ON PLANTS or ANIMALS: Due to the presence of Hydrogen Cyanide, this gas mixture may be harmful to over-exposed plant or animal life. Refer to Section 11 (Toxicology Information) for data on the effects of Hydrogen Cyanide on test animals during clinical studies.

EFFECT OF CHEMICAL ON AQUATIC LIFE: Hydrogen Cyanide (a component of this gas mixture) is soluble in water; therefore, this gas mixture may be harmful or fatal to aquatic life in contaminated bodies of water.

13. DISPOSAL CONSIDERATIONS

PREPARING WASTES FOR DISPOSAL PREPARING WASTES FOR DISPOSAL: Waste disposal must be in accordance with appropriate Federal, State, and local regulations. Cylinders with undesired residual product may be safely vented outdoors with the proper regulator. For further information, refer to Section 16 (Other Information).

14. TRANSPORTATION INFORMATION

THIS MATERIAL IS HAZARDOUS AS DEFINED BY 49 CFR 172.101 BY THE U.S. DEPARTMENT OF TRANSPORTATION.

PROPER SHIPPING NAME:	Compressed gases, n.o.s. (Nitrogen, Hydrogen Cyanide)
HAZARD CLASS NUMBER and DESCRIPTION:	2.2 (Non-Flammable Gas)
UN IDENTIFICATION NUMBER:	UN 1956
PACKING GROUP:	Not applicable.
DOT LABEL(S) REQUIRED:	Non-Flammable Gas

NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (1996): 126

MARINE POLLUTANT: The components of this gas mixture are not classified by the DOT as Marine Pollutants (as defined by 49 CFR 172.101, Appendix B).

SPECIAL SHIPPING INFORMATION: Cylinders should be transported in a secure position, in a well-ventilated vehicle. The transportation of compressed gas cylinders in automobiles or in closed-body vehicles can present serious safety hazards. If transporting these cylinders in vehicles, ensure these cylinders are not exposed to extremely high temperatures (as may occur in an enclosed vehicle on a hot day). Additionally, the vehicle should be well-ventilated during transportation.

Note: DOT 39 Cylinders ship in a strong outer carton (overpack). Pertinent shipping information goes on the outside of the overpack. DOT 39 Cylinders do not have transportation information on the cylinder itself.

TRANSPORT CANADA TRANSPORTATION OF DANGEROUS GOODS REGULATIONS: THIS MATERIAL IS CONSIDERED AS DANGEROUS GOODS. Use the above information for the preparation of Canadian Shipments.

15. REGULATORY INFORMATION

SARA REPORTING REQUIREMENTS: This product is subject to the reporting requirements of Sections 302, 304, and 313 of Title III of the Superfund Amendments and Reauthorization Act, as follows:

COMPONENT	SARA 302	SARA 304	SARA 313
Hydrogen Cyanide	YES	YES	YES
Nitrogen	NO	NO	NO

SARA THRESHOLD PLANNING QUANTITY: Hydrogen Cyanide = 100 pounds.

TSCA INVENTORY STATUS: The components of this gas mixture are listed on the TSCA Inventory.

CERCLA REPORTABLE QUANTITY (RQ): Hydrogen Cyanide = 10 pounds.

15. REGULATORY INFORMATION (Continued)

OTHER U.S. FEDERAL REGULATIONS:

- Hydrogen Cyanide is subject to the requirements of CFR 29 1910.1000 (under the 1989 PELs). Hydrogen Cyanide is listed on Table Z.1.
- Hydrogen Cyanide is subject to the reporting requirements of Section 112(r) of the Clean Air Act. The Threshold Quantity for this gas is 2,500 pounds.
- Depending on specific operations involving the use of Hydrogen Cyanide, the regulations of the Process Safety Management of Highly Hazardous Chemicals may be applicable (29 CFR 1910.119). Hydrogen Cyanide is listed in Appendix A of this regulation. The threshold quantity for Hydrogen Cyanide under this regulation is 1,000 pounds.; therefore, the requirements of this regulation are not applicable to one cylinder of this product.
- This gas mixture does not contain any Class I or Class II ozone depleting chemicals (40 CFR Part 82).
- Nitrogen is not listed as a Regulated Substance, per 40 CFR, Part 68, of the Risk Management for Chemical Releases. Hydrogen Cyanide is listed under Table 1 as a Regulated Toxic Substance; the threshold quantity for Hydrogen Cyanide under this regulation is 2,500 pounds.

OTHER CANADIAN REGULATIONS: This gas mixture is categorized as a Controlled Product, Hazard Classes A and D2B, as per the Controlled Product Regulations.

STATE REGULATORY INFORMATION: The components of this gas mixture are covered under the following specific State regulations:

Alaska - Designated Toxic and Hazardous Substances: Hydrogen Cyanide.
California - Permissible Exposure Limits for Chemical Contaminants: Nitrogen, Hydrogen Cyanide.
Florida - Substance List: Oxygen, Hydrogen Cyanide.
Illinois - Toxic Substance List: Hydrogen Cyanide.
Kansas - Section 302/313 List: No.
Massachusetts - Substance List: Oxygen, Hydrogen Cyanide.
Minnesota - List of Hazardous Substances: Hydrogen Cyanide.
Missouri - Employer Information/Toxic Substance List: Hydrogen Cyanide.
New Jersey - Right to Know Hazardous Substance List: Oxygen, Nitrogen, Hydrogen Cyanide.
North Dakota - List of Hazardous Chemicals, Reportable Quantities: No.
Pennsylvania - Hazardous Substance List: Oxygen, Nitrogen, Hydrogen Cyanide.
Rhode Island - Hazardous Substance List: Oxygen, Nitrogen, Hydrogen Cyanide.
Texas - Hazardous Substance List: Hydrogen Cyanide.
West Virginia - Hazardous Substance List: Hydrogen Cyanide.
Wisconsin - Toxic and Hazardous Substances: Hydrogen Cyanide.

CALIFORNIA PROPOSITION 65: No component of this product is on the California Proposition 65 lists.

16. OTHER INFORMATION

INFORMATION ABOUT DOT-39 NRC (Non-Refillable Cylinder) PRODUCTS

DOT 39 cylinders ship as hazardous materials when full. Once the cylinders are relieved of pressure (empty) they are not considered hazardous material or waste. Residual gas in this type of cylinder is not an issue because toxic gas mixtures are prohibited. Calibration gas mixtures typically packaged in these cylinders are Nonflammable n.o.s., UN 1956. A small percentage of calibration gases packaged in DOT 39 cylinders are flammable or oxidizing gas mixtures.

For disposal of used DOT-39 cylinders, it is acceptable to place them in a landfill if local laws permit. Their disposal is no different than that employed with other DOT containers such as spray paint cans, household aerosols, or disposable cylinders of propane (for camping, torch etc.). When feasible, we recommended recycling for scrap metal content. Air Liquide America will do this for any customer that wishes to return cylinders to us prepaid. All that is required is a phone call to make arrangements so we may anticipate arrival. Scrapping cylinders involves some preparation before the metal dealer may accept them. We perform this operation as a service to valued customers who want to participate.

MIXTURES: When two or more gases or liquefied gases are mixed, their hazardous properties may combine to create additional, unexpected hazards. Obtain and evaluate the safety information for each component before you produce the mixture. Consult an Industrial Hygienist or other trained person when you make your safety evaluation of the end product. Remember, gases and liquids have properties which can cause serious injury or death.

16. OTHER INFORMATION (Continued)

Further information about the handling of compressed gases can be found in the following pamphlets published by: Compressed Gas Association Inc. (CGA), 1725 Jefferson Davis Highway, Suite 1004, Arlington, VA 22202-4102. Telephone: (703) 412-0900.

P-1	*"Safe Handling of Compressed Gases in Containers"*
AV-1	*"Safe Handling and Storage of Compressed Gases"*
	"Handbook of Compressed Gases"

PREPARED BY:

CHEMICAL SAFETY ASSOCIATES, Inc.
9163 Chesapeake Drive, San Diego, CA 92123-1002
619/565-0302

Fax on Demand: 1-800/231-1366

AIR LIQUIDE

ATTACHMENT B

PROJECT FORMS

Safety Meeting

Hot Work Permit

Heat Stress Monitoring Form

Spill Report

Public Liabiity Accident Report

Employee Injury Report

Incident Report

NYSEG

Licensing & Environmental Operations Department

SAFETY MEETINGS

Project / Site: ______________________ Date: ______________

Presented By: ______________________ Time: ______________

Topic(s) / Information Reviewed: ______________________

Comments / Follow-up Actions: ______________________

ATTENDEES		
NAME	SIGNATURE	COMPANY

Instructions:

- Conduct a daily meeting prior to beginning each day's site activities
- Complete form and file with HASP
- Follow-up on any noted items and document resolution of any action items

NYSEG

Licensing & Environmental Operations Department

HOT WORK PERMIT

Project / Site: ______________________________ Date: __________

Hot Work Description: ______________________________

Welder Conducting Hot Work: ______________ Fire Watch Representative: ______________

PERMIT MUST BE COMPLETED IN ITS ENTIRETY AND POSTED BEFORE WORK BEGINS

ACTION ITEM	YES	NO	N/A
Has Construction Supervisor been notified of intended hot work?			
Hazardous materials involved? Name: ______________			
Will hot work impact the general public and/or on-site workers?			
Will the intended hot work need to be coordinated with other Contractors who may be working on the Site to make them aware of any hazards and the scope of work to be performed?			
Have hazardous energy sources been identified, isolated, and locked out/tagged out before start of project?			
Will hot work be conducted within confined space?			
All testing equipment (i.e., combustible gas indicator, oxygen meter, etc.) and fire fighting equipment (i.e., extinguisher, etc) have been checked to ensure proper operation and calibration before start of this project?			
Does task require a designated fire watch (30 minutes after work)?			
Flammable and combustible materials within 35 feet have been cleared or shielded.			
All fuel sources have been identified and protected (Uts, ASTs, sewers, piping, etc.)			
The area has been restricted with proper barriers and signs.			
The Areas has been tested to be certain that atmosphere is 0% LEL before starting hot work.			
Flame sensitive areas and equipment (including cylinders and gas delivery lines) exposed to slag, heat, and sparks are protected by a flame resistant blanket, shield, or removed from the area?			
Escape routes have been identified before starting work?			
Is ventilation equipment needed? Type need: ______________			

PROTECTIVE EQUIPMENT REQUIRED					
EQUIPMENT	YES	NO	EQUIPMENT	YES	NO
Welding Goggles / Shield			Hearing Protection		
Safety Shoes			Head Protection		
Leather gloves			Safety Harness		
Supplied Air Respirator			Welding Leather - Top		
APR ________ Cartridge			Welding Leather - Bottom		

APPROVAL: ______________________________ DATE: __________

Construction Supervisor

NYSEG

Licensing & Environmental Operations Department

HEAT STRESS MONITORING FORM

Project / Site: ______________________ Date: ______________

HEAT STRESS MONITORING FORM								
Date	Ambient Temp.	WBGT	Work/ Rest Regimen	Employee/ Location	Pulse Rate	Body Temp.	Body Water Loss	Comments

Construction Supervisor /
Site Safety and Health Officer: ______________________________

NYSEG

Licensing & Environmental Operations Department

SPILL REPORT

Date of Spill __________ Actual or Estimate (circle one) Time of Spill __________ Actual or Estimated (circle one)

Date of Discovery __________ Time __________ Discovered By ____________________

Location: Road ____________________ Town/Village ____________________

MGP Site ____________________

Describe spill location and extent of visible Traces: ____________________

(Draw sketch on back of this report. Include area visibly contaminated and the center, landmarks, distances, etc.)

Spilled Container type and size ____________________

Cause of Spill ____________________

What was Spilled ? ____________________

Estimated Quantity Spilled __________ gallons or pounds (Circle one)

Weather Conditions: Temp. ______ Degree F Rain/Snow ______ Wind Conditions __________

Any discharge to water ? __________ Describe ____________________

Describe steps taken to control, contain and clean-up spill ____________________

Depth of soil/stone, etc. removed __________ Quantitiy __________

Name NYSEG Employee Notified ____________________

Date Notified __________ Time Notified __________

List government agencies notified, (name, person, date, time) Spill No. ____________________

(Write in see back and List on back if reqired)

Describe restoration of site to original condition ____________________

Cleanup Completed: Date __________ Time __________

I hereby certify that the clean-up has been performed as described above and that the information contained on this report is true to the best of my knowledge.

Signature of Construction Supervisor ____________________

Name (print) ____________________ Date __________

Send copy of both sides of report to the Project Manager, NYSEG, P.O. Box 5224, Binghamton, NY, 13902

NYSEG

PUBLIC LIABILITY ACCIDENT REPORT

Use this form to report accidents or incidents involving bodily injury or property damage to non-company personnel or property that may result in claims or lawsuits against NYSEG.
Use form MV-104 for motor vehicle accidents. Use form C-2 for employee injuries.

General Office Report No.

NYSEG Operating District or Plant

Date, Time & Place

Date of Accident or Loss

Location of Accident or Loss

Time of Accident or Loss ☐ AM ☐ PM

NYSEG Dept. Involved

☐ Electric ☐ Generation
☐ Gas ☐ Other

NYSEG Line No.

Pole No.

Injured Person

Name

Age

Address

Bus. Phone

Res. Phone

Occupation

Employed By

NYSEG Contractor ☐ Yes ☐ No

NYSEG Contract No.

The injury

What was injured doing when hurt?

Nature & Extent of injury

Where was injured taken after accident?

Name of Doctor

Probable disability

Has injured resumed work? ☐ No ☐ Yes, When?

Property Damage

Owner

Estimated Loss
$

Address

List Damage

Witnesses

Name Address Bus. Phone Res. Phone

Name Address Bus. Phone Res. Phone

Description of Accident or Loss

(Continue on reverse side if necessary)

Police / Fire Investigation

Date, Location & Badge No. or Name of Police / Fire Authority to whom accident was reported

Date

NYSEG report prepared by

Phone

Address

ID-32, 04/99

NYSEG

EMPLOYEE INJURY REPORT

Always complete Section I and III. Complete Section II
only if doctor or hospital medical attention was provided.

SECTION I

GENERAL INFORMATION

Name of Injured Employee Number
Social Security No. CA/CC
Division Department
Job Classification Date of Employment
Home Street Address Home Phone
City State Zip Date of Birth
Date of Accident Day of week Time
Where did the accident occur? County
Outside weather condition
Homeowner's name
Who was employee working with?
Witnesses to accident
When was Salaried Supervisor first notified of injury?
How did injury/illness occur? (Please be specified. Describe nature of injury / illness and list all affected body parts.)

What areas of the body were indirectly affected by injury/illness described above? (Write NONE if applicable)

What task was employee performing when injured? (BRIEF description: i.e., Walking, Main Tie-In, Cross arm installation, etc.)

Was first-aid provided by someone other than yourself?
If yes, what was done?

Name and address of provider

Bloodborne pathogen exposure follow-up required?

EMPLOYEE INJURY REPORT (back)

SECTION II

MEDICAL

When was medical attention received? Date ______________

Time ______________

Medical treatment rendered ______________

____

____

Name and address of doctor/hospital ______________

____

Were prescription drugs given? yes ☐ no ☐

Started disability Date ______________ Time ______________

SECTION III

SIGNATURES

Injured Employee's Signature indicates they have completed this report and discussed it with their supervisor.

Fraudulent Workers' Compensation claims are subject to criminal penalties under Section 114 of the New York State Workers' Compensation Law.

Injured Employee Signature ______________ Date ______________

Supervisor's Comments ______________

____

____

____

Salaried Supervisor's Signature ______________ Date ______________

(1) Department Head (Signature and Date)	(2) Energy Delivery Manager (Signature and Date)
(3) Health & Safety (Signature and Date)	

NYSEG

INCIDENT REPORT

INSTRUCTIONS: This form is to be used for reporting all incidents, damages or losses involving Company property and/or employees (other than accidental personal injury and motor vehicle damages). Send completed report to the Security Department within 24 hours of the occurrence. (Incidents of a serious nature shall be reported immediately by telephone or personal contact to the Security Department, and the Risk Management Department when applicable.)

TYPE OF INCIDENT ____________________

WHEN/WHERE

Date of Incident ____________________ Time ____________________ AM PM

Location ____________________
Street Address City/Town/Village County

PROPERTY INVOLVED

Describe property damaged or stolen and give Serial/Model/NYSEG Capital Numbers ____________________

ESTIMATED LOSS $ ____________________

INCIDENT Give brief summary: ____________________

Police Agency notified: ____________________ Officer: ____________________ Date: __________

Risk Management Department notified? ☐ Yes ☐ No

Submitted By ____________________ Ext. __________

Date submitted ____________________