HEALTH AND SAFETY PLAN

Solvents Recovery Service of New England, Inc.
Superfund Site
Southington, Connecticut

Prepared for:
de maximis, inc.

April 2010

Prepared by:

TERRATHERM
10 Stevens Road
Fitchburg, MA 01420
978-343-0300

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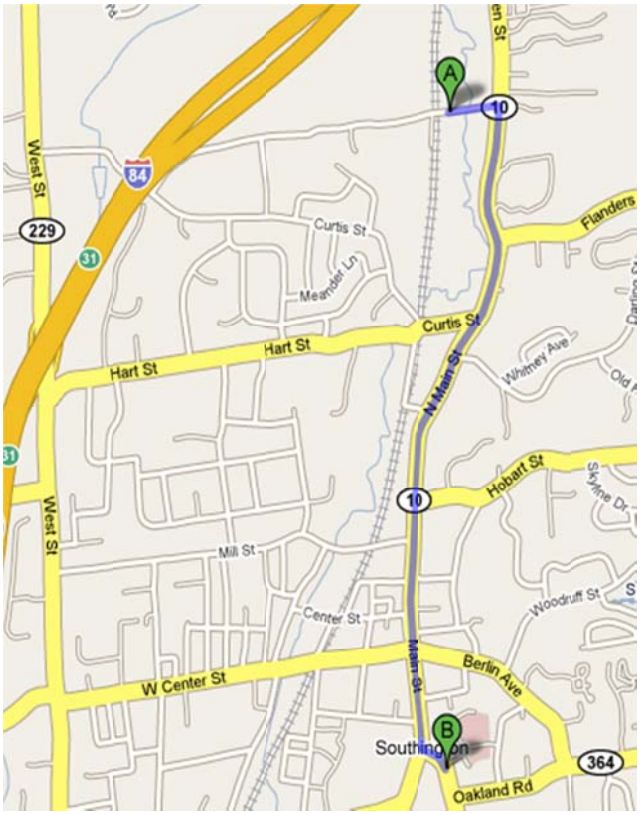
1. Emergency References

Ambulance:	911
Fire:	911
Police:	911
Medical Services:	860-276-5000
	Bradley Memorial Hospital 81 Meriden Avenue Southington, CT
State Environmental Agency:	860-424-3000
USEPA – Region 1:	888-372-7341
Poison Control:	800-222-1222
On Site Telephone:	Phone service will be available in the project trailer

TerraTherm Project Representatives: **Office: 978-343-0300**

- Robin Swift, Project Manager, Cell: 978-502-3539
- Renee LaGasse, Assistant Project Manager, Cell: 978-868-6456
- Larry Conant, Project Engineer, Cell 978-868-6014
- John LaChance, Program Manager, Cell: 978-855-1418
- Jim Galligan, Principal Engineer, Cell: 978-833-7714
- Linda Falk, Corporate Safety and Compliance Director, Cell: 401-663-7058
- John Bierschenk, President, Cell: 978-502-4839

1.1 Map and Directions from Site to Hospital



Driving directions to 81 Meriden Ave, Southington, CT 06489 - **2.0 mi** – about **5 mins**		
Start:	90 Lazy Lane, Southington, CT 06489	
1.	Head **east** on **Lazy Lane** toward **CT-10/Queen Street**	0.1 mi
2.	Turn **right** at **CT-10/Queen Street,** Continue to follow CT-10	1.8 mi
3.	Turn **left** at **CT-120/Meriden Avenue,** Destination will be on the left	0.1 mi
End:	81 Meriden Avenue, Southington, CT 06489	

2. Introduction

2.1 Health and Safety Plan Applicability

TerraTherm, Inc. (TerraTherm) has developed this site-specific Health and Safety Plan (HASP). It establishes the health and safety procedures to minimize any potential risk to TerraTherm and TerraTherm's subcontractor personnel involved with the In Situ Thermal Remediation (ISTR) at the at the Solvents Recovery Service of New England, Inc. (SRSNE) Superfund Site in Southington, Connecticut (Site). TerraTherm is performing this work on behalf of the SRSNE Site Group.

The provisions of this plan apply to all TerraTherm personnel and TerraTherm subcontractors who may potentially be exposed to safety and/or health hazards related to activities described in Section 3.0 of this document.

This HASP has been written to comply with the requirements of the Occupational Safety and Health Administration (OSHA) Hazardous Waste Operations and Emergency Response Standard (29 CFR 1910.120). All activities covered by this HASP must be conducted in complete compliance with this HASP and with all applicable federal, state, and local health and safety regulations. Personnel covered by this HASP who cannot or will not comply will be excluded from site activities.

This plan will be distributed to each employee involved with the ISTR program at the Site. Each employee must sign a copy of the attached Health and Safety Plan receipt and acknowledgment form (see Attachment A).

2.2 Modifications to HASP

The procedures in this HASP have been developed based on information provided by the SRSNE Site Group, by *de maximis, inc.*, by ARCADIS and the scope of work. Every effort has been made to address the chemical hazards that may be encountered during the implementation of the ISTR program at the Site. Similarly, this document also discusses the physical hazards associated with the ISTR program activities. However, unanticipated site-specific conditions or situations may occur during the implementation of this project. Also, TerraTherm and/or contractors may elect to perform certain tasks in a manner that is different from what was originally intended due to a change in field conditions. As such, this HASP must be considered a *working document* that is subject to change to meet the needs of this dynamic project.

Therefore, TerraTherm and/or subcontractors will review Activity Hazard Analysis (AHA) prior to the beginning of each major phase of work to ensure that all chemical and physical hazards have been properly addressed. AHAs for each major phase of work are included as Attachment B. The use of new installation techniques or operating procedures will be reviewed and if new hazards are associated with the proposed changes, they will be documented on the AHA. An effective control measure must also be identified for each new hazard. The Site Safety Officer

(SSO) will review AHAs prior to their implementation. Once approved, the AHAs will be reviewed with all field staff during the daily safety meeting.

2.2.1 HASP Modifications

Should significant information become available regarding potential on-site hazards, it may be necessary to modify this HASP. All proposed modifications to this HASP must be reviewed and approved by the Project Manager (PM) before such modifications are implemented. Any significant modifications must be incorporated into the written document as addenda and the HASP must be reissued. The PM will ensure that all personnel covered by this HASP receive copies of all issued addenda. Sign-off forms will accompany each addendum and must be signed by all personnel covered by the addendum. Sign-off forms will be submitted to the SSO. The HASP addenda should be distributed during the daily safety meeting so that they can be reviewed and discussed. Attendance forms will be collected during the meeting.

2.3 Organization/Responsibilities

The implementation of health and safety during this ISTR program will be the shared responsibility of the TerraTherm PM, the TerraTherm Construction Manager, the TerraTherm SSO, and all other on-site TerraTherm and contractor personnel.

2.3.1 TerraTherm Project Manager

The TerraTherm PM is the individual who has the primary responsibility for ensuring the overall health and safety of this project. As such, the PM is responsible for ensuring that the requirements of this HASP are implemented. Some of the PM's specific responsibilities include:

- Assigning an SSO to the project whose training and field experience is commensurate with the safety requirements of the proposed ISTR program at the Site;
- Assuring that all personnel to whom this HASP applies have received a copy of it;
- Providing the TerraTherm Construction Manager and SSO with updated information regarding environmental conditions at the Site and the scope of site work;
- Providing adequate authority and resources to the Construction Manager and SSO to allow for the successful implementation of all necessary safety procedures;
- Supporting the decisions made by the Construction Manager and/or the SSO;
- Maintaining regular communications with the Construction Manager and SSO; and,
- Coordinating the activities of all subcontractors and ensuring that they are aware of the pertinent health and safety requirements for this project.

2.3.2 TerraTherm Safety Advisor

TerraTherm's Corporate Safety & Compliance Director, Linda S. Falk, is the individual responsible for providing a safe job site and safe work practices for all employees and subcontractors at TerraTherm job sites. The Corporate Safety & Compliance Director is responsible for reviewing Incident Reports and Incident Investigations and assisting the Site Safety Officer and Project Manager, as needed.

2.3.3 TerraTherm Site Safety Officer

All TerraTherm employees working at the Site are responsible for implementing the safety requirements specified in this HASP. However, during each major phase of the project (e.g., construction, operation, demobilization), a designated employee, appointed by the PM, will serve as the SSO. During the construction phase, the SSO will be the Construction Manager. The SSO will be on-site during all activities covered by this HASP. The SSO is responsible for enforcing the requirements of this HASP once work begins. The SSO has the authority to immediately correct all situations where noncompliance with this HASP is noted and to immediately stop work in cases where an immediate danger is perceived. Some of the SSO's specific responsibilities include:

- Assuring that all personnel to whom this HASP applies have submitted a completed copy of the HASP receipt and acceptance form;
- Assuring that all personnel to whom this HASP applies attend the pre-entry briefing prior to entering an exclusion zone and also attend all subsequently scheduled safety meetings;
- Maintaining a high level of health and safety consciousness among employees at the work site;
- Reviewing the AHA for each major phase of work, in conjunction with the contractors, and identifying each new task or hazard that is not addressed by the AHA or this HASP and reviewing the information with the field team;
- Preparing new AHAs in cooperation with the Project Manager and Corporate Safety & Compliance Director as new tasks that are identified;
- Procuring and distributing the personal protective equipment (PPE), respiratory protection and safety equipment needed for this project for TerraTherm employees;
- Procuring the air monitoring instrumentation required by this HASP and performing health and safety-related air monitoring for TerraTherm activities;
- Verifying that all PPE and health and safety equipment used by TerraTherm are in good working order;
- Verifying that all subcontractors are prepared with the required PPE, respirators and safety equipment;
- Setting up and maintaining the decontamination zone and assuring proper cleanup of all site personnel involved with the ISTR program at the Site;
- Notifying the PM of all noncompliance situations and stopping work in the event that an immediate danger situation is perceived;
- Monitoring and controlling the safety performance of all personnel within the established restricted areas to ensure that required safety and health procedures are being followed;
- Conducting accident/incident investigations and preparing accident/incident investigation reports;
- Conducting the pre-entry briefing and subsequent safety meetings, as required by Section 11.0 of the HASP; and,
- Initiating emergency response procedures in accordance with Section 12.0 of this HASP.

2.3.4 TerraTherm Field Personnel and Contractor Personnel

All TerraTherm field personnel and subcontractor personnel covered by this HASP are responsible for following the health and safety procedures specified in this HASP and for performing their work in a safe and responsible manner. Some of the specific responsibilities of the field personnel are as follows:

- Reading the HASP in its entirety prior to the start of on-site work;
- Submitting a completed HASP Acceptance Form and documentation of medical surveillance and training, if applicable, to the Construction Manager or SSO prior to the start of work;
- Attending the required pre-entry briefing prior to beginning on-site work and any subsequent safety meetings that are scheduled by the SSO;
- Bringing forth any questions or concerns regarding the content of the HASP to the Construction Manager or the SSO prior to the start of work;
- Reporting all accidents, injuries and illnesses, regardless of their severity, to the SSO; and,
- Complying with the requirements of this HASP and the requests of the SSO.

2.3.5 Subcontractors

In addition to other requirements referenced in this HASP, all subcontractors are required to:

- Ensure, via daily inspections, that their equipment is in good working order;
- Operate their equipment in a safe manner;
- Appoint one employee as the SSO who will interact with the TerraTherm SSO when necessary;
- Prepare AHAs for new hazards that are introduced during the program and are not addressed in this HASP;
- Provide copies of MSDS for all hazardous materials brought on-site; and,
- Provide all the required PPE, respiratory protection and safety equipment for their employees.

3. Site Description

3.1 Site Background

The SRSNE Site is located in the Town of Southington, Connecticut, in Hartford County, approximately 15 miles southwest of the City of Hartford. It is located on Lazy Lane, just off Route 10 (Queen Street), and adjacent to the Quinnipiac River. The Site generally consists of the SRSNE Operations Area (4 acres), the Cianci Property (10 acres), a railroad right-of-way, and those areas where the SRSNE-related plume in groundwater has come to be located, including Southington's Curtiss Street Well Field (the Town Well Field Property). The Town Well Field Property is a 28-acre parcel of undeveloped land containing two municipal drinking water wells (Production Wells No. 4 and No. 6). The wells were closed in 1979 when they were found to contain volatile organic compounds (VOCs).

The SRSNE facility began operations in Southington in 1955. From approximately 1955 until the facility's closure in 1991, spent solvents were received from customers and distilled to remove impurities. Solvents and other wastes were handled and processed by several methods over the operational period, including distillation columns, lagoons, drums, and open pit incineration. Such operations were a source of historical releases of processed materials solvents and spent fuels, which resulted in the presence of Non-Aqueous Phase Liquids (NAPL) in the subsurface.

The Site was listed on the National Priorities List (NPL) in September 1983 and the USEPA initiated the Remedial Investigation (RI) for the Site in 1990. SRSNE operations ceased in 1991, and the USEPA conducted a Time-Critical Removal Action to remove contaminated soils from the railroad grade drainage ditch and to remove some chemicals stored at the property to an off-site location in 1992. In 1994, USEPA and the SRSNE Site Group entered into an Administrative Order on Consent (AOC) to, among other things, construct and operate a pump and treatment system to contain the principally contaminated overburden groundwater (the NTCRA 1 work). USEPA subsequently issued an Action Memorandum for a second NTCRA (NTCRA 2) in 1995 to hydraulically contain VOC-impacted bedrock groundwater down gradient of the NTCRA 1 system. USEPA and the SRSNE Site Group entered into a second AOC in 1996 to implement NTCRA 2 and to complete the RI and prepare a Feasibility Study (FS). NTCRA 2 started operation in 1998. The RI and Feasibility Study (FS) were completed between 1996 and 2004, and the USEPA issued the ROD in 2005. The ROD described the selected remedy for the Site, which is the basis for the RD/RA activities being undertaken.

Additional information regarding the site background is provided in the RDWP (ARCADIS, April 2009).

3.2 Site Geology/Hydrogeology

The Site is located within the Connecticut Valley Lowland section of the New England physiographic province. The Connecticut Valley Lowland occupies a regional, structural rift

basin, which is characterized by block-faulted and tilted bedrock strata. The geology of the region, in general, consists of glacially-derived unconsolidated deposits overlying the Upper Triassic New Haven Arkose bedrock (Rogers 1985). Bedrock fractures in the region dip moderately eastward, parallel to the eastward-dipping bedding (Hubert et al. 1978; Rogers 1985; BBL 1998). Steeply dipping fractures, however, have also been observed in outcrops near the Site, and in core samples and down-hole fracture-logging results obtained within the Site. While normal faults have been mapped approximately 2.5 miles west and 2.0 miles east of the Site (Rogers 1985), no bedrock faults have been reported within the Study Area (i.e., the targeted investigation area during the Remedial Investigation, including the Site and surrounding areas). The published bedrock geologic maps do not provide a sufficient basis to evaluate the presence or locations of faults, if any, beneath the thick sequence of unconsolidated materials within the Quinnipiac River Valley in the vicinity of the Site (Rogers 1997).

Additional information regarding the site geology and hydrogeologic settings are provided in the RDWP (ARCADIS, April 2009).

3.3 ISTR Target Treatment Zone

The ISTR program Target Treatment Zone (TTZ) covers an approximate area of 74,195 square feet with a target treatment depth ranging between 12 and 24 ft bgs, depending on the depth to bedrock in the wellfield. The weighted average treatment depth is 17.1 ft. Based on this, the volume of soil to be treated in the thermal remediation project is approximately 47,298 cubic yards (CY). The TTZ is shown below in Figure 2.1.

The primary Contaminants of Concern (COCs) for the ISTR program at the Site area are:

Trichloroethene
Tetrachloroethene
1,1,1-Trichloroethane
Ethylbenzene
Toluene
p/m Xylene
o Xylene

The primary COCs at the Site will likely also present daughter products at lower concentrations.

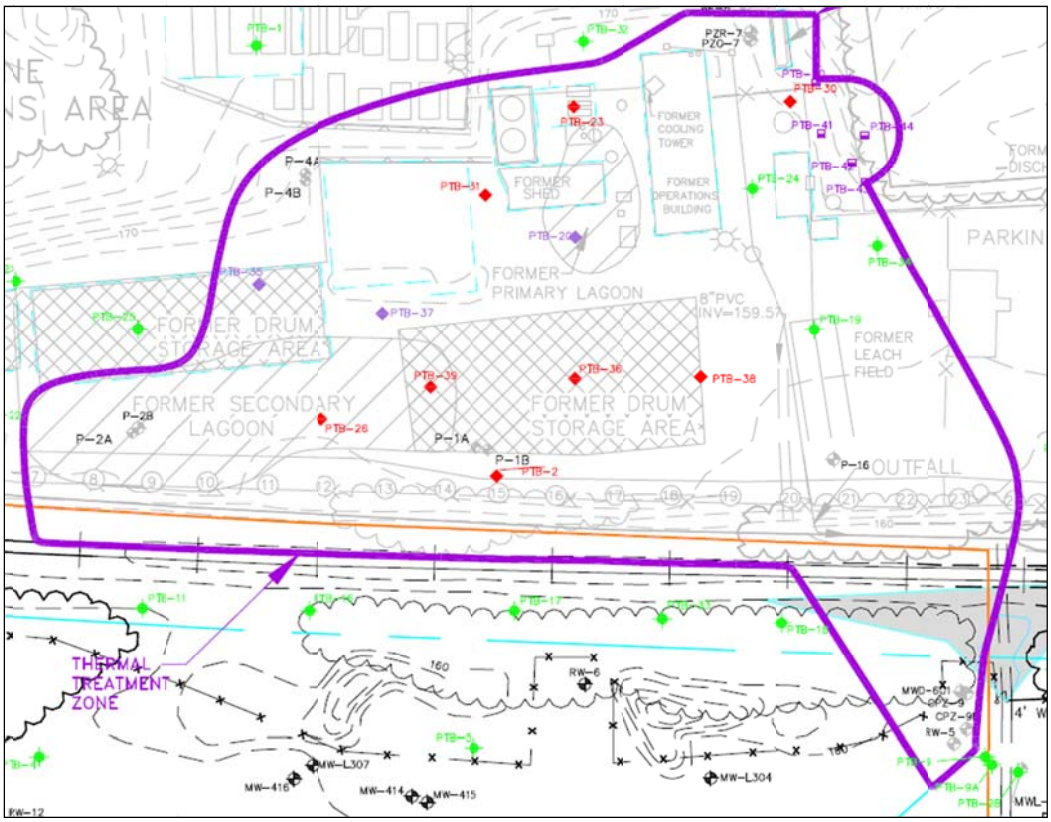


Figure 2.1. Thermal Treatment Zone

4. Scope of Work

4.1 Remedial Action Objectives

4.1.1 Human Health

1. Reduce or stabilize the NAPL mass that would otherwise result in groundwater concentrations that pose an excess carcinogenic risk of 1 x 10^{-4} to 1 x 10^{-6}, non-carcinogenic
2. Hazard Index greater than 1, a cumulative risk from multiple contaminants exceeding a lifetime cancer risk of 1 x 10^{-5}, or that exceed applicable or relevant and appropriate requirements (ARARs).

4.1.2 Protection of the Environment

1. Shorten the timeframe that groundwater standards are exceeded;
2. Shrink the size of the groundwater contaminant plume;
3. Reduce groundwater contaminant concentrations; and,
4. Prevent the migration of NAPL.

4.2 General ISTR Process

TCH, also known as ISTR, is a field-proven remediation technology licensed by TerraTherm that has been successfully used to remediate the full range of volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs)[1] at over 30 sites across the U.S. and world-wide. TCH is a viable treatment technology for nearly all VOCs including the COCs present at the SRSNE Site. TCH is particularly well-suited for application in low permeability soils because heat distribution is not affected by the low hydraulic conductivity of the soil matrix. TerraTherm is currently implementing TCH at multiple similar sites, and has successfully completed many TCH projects for VOC constituents similar to those present at the SRSNE site. Combined with a good vapor and liquid extraction strategy, the confidence in reaching remedial goals is extremely high, as evidenced by the successful completion of several time-critical Brownfield development projects using TCH.[2]

1. Thermal energy provided by vertical heater borings will heat the soil, water, and contaminants. The heating progresses by thermal conduction, as the heater wells are heated to temperatures around 1000-1500°F (500 to 800°C), creating significant temperature gradients in the formation around each heater. Thermal conductivity of soil materials varies over a very narrow range – only by a factor of 3; therefore, thermal

[1] Stegemeier, G.L., and Vinegar, H.J. 2001. "Thermal Conduction Heating for In-Situ Thermal Desorption of Soils." Ch. 4.6, pp. 1-37. In: Chang H. Oh (ed.), *Hazardous and Radioactive Waste Treatment Technologies Handbook*, CRC Press, Boca Raton, FL.

[2] LaChance, J., G. Heron and R. Baker. 2006. "Verification of an Improved Approach for Implementing In-Situ Thermal Desorption for the Remediation of Chlorinated Solvents." *Remediation of Chlorinated and Recalcitrant Compounds: Proceedings of the Fifth International Conference* (May 22-25, 2006). Battelle, Columbus, OH.

conduction heating (ISTD) is very precise and predictable regardless of the permeability of the soil or its degree of heterogeneity.
2. The heat front moves away from the heaters through the soil by thermal conduction and convection, and the superposition of heat from the many heaters results in a temperature rise throughout the TTZ.
3. As soil temperatures increase, contaminants and water contained in the soil matrix are vaporized. While locations close to heaters (i.e., 1 ft) may achieve temperatures well above the boiling point of water (212°F or 100°C), locations in between heaters need only achieve 212°F (100°C) to accomplish steam distillation for effective removal of VOCs. Boiling off all the soil water is not necessary. Very high (>99%) removal rates have been repeatedly measured for ISTD of VOCs.
4. The vacuum applied to the vapor extraction wells from the process system will draw the vapors through the soils and into the off-gas piping network for subsequent treatment.

4.3 Specific Installation and Operational Tasks

The major installation and operation field tasks associated with the ISTR program at the Site to be performed by TerraTherm and subcontractors hired directly by TerraTherm include:

- Site preparation activities
- Installation of the ISTR program at the Site system (wells, electrical, mechanical, Air Quality Control (AQC))
- ISTR system operation/monitoring
- Decommissioning and demobilization activities

4.3.1 Site Preparation Activities

Prior to the ISTR program at the Site, some ancillary tasks must be completed. These tasks include the following:

- Perform boundary survey and utility marking (performed by others)
- Establish site security (i.e. erect perimeter fencing) (performed by others)
- Mobilize temporary facilities (project trailer, storage container, port-a-john, etc.)
- Establish exclusion zones
- Construct equipment pads (gravel and/or concrete) as required
- Install utility services for the project including, electric, water, and sewer (performed by others)

4.3.2 ISTR System Installation

The TCH heater wells are laid out on a triangular grid pattern with a spacing of approximately 14 feet. In portions of the site with sufficient vadose zone thickness the VEWs are located approximately 3 ft from each heater well. In the portion of the site to the east of the railroad right-of-way, where the vadose zone is thin (i.e., <3 ft thick), permeable fill will be placed over the ground surface and horizontal VEWs will be installed. Combined temperature/pressure and groundwater level monitoring wells are distributed evenly throughout the wellfield.

The total number of wells for the ISTR program area is as follows:

- 593 heater wells (based on a spacing of 14 feet),
- 550 vertical vapor extraction wells across the unsaturated zone,
- 260 linear feet of horizontal vapor extraction wells,
- 50 boreholes for temperature monitoring, and
- 25 combined temperature/pressure and groundwater level.
- 7 Groundwater Monitoring wells

Wellfield installation activities include the following:

- Install wells and measurement points (heater wells, vacuum extraction wells, temperature and pressure measurement points)
- Install the surface cover
- Install heater elements into the wells
- Run vapor collection manifold pipe and fit up connections to the individual vapor extraction wells
- Install vapor collection and treatment equipment
- Install liquid (condensate) treatment system
- Make utility connections for water and sewer
- Install the electrical power service for the ISTR program at the Site system
- Wire ISTD heaters and process treatment equipment
- Install and wire field and process system instrumentation
- Calibrate, test and shakedown all equipment, instruments and systems; and
- Install Groundwater Monitoring wells

Vapors will be extracted from the subsurface under vacuum and pass through a moisture separator to remove entrained liquid and condensate prior to vapor treatment by dual Thermal Oxidizers (TO) and a wet scrubber.

The liquid condensate that accumulates in the wellfield piping manifold and moisture separator will be transferred to a phase separator designed to separate Light Non-Aqueous Phase Liquid (LNAPL) and DNAPL from water, if present. LNAPL and DNAPL, if present, will be collected in drums and the effluent water will be conveyed to an air stripper for treatment followed by a liquid phase carbon absorber for final polish prior to discharge to the Publically Owned Treatment Works (POTW).

4.3.3 ISTD System Operation

Once TerraTherm has completed and tested the electrical and mechanical connections, the ISTR program system will be commissioned and startup testing will begin. This includes calibrating and testing instrumentation, testing process safety interlocks, and starting and checking process vent fans, AQC and scrubber systems, and other major components of the

off-gas treatment system. Once the system commissioning and testing is successfully completed, the heaters will be energized and the ISTR program at the Site will begin.

4.3.4 ISTD System Monitoring

The ISTD system operator will collect the following measurements manually (Monday through Friday; and Saturday and Sunday, if onsite):

- Power usage (reading of totalizing meters) and circuit amperage readings.
- Cumulative liquid flows from totalizing flow-meters.
- Temperature, pressure and flow gauge readings for the treatment system.
- Wellfield temperature readings.
- Wellfield pressure readings (gauges placed in the wellfield).
- Groundwater Sampling

In addition, at least once per site visit, the site operator will perform a general inspection of the accessible ISTR program at the Site system components to identify components that may require maintenance or adjustment and to correct potential problems before they occur. In addition to these manual measurements, certain process performance monitoring data will be collected by the Programmable Logic Controller (PLC) and data acquisition system.

TerraTherm's home office will also remotely monitor the system and an automatic teledialer will call out to both the system operator and the home office in the event of any system upset such as a power failure, low vacuum/blower fault, etc.

4.4 Other Sampling/Monitoring Requirements

4.4.1 Air Emissions Monitoring

A handheld photo-ionization detector (MiniRAE 2000 or similar) will be used to screen the vapor concentrations. Ambient air samples within the ISTR program area will be collected to monitor the ambient air quality during the construction and operation of the ISTR system. Additionally, TerraTherm will obtain process vapor samples in order to monitor the efficiency of the AQC system. Process vapor samples will be collected at sample locations located in the influent to and effluent from the compression and condenser treatment unit, and the effluent from the vapor-phase Granular Activated Carbon (GAC) polishing unit.

A humidity filter is typically required for the PID. The screening data will be included in the daily data collection sheet.

4.4.2 Soil Sampling

Two interim and one confirmatory soil sampling effort will be conducted by TerraTherm staff.

4.5 Disposition of Contaminated Materials

A limited volume of contaminated materials may be generated throughout the various stages of the thermal remedy including:

- Soil cuttings during well installations and sampling;
- Spent media associated with the vapor treatment system;
- Excess condensate and water associated with personnel and equipment decontamination;
- Particulate matter that may be collected by the AQC system; and
- Construction debris and waste materials generated during demobilization from the site.
- NAPL

Soil waste material, spent media and decontamination fluids will be sampled for waste characterization to determine final disposition.

4.6 System Demobilization

Upon completion of the ISTR program at the Site, temporary facilities will be disconnected and/or removed as appropriate. Once post-treatment sampling is completed, heaters, wiring and piping will be removed from the wellfield, decontaminated as required and demobilized. The aboveground ISTD equipment will be decontaminated and demobilized. Thermal wells and measurement points will be filled with bentonite-cement grout from the bottom up to surface of the vapor cap using a tremie tube. Prior to demobilizing from the site, TerraTherm will perform rough grading as needed to maintain adequate drainage, remove berms or swales constructed for the thermal remedy, and generally return the site to a condition substantially similar to its condition prior to the start of construction.

5. Chemical Hazards and Exposure Control

5.1 Chemical Hazards

5.1.1 Contaminants of Concern

The primary contaminants of concern (COCs) identified in the subsurface at the at the Site include various metals, VOCs/NAPL, Polycyclic Aromatic Hydrocarbons (PAHs), PolyChlorinated Biphenyls (PCBs) and organic compounds, including halogenated compounds.

Overexposure to the COCs likely to be present in the Site soils may result in the symptoms listed in Table 5.1 below. Table 5.1 below also lists the OSHA Permissible Exposure Limits (PEL), the NIOSH Immediately Dangerous to Life and Health (IDLH) concentrations, and the possible exposure route for Site COCs and the treatment for exposure.

Note that Table 5.1 also identifies the COCs that are possible human carcinogens including: arsenic, benzene, beryllium, cadmium, PAHs, 1,2-dichloroethane, methylene chloride, nickel, PCBs, trichloroethene, and vinyl chloride.

Note that the IDLH concentration is a vapor phase concentration, as compared to the soil concentration that will be encountered during onsite activities. However, if high soil concentrations and/or NAPL are encountered at some locations in the ISTR program at the Site this has the potential to produce elevated concentrations in the vapor phase that could impact the breathing zone. As such, ambient air monitoring will be conducted to monitor breathing zone VOC concentrations.

Attachment C contains the full OSHA/EPA Occupational Chemical Database reports for the site COCs. Given the potential hazards associated with these chemicals, it is important that the reader familiarize himself with the key data on the OSHA/EPA and MSDS data sheets.

Table 5.1. Chemical Hazard Information

Substance [CAS Number]	IP[1] (eV)	Odor Threshold (ppm)	Route[2]	Symptoms of Exposure	Treatment	TWA[3]	STEL[4]	Source[5]	IDLH (NIOSH)[6]
Acetone [67-64-1]	9.7	13-100	Inh Ing Con	Irritated eyes, nose, and throat; headache; dizziness; dermatitis	Eye: Irrigate immediately Skin: Soap wash immediately Breath: Respiratory support Swallow: Immediate medical attention	1000 ppm 500 ppm 250 ppm	750 ppm	PEL TLV REL	20,000 ppm
Arsenic and soluble inorganic compounds (as As) [7740-38-2]	NA	NA	Inh Abs Ing Con	Ulceration of nasal septum; dermatitis; gastrointestinal disturbances; hyperpigmentation of skin (carcinogenic); peripheral neuropathy; respiratory irritation	Eye: Irrigate immediately (15 min) Skin: Soap wash immediately Breath: Respiratory support Swallow: Immediate medical attention	0.01 mg/m^3 0.01 mg/m^3 (Ca-29 CFR 1910.1018)	C0.002 mg/m^3	PEL TLV REL	Ca (5 mg/m^3)
Barium soluble compounds (as Ba) [7440-39-3]	ND	NA	Inh Ing Con	Upper respiratory irritation; gastroenteritis; muscular spasms; slow pulse, extra systoles; hypokalemia; eye and skin irritation; skin burns	Eye: Irrigate immediately Skin: Water flush immediately Breath: Respiratory support Swallow: Immediate medical attention	0.5 mg/m^3 0.5 mg/m^3 0.5 mg/m^3		PEL TLV REL	50 mg/m^3
Benzene [71-43-2]	9.24	34-119	Inh Abs Ing Con	Irritated eyes, nose, skin, and respiratory system; giddiness; headache; nausea; staggered gait; fatigue; anorexia, lassitude; dermatitis; bone marrow depression – carcinogenic	Eye: Irrigate immediately Skin: Soap wash immediately Breath: Respiratory support Swallow: Immediate medical attention	1 ppm (0.5 ppm) NIC-0.1 skin 0.1 ppm	2.5 ppm	PEL TLV REL	Ca (500 ppm)* *OSHA 29 CFR 1910.1028
Beryllium and compounds (as Be) [7440-41-7]	NA	NA	Inh Con	Respiratory systems; weakness, fatigue, weight loss – carcinogenic	Eye: Irrigate immediately Skin: Soap wash immediately Breath: Respiratory support Swallow: Immediate medical attention	0.002 mg/m^3 NTE 0.0005 mg/ m^3 0.002 mg/m^3	C0.005 mg/m^3 (30 min max)	PEL TLV REL	Ca (4 mg/m^3)
2-Butanol [78-92-2]	10.1		Inh Ing Con	Throat irritation, cough, and difficulty breathing; headache, nausea and vomiting, diarrhea, muscle weakness, giddiness, ataxia, confusion, delirium, and coma.	Eye: Irrigate immediately Skin: Soap wash immediately Breath: Respiratory support Swallow: Immediate medical attention	150 ppm 100 ppm 100 ppm,	150 ppm	PEL TLV REL	2000 ppm
2-Butanone (MEK) [78-93-3]	9.54	NE	Inh Ing Con	Irritated eyes, skin, nose; headache dizziness; vomiting; dermatitis	Eye: Irrigate immediately Skin: Soap wash immediately Breath: Respiratory support	200 ppm 200 ppm 200 ppm	300 ppm 300 ppm	PEL TLV REL	3000 ppm

Substance [CAS Number]	IP[1] (eV)	Odor Threshold (ppm)	Route[2]	Symptoms of Exposure	Treatment	TWA[3]	STEL[4]	Source[5]	IDLH (NIOSH)[6]
					Swallow: Immediate medical attention				

Cis-1,2-Dichloroethene 156-59-2	9.65	17	Inh Ing Con	Irritated eyes, nausea, vomiting, and epigastric distress. Symptoms of exposure-related narcosis including drowsiness, tremor, incoordination, dizziness, and weakness; defatting of skin/dermatitis	Eye: Irrigate immediately Skin: Soap wash promptly Breath: Respiratory support Swallow: Immediate medical attention	200 ppm 200 ppm 200 ppm		PEL TLV REL	1000 ppm
Cadmium dust (as Cd) [7440-43-9]	NA	NA	Inh Ing	Pulmonary edema, dyspnea, cough, chest tightness, substernal pain; headache; chills, muscular aches; nausea, vomiting, diarrhea; anosmia, emphysema, proteinuria, mild anemia – carcinogenic	Eye: Irrigate immediately Skin: Soap wash immediately Breath: Respiratory support Swallow: Immediate medical attention	0.005 mg/m^3 0.01 mg/m^3 Ca, lowest feasible concentration		PEL TLV REL	Ca (9 mg/m^3)
Carbon Tetrachloride 56-23-5	11.47	NA	Inh Abs Ing Con	Irritation to eyes, skin; CNS depression; nausea, vomiting, drowsiness, dizziness, incoordination; liver and kidney injury	Eye: Irrigate immediately Skin: Soap wash immediately Breath: Respiratory support Swallow: Immediate medical attention	10 ppm; Ceiling: 25ppm, 200 ppm, 5-minute maximum peak in any 4 hours 5 ppm 2 ppm, 60 minutes	2 ppm, 60 minutes	PEL TLV REL	200 ppm
Chloroethane [75-00-3]			Inh Abs	Highly discomforting to the upper respiratory tract and lungs and may be harmful if inhaled. Depression of the central nervous system Ingestion may result in nausea, abdominal irritation, pain and vomiting	Eye: Irrigate immediately Skin: Soap wash immediately Breath: Respiratory support Swallow: Immediate medical attention	1000 ppm 100 ppm; skin		PEL TLV REL	3800 ppm (10% LEL).
Chromium metal (as Cr) [7440-47-3]	NA	NA	Inh Ing	Histologic fibrosis of lungs	Eye: Irrigate immediately Skin: Soap wash immediately Breath: Respiratory support Swallow: Immediate medical attention	1 mg/m^3 0.5 mg/m^3 0.5 mg/m^3		PEL TLV REL	250 mg/m^3

Coal-tar-pitch volatiles (benzene-soluble fraction) (polynuclear aromatic hydrocarbons [PAH]) [65996-93-2]	ND	ND	Ing Con	Eye sensitivity to light; eye and skin irritation, dermatitis, bronchitis; carcinogenic	Eye: Irrigate immediately Skin: Soap wash immediately Breath: Respiratory support Swallow: Immediate medical attention	0.2 mg/m^3 0.2 mg/m^3 0.1 mg/m^3		PEL TLV REL	Ca [80 mg/m^3]
Copper dusts and mists (metal) (copper sulfate) [7440-50-8]	NA	NA	Inh Ing Con	Irritated pharynx and nasal mucous membrane; nasal perforation; eye irritation; metallic taste; dermatitis; in animals: lung, kidney, and liver damage; anemia	Eye: Irrigate immediately Skin: Soap wash immediately Breath: Respiratory support Swallow: Immediate medical attention	1 mg/m^3 1 mg/m^3 1 mg/m^3		PEL TLV REL	100 mg/m^4
1,2-Dichloroethane (ethylene dichloride) (107-06-02	11.05	ND	Inh Abs Ing Con	Depressed cns, nausea, vomiting, dermatitis, irritated eyes, corneal opacity. Carcinogenic	Eye: Irrigate immediately Skin: Soap wash promptly Breath: Respiratory support Swallow: Immediate medical attention	50 ppm w/ceiling 100ppm 10 ppm 1 ppm	2 ppm 2 ppm	PEL TLV REL	Ca (50 ppm)
1,2 Dichloroethylene (DCE) 540-59-0	9.65		Inh Ing Con	Irritated eyes, respiratory system; CNS depression	Eye: Irrigate immediately Skin: Soap wash immediately Breath: Respiratory support Swallow: Immediate medical attention	200 ppm 200 ppm 200 ppm		PEL TLV REL	1000 ppm
1,1-Dichloroethane [75-35-3]	11.06		Inh Ing Con	Irritated skin; CNS depression, liver, kidney, lung damage	Eye: Irrigate immediately Skin: Soap wash immediately Breath: Respiratory support Swallow: Immediate medical attention	100 ppm 100 ppm	300 ppm	PEL TLV REL	
1,1-Dichlorethane 75-34-3			Inh Ing Con	Irritation to eyes, skin and respiratory tract; dizziness, coughing, staggering, disturbed vision, irregular heartbeat, unconsciousness	Eye: Irrigate immediately Skin: Soap wash immediately Breath: Move to fresh air, respiratory support Swallow: Medical support, do not induce vomiting	100 ppm 100 ppm 100 ppm		PEL TLV REL	3000 ppm

1,1-Dichloroethene (vinylidene chloride) [75-35-4]	8.20	ND	Ing Inh Con Abs	Irritated eyes, skin, throat; dizziness, headache, nausea; dyspnea; liver, kidney dysfunction, pneuitis; carcinogen	Eye: Irrigate immediately Skin: Soap wash immediately Breath: Respiratory support Swallow: Immediate medical attention	5 ppm		PEL TLV REL	
Ethylbenzene [100-41-4]	8.76	0.09-0.6	Inh Ing Con	Irritated eyes, mucous membranes; headache; dermatitis; narcosis, coma	Eye: Irrigate immediately Skin: Water flush immediately Breath: Respiratory support Swallow: Immediate medical attention	100 ppm 100 ppm 100 ppm	125 ppm 125 ppm 125 ppm	PEL TLV REL	800 ppm
Ethanol [64-17-5]			Inh Con Ing	Discomforting to the upper respiratory tract; vapor is discomforting to the eyes; liquid is mildly discomforting to the skin and may cause drying of the skin, which may lead to dermatitis	Eye: Irrigate immediately Skin: Water flush immediately Breath: Respiratory support Swallow: Immediate medical attention		1000 ppm 1000 ppm	PEL TLV REL	3300 ppm (10% LEL)
Iron oxide, dust and fumes (as Fe) [1309-37-1]	NA	NA	Inh	Non-progressive dust-caused lung disease, with x-ray shadows indistinguishable from progressive fibrous lung disease	Breath: Respiratory support	10 mg/m^3* 5 mg/m^3 5 mg/m^3* *total particulate		PEL TLV REL	2500 mg/m^3
Lead, inorganic dusts and fumes (as Pb) [7439-92-1]	NA	NA	Inh Ing Con	Weakness, lassitude, insomnia; facial pallor; eye pallor; anorexia, low weight, malnutrition; constipation, abdominal pain, colic; anemia; gingival lead line; tremors; wrist and ankle paralysis; brain damage; kidney damage; irritated eyes; hypotension	Eye: Irrigate immediately Skin: Soap wash immediately Breath: Respiratory support Swallow: Immediate medical attention	0.05 mg/m^3 0.05 mg/m^3 <0.1 mg/m^3 See 29 CFR 1910.1025		PEL TLV REL	100 mg/m^3
Manganese, dust and compounds (as Mn) [7439-96-5]	NA	NA	Inh Ing	Parkinson's; asthenia, insomnia, mental confusion; metal fume fever; dry throat, cough, tight chest, dyspnea, rales, flu-like fever; low back pain; vomiting; malaise; fatigue	Breath: Respiratory support Swallow: Immediate medical attention	0.2 mg/m^3 1 mg/m^3	C5 mg/m^3 3 mg/m^3	PEL TLV REL	500 mg/m^3
Magnesium metal [7439-95-4]	ND	ND	Inh Abs Ing Con	Irritated upper respiratory tract, eyes, and skin; coughing, conjunctivitis; small blisters; nausea, vomiting, hypotension	Eye: Irrigate immediately Skin: Water flush immediately Breath: Respiratory support Swallow: Immediate medical attention	NE		PEL TLV REL	

Methyl alcohol (Methanol) 67-56-1	10.84	2000 ppm	Inh Abs Ing Con	Irritated eyes, skin, upper respiratory syst; head drowsiness, dizziness, vertigo, nausea, vomiting; blindness	Eye: Irrigate immediately Skin: Water flush promptly Breath: Respiratory support Swallow: Immediate medical attention	200 ppm 200 ppm 200 ppm	250 ppm	PEL TLV REL	6000 ppm
4-Methyl-2-Pentanone (Methyl isobutyl ketone, hexanone) [108-10-1]	9.3		Inh Ing Con	Irritated eyes, skin, mucous membrane, headache, narcosis, coma; dermatitis; in animals: liver kidney damage	Eye: Irrigate immediately Skin: Water flush immediately Breath: Respiratory support Swallow: Immediate medical attention	100 ppm 50 ppm 50 ppm			500 ppm
Mercury vapor [7439-97-6]	ND	ND	Inh Abs Con	Coughing, chest pain, dyspnea, bronchial pneumonitis; tremors, insomnia; irritability, indecision; headache; fatigue, weakness, stomatitis, salivation; gastrointestinal disturbance, anorexia, low weight; proteinuria; irritated eyes and skin	Eye: Irrigate immediately Skin: Soap wash immediately Breath: Respiratory support Swallow: Immediate medical attention	0.05 mg/m^3 0.025 mg/m^3 0.05 mg/m^3 (skin)	C0.1 ppm C0.1 ppm	PEL TLV REL	2 mg/m^3
Methylene chloride (dichloromethane) [75-09-2]	11.32	ND	Inh Ing Con	Fatigue, weakness, sleepiness, lightheadedness; numbness and tingling in limbs; nausea; irritated eyes and skin	Eye: Irrigate immediately Skin: Soap wash immediately Breath: Respiratory support Swallow: Immediate medical attention	25 ppm 50 ppm	C1,000 ppm C2,000 mg/m^3 (5 min in 2 hrs)	PEL TLV REL	Ca (2300 ppm)
Naphthalene [91-203]	8.12	ND	Inh Abs Ing Con	Irritated eyes; headache; confusion, excitement, malaise; nausea, vomiting, abdominal pain; irritated bladder, profuse sweating; jaundice, renal shutdown; dermatitis	Eye: Irrigate immediately Skin: Molten flush immediately/ sol-liq soap wash promptly Breath: Respiratory support Swallow: Immediate medical attention	10 ppm 10 ppm 10 ppm	15 ppm	PEL TLV REL	250 ppm
Nickel, metal, and other compounds (as Ni) [7440-02-0]	NA	NA	Inh Ing Con	Headache, vertigo; nausea, vomiting, epigastric pain; substernal pain; coughing, hyperpnea; cyanosis; weakness; leukocytosis, pneumonitis; delirium, convulsions – carcinogenic	Eye: Irrigate immediately Skin: Water flush immediately Breath: Respiratory support Swallow: Immediate medical attention	1 mg/m^3 1.5 mg/m^3* 0.015 mg/m^3 Ca *NIC-0.05 A1		PEL TLV REL	Ca 10 mg/m^3
Phenol [108-95-2]	8.5	0.040-3.0	Inh Abs Ing Con	Irritated eyes, nose, and throat; anorexia, low weight; weakness, muscular aches and pains; dark urine; cyanosis; liver and kidney damage; skin burns; dermatitis; ochronosis; tremors, convulsions, twitching	Eye: Irrigate immediately Skin: Soap wash immediately Breath: Respiratory support Swallow: Immediate medical attention	5 ppm (skin) 5 ppm (skin) 5 ppm (skin)	C15.6 ppm	PEL TLV REL	250 ppm

Polychlorinated biphenyls (PCB) Aroclor 1242 [53469-21-9] and Aroclor 1254 [11097-69-1]	ND	ND	Inh Abs Ing Con	Aroclor 1242: irritated eyes; chloracne; acne-form dermatitis; mildly toxic by ingestion; poison by subcutaneous route – carcinogenic Aroclor 1254: irritated eyes and skin; acne-form dermatitis; poison by intravenous route; moderately toxic by ingestion and intraperitoneal routes – carcinogenic	Eye: Irrigate immediately Skin: Soap wash immediately Breath: Respiratory support Swallow: Immediate medical attention	Aroclor 1242: 1 mg/m^3 (skin) 1 mg/m^3 (skin) 0.001 mg/m^3 Aroclor 1254: 0.5 mg/m^3 (skin) 0.5 mg/m^3 (skin) 0.001 mg/m^3		PEL TLV REL PEL TLV REL	Ca (10 mg/m^3) Ca (5 mg/m^3)
2-Propanol [67-63-0]			Inh Abs Ing Con	irritating to the respiratory tract and can cause central nervous system depression; nausea and vomiting, headache, facial flushing, dizziness, lowered blood pressure, mental depression, hallucinations and distorted perceptions, difficulty breathing, respiratory depression, stupor, unconsciousness, and coma. Kidney insufficiency including oliguria (reduced urine excretion), anuria (absent urine excretion), nitrogen retention, and edema (fluid build-up in tissues) may occur.	Eye: Irrigate immediately Skin: Soap wash immediately Breath: Respiratory support Swallow: Immediate medical attention	400 ppm 200 ppm 400 ppm	400 ppm	PEL TLV RELs	2000 ppm (10% LEL).
Silver (metal) [7440-22-4]	NA	NA	Inh Ing Con	Blue-gray eyes, nasal septum, throat, and skin; irritated skin, ulceration; gastrointestinal disturbance	Eye: Irrigate immediately Skin: Water flush immediately Breath: Respiratory support Swallow: Immediate medical attention	0.01 mg/m^3 0.1 mg/m^3 0.01 mg/m^3		PEL TLV REL	10 mg/m^3
Styrene [100-42-5]	8.40	ND	Inh Abs Ing Con	Irritated eyes, nose, and respiratory system; headache; fatigue, dizziness, confusion, malaise, drowsiness, unsteady gait; narcosis; defatting dermatitis; reproductive effects	Eye: Irrigate immediately Skin: Water flush immediately Breath: Respiratory support Swallow: Immediate medical attention	100 ppm 20 ppm 50 ppm	100 ppm	PEL TLV REL	700 ppm

Tetrahydrofuran [109-99-9]			Ing Con	Moderately discomforting to the upper respiratory tract. Inhalation of vapor may aggravate a pre-existing respiratory condition. Overexposure by inhalation may result in the irritation of the mucous membrane and cause coughing, chest pains, nausea, dizziness, headache and narcosis. Exposure to high concentrations can affect the central nervous system skin contact may cause reactions which may lead to dermatitis. Certain grades of tetrahydrofuran may cause liver and kidney damage.	Eye: Irrigate immediately Skin: Soap wash immediately Breath: Respiratory support Swallow: Immediate medical attention	200 ppm 200 ppm 200 ppm	250ppm 250ppm	PEL TLV REL	2000 ppm (10% LEL).
Tetrachloroethylene (perchloroethylene) [127-18-4]	9.32	ND	Inh Abs Ing Con	Irritation to eyes, skin, nose, throat, and respiratory system; nausea; flush face, neck; vertigo, dizziness, incoordination; headache, somnolence; skin erythema; liver damage; carcinogen	Eye: Irrigate immediately Skin: Soap wash immediately Breath: Respiratory support Swallow: Immediate medical attention	100 ppm 25 ppm	C 200 ppm, 300 ppm (5-min maximum peak in any three hours)	PEL TLV REL	150 ppm
Thallium [7440-28-0]	ND	ND	Inh Abs Ing Con	Irritated eyes and skin; nausea, vomiting, diarrhea; headache; chest pain or tightness; excessive salivation	Eye: Irrigate immediately Skin: Soap wash immediately Breath: Respiratory support Swallow: Immediate medical attention	0.1 mg/m^3 0.1 mg/m^3 0.1 mg/m^3		PEL TLV REL	15 mg/m^3
Trichloroethylene (TCE, trichloroethene) [79-01-6]	9.45	21.4	Inh Ing Con	Headache, vertigo; visual disturbance, tremors, somnolence, nausea, vomiting; irritated eyes; dermatitis; cardiac arrhythmia, paresthesia – carcinogenic	Eye: Irrigate immediately Skin: Soap wash immediately Breath: Respiratory support Swallow: Immediate medical attention	100 ppm 50 ppm 25 ppm (10-hour)	C200 ppm C100 ppm C2 ppm (60 MIN)	PEL TLV REL	Ca (1,000 ppm)
1,1,1-Trichloroethane (methyl chloroform) [71-55-6]	11.0		Inh Ing Con	Irritated eyes, skin; headache, lassitude, CNS depression, poor equilibrium, dermatitis, cardiac arrhythmia; liver damage	Eye: Irrigate immediately Skin: Soap wash immediately Breath: Respiratory support Swallow: Immediate medical attention	350 ppm 350 ppm	450 ppm C 350 ppm	PEL TLV REL	700ppm

Vanadium pentoxide (as dust) [1314-62-1]			Inh Ing Con	Irritated eyes, skin, throat; green tongue, metallic taste; eczema; cough; fine rales, wheezing, bronchitis dyspnea (breathing difficulty)	Eye: Irrigate immediately Skin: Soap wash immediately Breath: Respiratory support Swallow: Immediate medical attention	0.5 ppm	C0.5 mg/m^3 (respirable)	PEL TLV REL	35 mg/m^3
Vinyl chloride [75-01-4]	9.99	25	Inh Con	Intoxication, weakness; abdominal pain; GI bleeding; enlarged liver; pallor; cyanosis of extremities	Eye: Irrigate immediately Skin: Soap wash immediately Breath: Respiratory support Swallow: Immediate medical attention	1 ppm 1 ppm	5 ppm	PEL TLV REL	Ca
Xylene (o-, m-, and p-isomers) [1330-20-7; 95-47-6; 108-38-3; 106-42-3]	8.56 8.56 8.44	1.1-20	Inh Abs Ing Con	Dizziness, excitement, drowsiness, incoordination, staggering gait; irritated eyes, nose, throat; corneal vacuolization; anorexia, nausea, vomiting, abdominal pain; dermatitis	Eye: Irrigate immediately Skin: Soap wash immediately Breath: Respiratory support Swallow: Immediate medical attention	100 ppm 100 ppm 100 ppm	150 ppm 150 ppm 150 ppm	PEL TLV REL	900 ppm
Zinc (as oxide fume) [1314-13-2]	NA	NA	Inh	Sweet metallic taste; dry throat, cough, chills, fever; tight chest, dyspnea, rales, reduced pulmonary function; headache; blurred vision; muscular cramps, low back pain; nausea, vomiting; fatigue, lassitude, malaise	Breath: Respiratory support	5 mg/m^3 5 mg/m^3 5 mg/m^3	10 mg/m^3	PEL TLV REL	50 mg/m^3

[1]IP = Ionization potential (electron volts).
[2]Route = Inh, Inhalation; Abs, Skin absorption; Ing, Ingestion; and Con, Skin and/or eye contact.
[3]TWA = Time-weighted average. The TWA concentration for a normal workday (usually 8 or 10 hours) and a 40-hour work week, to which nearly all workers may be repeatedly exposed, day after day without adverse effect.
[4]STEL = Short-term exposure limit. A 15-minute TWA exposure that should not be exceeded at any time during a workday, even if the TWA is not exceeded.
[5]PEL = Occupational Safety and Health Administration (OSHA) permissible exposure limit (29 CFR 1910.1000, Table Z).
[5]TLV = American Conference of Governmental Industrial Hygiene (ACGIH) threshold limit value – TWA.
[5]REL = National Institute for Occupational Safety and Health (NIOSH) recommended exposure limit.
[6]IDLH (NIOSH) = Immediately dangerous to life or health (NIOSH). Represents the maximum concentration from which, in the event of respirator failure, one could escape within 30 minutes without a respirator and without experiencing any escape-impairing or irreversible health effects.
NE = None established. No evidence could be found for the existence of an IDLH (NIOSH Pocket Guide to Chemical Hazards, Pub. No. 90-117, 1990, 1997).
C = Ceiling limit value which should not be exceeded at any time.
Ca = Carcinogen.
NA = Not applicable.
ND = Not Determined.

LEL = Lower explosive limits.
LC_{50} = Lethal concentration for 50 percent of population tested.
LD_{50} = Lethal dose for 50 percent of population tested.
NIC = Notice of intended change (ACGIH).

References:

American Conference of Governmental Industrial Hygienists Guide to Occupational Exposure Values, 2004, compiled by the American Conference of Governmental Industrial Hygienists.
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Odor Threshold for Chemicals with Established Occupational Health Standards, American industrial Hygiene Association, 1989.
Respirator Selection Guide, 3M Occupational Health and Safety Division, 1993.
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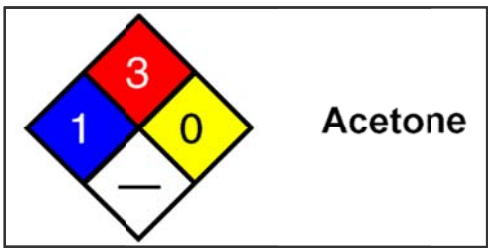
Warning Properties of Industrial Chemicals – Occupational Health Resource Center, Oregon Lung Association.
Workplace Environmental Exposure Levels, American Industrial Hygiene Association, 1992.

5.1.2 Hazardous Substances Brought On-Site by TerraTherm or Subcontractors

A material safety data sheet (MSDS) must be available for each hazardous substance that TerraTherm or their subcontractors bring on the site. This includes solutions/chemicals that will be used to decontaminate sampling equipment, calibration gases, or fuels.

In addition, all containers of hazardous materials, including tanks, vessels and other containers, must be labeled in compliance with OSHA's Hazard Communication Standard with either the original manufacturer's label or an NFPA 704M label specific for the material (as shown at right).



5.2 Chemical Exposure and Control

5.2.1 Chemical Exposure Potential

Site soils are known to be impacted with various metals, VOCs/NAPL, polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs) and organic compounds, including halogenated compounds. Although efforts will be made during drilling to minimize soil cuttings, impacted subsurface soils may be brought to the surface during well installation activities. Therefore, the field team should be prepared for the potential for exposure to the contaminants of concern, via inhalation of dusts and vapors and direct dermal contact.

5.2.2 Chemical Exposure Control

TerraTherm will use several methods to control the potential for chemical exposure during the proposed ISTR program at the Site:

- The breathing zone of employees will be screened for the presence of chlorinated VOC vapors using a PID during subsurface activities that disturb contaminated soils as well as during the sampling of the off-gas system. Where applicable, focused screening will be performed for known carcinogenic compounds via short-term detector tubes (i.e., Draeger or other) or time-weighted average exposure monitoring. Engineering controls will be used to minimize vapor or airborne hazards to the extent possible. If sustained vapor concentrations exceed the established action level, as defined in Section 7.1, respiratory protection, as indicated in Section 8.2, will be donned.
- The ISTD wells will be installed using sonic drilling technology; therefore, dust generation is expected to be minimized. If a significant amount of visible dust is generated, the SSO may opt to utilize a portable dust monitor during well installation/excavation activities to determine if sustained dust levels exceed the established action level. Engineering controls (e.g., applying light mist of water; modifying drilling methods) will be used if the action limit is exceeded.
- To avoid direct dermal contact with contaminated soils, protective clothing, as described in Section 8.1, will be required, as specified for each task.
- Although highly unlikely, exposure to the contaminants of concern may occur via ingestion (hand-to-mouth transfer). The decontamination procedures described in Section 10.0 address personal hygiene issues that will limit the potential for contaminant ingestion.

6. Physical Hazards and Controls

6.1 Utility Hazards

6.1.1 Underground Utilities

It is expected that all subsurface utilities within the immediate vicinity of the ISTR program at the Site will have been relocated prior to TerraTherm's mobilization to the Site. Regardless, the driller and excavating contractors must exercise due diligence and try to identify the location of any private utilities on the property being investigated. The contractors can fulfill this requirement in several ways, including:

- Obtaining as-built drawings for the areas being investigated from the property owner;
- Visually reviewing each proposed drilling/excavation location with the property owner or knowledgeable site representative;
- Hiring a private line locating firm to determine the location of utility lines that are present at the property or, if necessary, performing a geophysical survey to locate utilities;
- Identifying a no-drill zone; or,
- Hand digging or vacuum excavation in the proposed drilling locations if insufficient data is available to accurately determine the location of the utility lines.

6.1.2 Overhead Utilities

Any vehicle or mechanical equipment capable of having parts of its structure elevated (i.e., drill rig, manlift, telehandler, crane) near energized overhead lines shall be operated so that a clearance of at least 10 feet is maintained. If the voltage is higher than 50kV, the clearance shall be increased 4 inches for every 10kV over that voltage.

The danger posed by overhead power lines at the site will be compounded during use of cranes by other factors, such as uneven ground that could cause the crane to weave or bob into power lines, and windy conditions that can make the power lines sway, reducing clearance. To address these risks, the following procedures shall be followed:

* Overhead power lines and safe routes will be marked where cranes must repeatedly travel.
* The crane will be operated at a slower-than-normal speed in the vicinity of power lines.
* When working around overhead power lines, the lines will be de-energize, grounded, guarded, and/or insulated, if feasible.
* If the power lines are not de-energized, cranes will only be operated if a safe minimum clearance is maintained.
* If maintaining safe clearance by visual means is difficult, the SSO to observe the clearance and to give immediate warning when the crane approaches the limits of safe clearance.
* All persons shall keep well away from the crane whenever it is close to power lines.
* The crane or its load shall not be contacted until a signal person indicates that it is safe to do so.

6.2 Drilling Hazards

Sonic drilling technology will be used to install the wells and measurement points for the ISTR program at the Site. Use of a drill rig to install thermal wells will require all personnel in the

vicinity of the operating rig to wear steel-toed boots, hardhats, hearing protection and safety eyewear. Personnel shall not remain in the vicinity of operating equipment unless it is required for their work responsibilities. Additionally, the following safety requirements must be adhered to:

- All drill rigs and other machinery with exposed moving parts must be equipped with an operational emergency stop device. Drillers and technicians must be aware of the location of this device. This device must be tested prior to job initiation and periodically thereafter. The driller/operator and helper shall not simultaneously handle augers while the rig is operating unless there is a standby person to activate the emergency stop.
- The driller/operator must never leave the controls while the tools are rotating/driving unless all personnel are kept clear of rotating equipment.
- A long-handled shovel or equivalent must be used to clear drill cuttings away from the hole and from rotating/driving tools. Hands and/or feet are not to be used for this purpose.
- A remote sampling device must be used to sample drill cuttings if the tools are rotating or if the tools are readily capable of rotating. Samplers must not reach into or near the rotating equipment. If personnel must work near any tools that could rotate, the driller/operator must shut down the rig prior to initiating such work.
- Drillers, helpers, and technicians must secure all loose clothing, or other items that could become entangled in the machinery when in the vicinity of drilling/driving operations.
- Only equipment that has been approved by the manufacturer may be used in conjunction with site equipment and specifically to attach sections of drilling tools together. Pins that protrude excessively from augers/casing segments shall not be allowed.
- No person shall climb the drill mast while tools are rotating/operating.
- No person shall climb the drill mast without the use of ANSI-approved fall protection (approved belts, lanyards, and a fall protection slide rail) or portable ladder that meets the requirements of OSHA standards.

6.3 Noise

Use of heavy equipment during thermal well installation may expose the field team to noise levels that exceed the OSHA PEL of 90 dBA for an 8-hour day. Exposure to noise can result in the following:

- Temporary hearing losses where normal hearing returns after a rest period;
- Interference with speech communication and the perception of auditory signals;
- Interference with the performance of complicated tasks; and,
- Permanent hearing loss due to repeated exposure resulting in nerve destruction in the hearing organ.

Since personal noise monitoring will not be conducted during the proposed activities, employees must follow this general rule of thumb: If the noise levels are such that you must shout at someone 5 feet away from you, you need to be wearing hearing protection. Employees can wear either disposable earplugs or earmuffs but all hearing protection must have a minimum noise reduction rating (NRR) of 27 db.

6.4 Back Safety

Using the proper techniques to lift and move heavy and awkward pieces of equipment is important to reduce the potential for back injury. The following precautions should be implemented when lifting or moving heavy objects:

- Use mechanical devices to move objects that are too heavy to be moved manually.
- If mechanical devices are not available, ask another person to assist you.
- Bend at the knees, not the waist. Let your legs do the lifting.
- Do not twist while lifting.
- Bring the load as close to you as possible before lifting.
- Bring a card table into the field so that work can be performed at waist level versus bending over from the ground surface.
- Be sure the path you are taking while carrying a heavy object is free of obstructions and slip, trip, and fall hazards.

6.5 Hand and Power Tool Use

A variety of hand and power tools may be used during the pre-construction, system installation and demobilization activities, as well as during routine system operations and maintenance tasks. The use of each can pose serious safety hazards to the user.

6.5.1 Hand Tools

The greatest hazards posed by hand tools result from misuse and improper maintenance.

- When using hand tools be sure you have selected the right tool for the job. If a chisel is used as a screwdriver, the tip of the chisel may break or fly off, hitting the user or others.
- Inspect tools for damage such as mushroomed chisel heads or broken hammer handles. If jaws of a wrench are sprung, the wrench may slip. If a wooden handle is loose, splintered or cracked, the head of the tool may fly off.
- Do not use damaged tools.
- Be sure you know how to use the tool you are working with.

6.5.2 Knives and Cutting Tools

There is the potential for employees to cut themselves on the sharp edges of piping, unfinished or jagged edges of metal, or during the use of hand tools, as well as knives, handsaws, and blades that may be used to cut materials that are needed to install the proposed system. To prevent the potential for cuts and lacerations, employees will wear either leather work gloves or Kevlar™ gloves. When using knives or blades for these activities, as well as others that involve the cutting of tubing and/or small diameter piping, follow the safety precautions listed below:

- Keep your free hand out of the way.
- Secure your work if cutting through thick material.
- Use only sharp blades; dull blades require more force that results in less knife control.
- Don't put your knife in your pocket.
- Use a self-retracting blade.
- Wear leather or Kevlar™ gloves when using knives or blades.

6.5.3 Power Tools

To prevent hazards associated with the use of power tools, workers should observe the following general precautions:

- Never carry a tool by the cord or hose.
- Never yank the cord or the hose to disconnect it from the receptacle.
- Keep cords away from heat, oil, and sharp edges.
- Disconnect tools when not using them, before servicing or cleaning them, and when changing accessories such as blades, bits, and cutters.
- Secure work with clamps or vise, freeing up both hands to operate the tool.
- Avoid accidental starting. Do not hold fingers on the switch button when carrying a plugged-in tool.
- Keep tools sharp and clean for best performance.
- Wear appropriate clothing. Loose clothing or jewelry can become caught in moving parts.
- Keep all guards in place.

6.5.4 Electric Tools

When using portable tools that are electrically powered, follow the safety precautions listed below:

- Check to see that electrical outlets used to supply power during field operations is of the three wire grounding type.
- All portable or temporary wiring, which is used outdoors or in other potentially wet or damp locations must be connected to a circuit that is protected by a ground fault circuit interrupter (GFCI). GFCI's are available as permanently installed outlets, as plug-in adapters and as extension cord outlet boxes. DO NOT CONTINUE TO USE A PIECE OF EQUIPMENT OR EXTENSION CORD THAT CAUSES A GFCI TO TRIP.
- Extension cords used for field operations should be of the three wire grounding type and designed for hard or extra-hard usage. This type of cord uses insulated wires within an inner insulated sleeve and will be marked S, ST, STO, SJ, SJO, or SJTO.
- NEVER remove the ground plug blade to accommodate ungrounded outlets.
- Do not use extension cords as a substitute for fixed or permanent wiring. Do not run extension cords through openings in walls, ceilings, or floors.
- Protect the cord from becoming damaged if the cord is run through doorways, windows, or across pinch points.
- Examine extension and equipment cords and plugs prior to each use. Damaged cords with frayed insulation or exposed wiring and damaged plugs with missing ground blades MUST BE REMOVED from service immediately.
- When working in flammable atmospheres, be sure that the electrical equipment being used is approved for use in Class I, Division I atmospheres.

6.6 Welding Hazards

Welding is considered “Hot Work” and shall comply with TerraTherm’s Hot Work Program and site-specific hot work requirements. Field welding may be required where it is not possible to install full length cans/liners (e.g., where overhead electrical hazards or other obstructions are

present, where the drill rig cannot handle long pipes) and/or for equipment/material/fixture fabrication or repair. The specific welding process being used is shielded metal arc welding or "stick welding" or “MIG” metal inert gas welding for most work on carbon steel components. In addition, field welding may be required to fabricate or repair stainless steel heater liners and/or heater elements. The “TIG” (Tungsten Inert Gas) welding method will be used for this work. An inert gas, commonly nitrogen, is expelled from the tip of the Tungsten electrode to “shield” the weld pool.

The electrode and work circuit is electrically live whenever the output is on. The input power circuit and machine internal circuits are also live when the power is on. To avoid electrical shocks and burns, do not touch live electrical parts. Employees will wear dry, hole-free insulating gloves. Insulate yourself from work and ground using dry insulating mats. Always verify the supply ground. When making input connections, attach proper grounding conductor first. Inspect power cord for damage or bare wiring. Replace immediately if damaged. Connect work cable to the work as close as possible to the welding area as practical to prevent welding current from traveling long, possibly unknown paths and causing electric shock and fire hazards.

Electric arc welding is a source of intense radiation of visible light and invisible (infrared and ultraviolet) rays that can burn eyes and skin. UV light is the most harmful fraction of the radiant energy produced. If unprotected, intense irritation of the cornea and eyelids occurs. The action of UV light on the exposed skin of the welder produces a burn similar to sunburn. It is therefore mandatory for the welder to wear a welding helmet fitted with the proper shade of filter. Based on the type of welding and the various electrode sizes being used, filters with shade # 10, #12 and #14 will be required. Warn others not to watch the arc and if necessary, use a protective screen or barrier to protect others from flash and glare.

Welding produces gases (i.e. ozone, nitric oxide and nitrogen dioxide) and metal fumes. However, welding is being conducted outdoors so natural dilution ventilation should be sufficient to remove gases and fumes from welder’s breathing zone.

Sparks and molten metal can fly off from the welding arc. The flying sparks, as well as the hot work piece and hot equipment, can cause fires. Accidental contact of the electrode to metal objects can cause sparks, explosion, overheating or fire. Do not weld where sparks can strike flammable materials. Remove all flammables and combustibles within 35 ft of the welding arc. Keep a fire extinguisher in the welding area. Wear oil-free protective garments. Welders should also wear leather gloves and boots and flame-resistant coveralls that are cuff-less. When re-fueling, stop the engine and let it cool off.

As welds cool, they can throw off slag. Wear safety glasses with side shields under welding helmet.

6.7 Electrical Hazards

6.7.1 Electrical Installation

Electrical work on this project will be performed in accordance with the National Electrical Code (NEC, NFPA 70). A licensed electrician, subcontracted to TerraTherm, will perform electrical wiring. *de maximis* is responsible for bringing electrical service to the ISTR program area.

TerraTherm's subcontracted electrician will wire the electrical distribution panels, connect power wiring to the off-gas treatment equipment, and wire the ISTD heaters. TerraTherm staff will support the well field wiring efforts and will install low voltage instrumentation wiring (e.g., thermocouple extension cable).

There will be no exposed, live electrical parts in the wellfield. Electrical connections to the primary and secondary sides of the transformers and the various power distribution panels will be made within approved electrical enclosures using standard UL approved electrical connection devices. ISTD heater electrical connections will be made inside NEMA 3R or NEMA 4 electrical enclosures. To protect against worker injury in the event of an electrical fault with the heater elements, the heater cans, well screens, and metallic process piping will be bonded together with an appropriately sized copper conductor, which will be connected to an earth ground (i.e., ground rod). In addition, metallic instrumentation ports (e.g., temperature and pressure measurement points) will also be bonded to an earth ground. Transformers and electrical distribution gear will be connected to an earth ground as required by the NEC.

The silicon controlled rectifiers (SCRs) used to supply power to the heater circuits are encased in a fiberglass enclosure on the front and sides, however the top and bottom are typically open frame structures to allow flow through and/or forced ventilation to dissipate the heat generated by these devices. As such, the SCRs will be enclosed in a locked shed, accessible to authorized personnel only. Authorized and trained personnel shall only enter the SCR shed when necessary to perform maintenance on the devices, and shall use appropriate PPE for the task being performed. At a minimum, leather boots, safety glasses and voltage rated gloves must be worn when working in this enclosure. Additional PPE including arc-flash protective hood and shield, and fire resistant coveralls are also required when testing or working on live equipment in this enclosure. Lock-out/tag-out procedures shall also be followed when removing, replacing or repairing SCRs.

To minimize the potential for worker exposure to energized electrical sources, access to the electrical distribution panels and the heater element electrical junction boxes will be restricted to authorized personnel only. Electrical components will be equipped with appropriate warning labels (e.g., high voltage, arc flash) as required by the NEC.

6.7.2 Working near Energized Circuits

Per OSHA electrical regulations (29 CFR 1910.333), only "qualified" persons may work on energized electrical circuit parts or equipment or perform testing work on energized electrical circuits or equipment. TerraTherm has provided electrical safety and arc flash safety training to our field staff and have designated selected staff members as "qualified" for the purpose of performing maintenance and troubleshooting on electrical equipment and circuits.

The OSHA standard further states that even qualified persons working near exposed energized electrical parts can't approach closer than 1 foot of a system that is over 300 volts but not over 750V. The standard does allow for closer approaches by qualified personnel if personnel are wearing insulated gloves with the proper voltage rating. For this program, qualified personnel will wear rubber insulated gloves with a voltage rating of up to 1,000 volts (Class O glove). Leather protector gloves will be worn over the rubber insulating gloves.

6.7.3 Lock-Out/Tag-Out

It is the responsibility of TerraTherm employees (and/or subcontractors) to verify that all equipment is locked out in accordance with TerraTherm's standard operating procedures before performing any maintenance or repair work on energized equipment. The source must be locked out; it is not enough to push the power switch to "off" and disconnect the breaker. Anyone can re-engage power under these circumstances. Locking out the power source is the only way to guarantee that the power will not be inadvertently reactivated**.**

The ISTR program at the Site Operation and Maintenance Manual will include a lock-out/tag-out procedure for use during troubleshooting and maintenance activities. TerraTherm and electrical subcontractor personnel will be instructed in the application of these lock-out/tag-out procedures during the site-specific training and will be required to follow the procedures during electrical repair and/or maintenance activities.

6.8 Machine Guarding

Certain components of the off-gas treatment system may be guarded. Machine guards are designed to protect hands and arms from being cut, amputated or crushed. Machine areas that are typically guarded include:

- Points of operation;
- Mechanical power transmission apparatus; and,
- Moving points or pinch points (any point other than a point of operation at which it is possible for a part of the body to be caught).

Most machine guards are built into the equipment. The machine guards that are most common for this project include the metal mesh covers that are placed around the drive belts of the pumps, blowers, or compressors and the blade guards on cutting and grinding tools. These guards can be removed to perform repairs or maintenance to the equipment. However, in compliance with 29 CFR 1910.211-222, **equipment shall not be operated without having the required machine guards in place.** As such, all employees are reminded to replace all machine guards if they have to be removed to facilitate maintenance activities.

6.9 System Operation Safety

The ISTD treatment system components have inherent fail-safes to protect from overheating, fire, and catastrophic failure, as well as accidental discharge of hazardous materials during system malfunction. Examples of such safety features include:

- Heater elements are self-regulating with respect to power consumption to prevent elements from overheating and burning out or failing;
- A pressure sensor installed in the well field manifold piping will monitor the vacuum level in the manifold. This sensor will provide input to the motor controller for the main process blower, modifying the blower speed to maintain the system vacuum at the desired setpoint.

6.9.1 Exposed Hot Surfaces

Appropriate measures will be taken to protect on-site workers from incidental contact with exposed hot surfaces. Exposed hot surfaces may include the heater cans, process piping and

certain components of the off-gas treatment equipment. Surfaces that are expected to exceed 140°F will be covered with insulation or otherwise protected with a guard where insulation is not practical. In addition, personnel working in areas where incidental contact with hot surfaces (140°F) may be possible will wear leather gloves.

In some instances, exposure to hot material and/or components is unavoidable. Such circumstances may include, but are not limited to, replacing ISTD heater elements (if required) during heating and dismantling the ISTR program at the Site system. In these instances, only trained personnel will be allowed in the work area. Worker protective measures will be selected in accordance with the potential heat exposure. For example, if removal and replacement of a heater element is required during the heating, the heater element may be in excess of 500°F. In this case, TerraTherm personnel will wear special high-temperature heat resistant gloves. Direct contact with the hot heater element will be minimized to the extent possible (e.g., using a hook or chain to remove and/or move the hot heater element). TerraTherm will also include specific procedures for handling these potential exposures to high temperatures as part of the Operation and Maintenance Plan.

6.9.2 Hot Soils/Equipment

A minimum soil temperature of approximately 100°C (212°F) is expected to be achieved over the vertical soil profile at the centroids after a period of full power heating. Soil temperatures closer to the heater wells are expected to be in excess of 400°C (800°F) by that time. If necessary, hot core barrels may be handled with tongs and/or high temperature gloves until air-cooled sufficiently to handle with gloves. Hot well screens/cans may be directly handled during demobilization and may require the wearing of high-temperature gloves.

6.10 Thermal Stress

6.10.1 Cold Stress

Types of Cold Stress

Cold injury is classified as either localized, as in frostbite, frostnip, or chilblain; or generalized, as in hypothermia. The main factors contributing to cold injury are exposure to humidity and high winds, contact with wetness, and inadequate clothing.

The likelihood of developing frostbite occurs when the face or extremities are exposed to a cold wind in addition to cold temperatures. The freezing point of the skin is about 30°F. The fluids around the cells of the body tissue freeze, causing the skin to turn white. This freezing is due to exposure to extremely low temperatures. As wind velocity increases, heat loss is greater and frostbite will occur more rapidly.

Symptoms of Cold Stress

The first symptom of frostbite is usually an uncomfortable sensation of coldness, followed by numbness. There may be a tingling, stinging, or aching feeling in the affected area. The most vulnerable parts of the body are the nose, cheeks, ears, fingers, and toes.

Symptoms of hypothermia, a condition of abnormally low body temperature, include uncontrollable shivering and sensations of cold. The heartbeat slows and may become irregular, the pulse weakens and the blood pressure changes. Pain in the extremities and severe shivering can be the first warning of dangerous exposure to cold.

Maximum severe shivering develops when the body temperature has fallen to 95°F. This must be taken as a sign of danger and exposure to cold must be immediately terminated. Productive physical and mental work is limited when severe shivering occurs.

Methods to Prevent Cold Stress

When the ambient temperature, or a wind chill equivalent, falls to below 40°F (American Conference of Governmental Industrial Hygienists recommendation), site personnel who must remain outdoors should wear insulated coveralls, insulated boot liners, hard hat helmet liners and insulated hand protection. Wool mittens are more efficient insulators than gloves. Keeping the head covered is very important, since 40% of body heat can be lost when the head is exposed. If it is not necessary to wear a hard hat, a wool knit cap provides the best head protection. A facemask may also be worn.

Persons should dress in several layers rather than one single heavy outer garment. The outer piece of clothing should ideally be wind and waterproof. Clothing made of thin cotton fabric or synthetic fabrics such as polypropylene is ideal since it helps to evaporate sweat. Polypropylene is best at wicking away moisture while still retaining its insulating properties. Loose fitting clothing also aids in sweat evaporation. Denim is not a good protective fabric. It is loosely woven which allows moisture to penetrate. Socks with high wool content are best. If two pairs of socks are worn, the inner sock should be smaller and made of cotton, polypropylene, or a similar type of synthetic material that wicks away moisture. If clothing becomes wet, it should be taken off immediately and a dry set of clothing put on.

If wind conditions become severe, it may become necessary to shield the work area temporarily. The SSO and the PM will determine if this type of action is necessary. The project trailer is heated and should be available for periodic warming if work is performed continuously in the cold at temperatures, or equivalent to wind chill temperatures, of 20°F.

Dehydration occurs in the cold environment and may increase the susceptibility of the worker to cold injury due to significant change in blood flow to the extremities. Drink plenty of fluids, but limit the intake of caffeine.

6.10.2 Heat Stress

Types of Heat Stress

Heat related problems include heat rash, fainting, heat cramps, heat exhaustion, and heat stroke. Heat rash can occur when sweat isn't allowed to evaporate, leaving the skin wet most of the time and making it subject to irritation. Fainting may occur when blood pools to lower parts of the body and as a result, does not return to the heart to be pumped to the brain. Heat related fainting often occurs during activities that require standing erect and immobile in the heat for long periods of time. Heat cramps are painful spasms of the muscles due to excessive salt loss associated with

profuse sweating. Heat exhaustion results from the loss of large amounts of fluid and excessive loss of salt from profuse sweating. The skin will be clammy and moist and the affected individual may exhibit giddiness, nausea, and headache. Heat stroke occurs when the body's temperature regulatory system has failed. The skin is hot, dry, red, and spotted. The affected person may be mentally confused and delirious. Convulsions could occur. ***EARLY RECOGNITION AND TREATMENT OF HEAT STROKE ARE THE ONLY MEANS OF PREVENTING BRAIN DAMAGE OR DEATH.*** A person exhibiting signs of heat stroke should be removed from the work area to a shaded area. The person should be soaked with water to promote evaporation. Fan the person's body to increase cooling. Increased body temperature and physical discomfort also promote irritability and a decreased attention to the performance of hazardous tasks.

Early Symptoms of Heat-Related Health Problems:

- Decline in task performance
- Lack of coordination
- Decline in alertness
- Unsteady walk
- Excessive fatigue
- Reduced vigilance
- Muscle cramps
- Dizziness

Susceptibility to Heat Stress Increases due to:

- Lack of physical fitness
- Lack of acclimation
- Increased age
- Dehydration
- Obesity
- Drug or alcohol use
- Sunburn
- Infection

People unaccustomed to heat are particularly susceptible to heat fatigue. First timers in PPE need to gradually adjust to the heat.

The Effect of Personal Protective Equipment

Sweating normally cools the body as moisture is removed from the skin by evaporation. However, the wearing of certain personal protective equipment (PPE), particularly chemical protective coveralls (e.g., Tyvek), reduces the body's ability to evaporate sweat and thereby regulate heat buildup. The body's efforts to maintain an acceptable temperature can therefore become significantly impaired by the wearing of PPE.

Measures to Avoid Heat Stress:

The following guidelines should be adhered to when working in hot environments:

- Establish work-rest cycles (short and frequent are more beneficial than long and seldom).
- Identify a shaded, cool rest area.
- Rotate personnel, alternative job functions.
- Water intake should be equal to the sweat produced. Most workers exposed to hot conditions drink less fluid than needed because of an insufficient thirst. DO NOT

DEPEND ON THIRST TO SIGNAL WHEN AND HOW MUCH TO DRINK. For an 8-hour workday, 50 ounces of fluids should be drunk.

- Eat lightly salted foods or drink salted drinks such as Gatorade to replace lost salt.
- Save most strenuous tasks for non-peak heat hours such as the early morning or at night.
- Avoid double shifts and/or overtime.

The implementation and enforcement of the above mentioned measures will be the joint responsibility of the project manager and the SSO. Potable water should be made available each day for the field team.

Heat Stress Monitoring Techniques

Site personnel should regularly monitor their heart rate as an indicator of heat strain by the following method: Check radial pulse rates by using fore-and middle fingers and applying light pressure to the pulse in the wrist for one minute at the beginning of each rest cycle. If the pulse rate exceeds 110 beats/minute, shorten the next work cycle by one-third and keep the rest period the same. If, after the next rest period, the pulse rate still exceeds 110 beats/minute, shorten the work cycle again by one-third.

6.11 Slips, Trips, and Falls

Maintaining a work environment that is free from accumulated debris is the key to preventing slip, trip, and fall hazards at construction sites. Essential elements of good housekeeping include:

- Orderly placement of materials, tools and equipment;
- Placing trash receptacles at appropriate locations for the disposal of miscellaneous rubbish;
- Prompt removal and secure storage of items that are not needed to perform the immediate task at hand; and
- Awareness on the part of all employees to walk around, not over or on, equipment that may have been stored in the work area.

During the winter months, snow shovels and salt crystals should be kept on site to keep paths and work areas free of accumulated snow and ice.

7. Air Monitoring

7.1 Direct-Reading Instrumentation

A Photo-Ionization Detector (PID), such as a MiniRAE**,** equipped with an 11.7eV lamp, will be used to screen the breathing zone of employees during ISTD wellfield installation and system influent and effluent monitoring. A project-specific action limit is calculated based on the OSHA PEL of 1 ppm for vinyl chloride using the vendor's reported response correction factor to the selected compound with an 11.7eV lamp (0.64) divided by an applied safety factor of 2. For VC, this level calculates to 0.3 PID. Given this range and the mix of compounds that are likely to be present, a reading of 1.0 unit above background has been selected as the action level for this project.

If breathing zone concentrations are sustained (for 15 minutes) at **1 unit above background** and administrative or engineering controls are not sufficient to eliminate the vapor concentrations, **Level C respiratory protection**, as described in Section 8.2, will be donned.

If breathing zone concentrations exceed **30 units**, **work will be temporarily suspended** until the PM and Safety Advisor can determine the best control measures to implement to control VOC concentrations.

All sampling will be conducted by the SSO. Readings will be taken at regular intervals (i.e., at least once every hour) from the breathing zone of employees during subsurface activities, or more frequently when noticeable odors are present. Additional monitoring may be required if action levels are repeatedly exceeded during a certain activity.

7.2 Calibration and Recordkeeping

The PID will be calibrated to a 100 ppm isobutylene-in-air standard on a daily basis in accordance with manufacturer's instructions. All PID readings will be recorded in the field notebook or on dedicated air monitoring result sheets (see Attachment D). In addition, all calibrations must be recorded.

8. Personal Protective Equipment

Personal Protective Equipment (PPE) will be worn to prevent on-site personnel from being injured by the safety hazards posed by the site and/or the activities being performed. In addition, chemical protective clothing will be worn to prevent direct dermal contact with impacted soils during certain intrusive activities. The following table describes the PPE and chemical protective clothing to be worn, where required, for general site activities and for certain specific tasks.

8.1 Chemical Protective Clothing

PPE Item	Task #						
	1	2	3	4	5	6	7
Hard Hat	✓	✓	✓	✓	✓	✓	✓
Long Sleeve Shirt	✓			✓	✓	✓	✓
Rubber steel-toed boots or booties		✓					For Wet Decon
Steel Toed Safety boots	✓	✓	✓	✓	✓	✓	✓
Safety Glasses with Side shields	✓	✓	✓	✓	✓	✓	✓
Tyvek coveralls	As Needed	✓	As Needed	As Needed	✓	✓	For Wet Decon
Inner Nitrile gloves	As Needed	✓	As Needed	✓	✓	✓	✓
Outer Nitrile rubber gloves		As Needed	As Needed	As Needed	✓	✓	✓
Leather or Kevlar gloves	✓	✓	✓	✓	When cutting open liners	When cutting open liners	✓
Heat Resistant gloves				Contact w/ hot surfaces	As needed	✓	As needed
Hearing Protection	As Needed	✓	As Needed	As Needed	As Needed	✓	As Needed

Task 1 –Site Preparation
Task 2 – Installation of Wells/Wellfield
Task 3 – Mechanical/Electrical Construction Activities
Task 4 – Operating/Monitoring System
Task 5 – Carbon Media Change Out
Task 6 – Interim/Confirmatory Soil Sampling
Task 7 – Demobilization

8.2 Respiratory Protection

Respiratory protection may be needed during activities that involve disturbance to impacted soils and influent and effluent monitoring. If total VOC concentrations exceed the breathing zone action level as stipulated in Section 7.1 (sustained for 15-minutes), Level C respiratory protection will be donned. Respirators may also be donned if odors are a nuisance. Combination acid gas and organic vapor cartridges are the preferred cartridge for this application.

Level C Specification- Air-purifying respirator organic vapor cartridge

If breathing zone concentrations exceed the work stoppage level as stipulated in Section 7.1, work will be temporarily suspended until the PM and Safety Advisor can determine the best control measures to implement to control VOC concentrations.

All employees who are expected to wear respiratory protection must have successfully passed a quantitative or qualitative fit-test within the past year.

8.3 Other Protective Equipment

The following additional safety items should be available in the immediate work area and the project trailer:

- Portable, hand-held eyewash
- First aid kit
- Type A-B-C fire extinguisher (on drill rig, in project trailer, and near welding operations)
- Lock-out/Tag-out Kit

9. Site Control

9.1 Site Identification

A site contact poster will be displayed in a permanent and conspicuous location at the Site. The poster will identify a TerraTherm contact name and contact phone number.

9.2 Site Control

To prevent both exposure of unprotected personnel and migration of contamination due to tracking by personnel or equipment, work areas along with personal protective equipment requirements will be clearly identified. TerraTherm designates work areas or zones as suggested in the "Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities," NIOSH/OSHA/USCG/EPA, November, 1985. They recommend the areas surrounding each of the work areas to be divided into three zones:

- Exclusion or "Hot" Zone
- Contamination Reduction Zone (CRZ)
- Support Zone

9.2.1 Exclusion Zone

It is assumed that the fence that ARCADIS will install around the site will provide a sufficient degree of access control for the site. In addition to this, TerraTherm will erect a secondary interior temporary fence to segregate the ISTR program at the Site. This secondary fence will also demarcate the exclusion zone. This zone will serve to protect site visitors and delivery personnel from chemical or physical hazards that are associated with the implementation of the ISTD remediation program. All personnel entering the exclusion zone must wear the prescribed level of protective equipment for the specific task and meet the training requirements of Section 10.

9.2.2 Contamination Reduction Zone

Decontamination zones will be established adjacent to the exclusion zone. Personnel will remove contaminated gloves and other disposable items in these areas and place them in a 55-gallon drum or other container until they can be properly disposed. To assist with the decontamination of rubber boots that have been in direct contact with contaminated materials, a boot wash and boot storage area will be established in each CRZ. A bench will be placed in this area to assist employees when removing their boots.

9.2.3 Support Zone

A project trailer will be mobilized to the Site and will serve as the support zone for the ISTR program.

9.3 Safety Practices

The following measures are designed to augment the specific health and safety guidelines provided in this plan.

- TerraTherm employees will implement the "buddy system" during construction and demobilization and for heavy lifting activities and when entering the energized wellfield. The buddy system does not need to be implemented when TerraTherm employees are performing routine recording of system parameters. However, the employees must have the ability to contact additional TerraTherm staff or the site's representative if assistance is needed for certain tasks.
- Eating, drinking, chewing gum or tobacco, smoking or any practice that increases the probability of hand-to-mouth transfer and ingestion of materials is prohibited in the exclusion zone and the decontamination zone.
- Smoking is prohibited in all contaminated work areas. Matches and lighters are not allowed in these areas.
- Hands and face must be thoroughly washed upon leaving the work area and before eating, drinking, or any other activities.
- Beards or other facial hair that interfere with respirator fit are prohibited.
- The use of alcohol or illicit drugs or being under the influence of such is prohibited during the conduct of field operations.
- All equipment must be decontaminated or properly discarded before leaving the Site.

10. Decontamination

10.1 Personal Decontamination

Proper decontamination is required of all personnel before leaving the site. Decontamination will occur within the contamination reduction zone (CRZ). Disposable PPE will be removed in the decontamination zone and placed in 55-gallon drums. To assist with the decontamination of rubber boots that have been in direct contact with tarry materials, a three-basin boot wash and boot storage area will be established in the CRZ.

If worn, respirators will be cleaned after each use with respirator wipe pads and will be stored in plastic bags after cleaning. At the end of the day, respirators will be washed with warm, soapy water, and then rinsed in clear cool water. If possible, respirators should be allowed to air-dry in a clean area. If such an area does not exist, respirators will be wiped dry and placed in plastic bags for proper storage.

Regardless of the type of decontamination system required, a container of potable water and liquid soap should be made available in the immediate work area, so employees can wash their hands and face before leaving the site. Toilet facilities will be available next to the project trailer.

10.2 Equipment Decontamination

Large pieces of machinery will be decontaminated via dry brushing, pressure washing and/or steam cleaning. The equipment cannot leave the site until the SSO has released it.

11. Medical Monitoring and Training Requirements

11.1 Medical Monitoring

All personnel, performing activities covered by this HASP that may result in exposure to the site contaminants, must be active participants in a medical monitoring program that complies with 29 CFR 1910.120(f). Each individual must have completed an annual surveillance examination and/or an initial baseline examination within the last year prior to performing any work on the site covered by this HASP.

11.2 Health and Safety Training

11.2.1 HAZWOPER

All personnel, performing activities covered by this HASP that may result in exposure to the site contaminants, must have completed the appropriate training requirements specified in 29 CFR 1910.120(e). Each individual must have completed an annual 8-hour refresher-training course and/or an initial 40-hour training course within the last year prior to performing any work on the sites covered by this HASP.

11.2.2 Pre-Entry Briefing

The SSO will conduct a pre-entry briefing before site activities begin. HASP receipt and acceptance sheets will be collected at this meeting. Short safety refresher meetings will be conducted, as needed, throughout the duration of the project. Attendance of the pre-entry meeting and subsequent safety meetings is mandatory and will be documented by the TerraTherm SSO. An attendance form is presented in Attachment E.

11.2.3 Daily Safety Meetings

Daily safety meetings will also be conducted by the SSO to ensure that all workers are prepared for and knowledgeable of the safety hazards associated with the scheduled work. All field employees must be present during the daily safety meetings and must sign the attendance sheet for each such meeting.

11.3 Site Visitors

Only authorized personnel or authorized representatives from federal and/or state regulatory agencies will be permitted to access an exclusion zone. Visitors will not be permitted to enter the exclusion zone unless escorted by a TerraTherm employee. Visitors will not be permitted in an exclusion zone unless they have documentation that indicates they have been properly trained as described above. Additionally, visitors cannot enter the site unless they have the proper PPE, have read the HASP, signed the HASP acknowledgment form, and have attended a pre-entry briefing conducted by the TerraTherm SSO.

12. Emergency Response

OSHA defines emergency response as any "response effort by employees from outside the immediate release area or by other designated responders (i.e., mutual-aid groups, local fire departments) to an occurrence which results, or is likely to result in an uncontrolled release of a hazardous substance." TerraTherm response actions will be limited to evacuation and medical/first aid as described within this section below as well as small spill response and responding to fires that can be extinguished via the use of portable fire extinguishers.

The basic elements of an emergency evacuation plan include:

- Employee training;
- Alarm systems;
- Escape routes;
- Escape procedures;
- Critical operations or equipment;
- Rescue and medical duty assignments;
- Designation of responsible parties;
- Emergency reporting procedures; and,
- Methods to account for all employees after evacuation.

12.1 Employee Training

Employees must be instructed in the site-specific aspects of emergency evacuation. On-site refresher or update training is required anytime escape routes or procedures are modified or personnel assignments are changed. Specific escape routes from the work area will be reviewed upon arrival to the site.

12.2 Alarm Systems/Emergency Signals

An emergency communication system must be in effect at all sites. The most simple and effective emergency communication system in many situations will be direct verbal communications. Each site must be assessed at the time of initial site activity and periodically as the work progresses. Verbal communications must be supplemented anytime voices cannot be clearly perceived above ambient noise levels (i.e., noise from heavy equipment; drilling rigs, backhoes, etc.) and anytime a clear line-of-sight cannot be easily maintained amongst all TerraTherm and subcontracted personnel because of distance, terrain, or other obstructions.

Verbal communications will be adequate to warn employees of hazards associated with the immediate work area. Phone service will be available in the project trailer if local emergency responders need to be called to the site.

12.3 Escape Routes and Procedures

The escape route from the Site will be via the site entrance/exit gate onto Lazy Lane.

12.4 Rescue and Medical Duty Assignments

The phone numbers of the police and fire departments, ambulance service, local hospital, environmental regulators, poison control center, TerraTherm representatives, and facility medical/emergency response team (if applicable) are provided in the emergency reference sheet. This sheet will be posted in the site vehicles and the on-site project trailer.

In the event an injury or illness requires more than first aid treatment, the SSO, or his designated representative, will accompany the injured person to the medical facility and will remain with the person until release or admittance is determined. The escort will relay all appropriate medical information to the PM.

If the injured employee can be moved from the accident area, he or she will be brought to the CRZ where their PPE will be removed. If the person is suffering from a back or neck injury the person will not be moved and the requirements for decontamination do not apply. The SSO must familiarize the responding emergency personnel about the nature of the site and the injury. If the responder feels that the PPE can be cut away from the injured person's body, this will be done on-site. If this is not feasible, decontamination will be performed after the injured person has been stabilized.

12.5 Designation of Responsible Parties

The SSO is responsible for initiating emergency response. In the event the SSO cannot fulfill this duty, the alternate SSO will take charge.

12.6 Employee Accounting Method

All TerraTherm subcontractors and visitors must sign in and out daily on the sign-in sheet that will be located in the project trailer. This sheet will be used to count personnel in the event of an evacuation/emergency. All personnel on site are responsible for knowing the escape route from the site and where to assemble after evacuation for a headcount.

12.7 Accident Reporting and Investigation

Any incident (other than minor first aid treatment) resulting in injury and illness requires an accident investigation and report in accordance with TerraTherm's Workplace Injury and Illness Prevention Policy. The investigation should be conducted as soon as emergency conditions are under control. The purpose of the investigation is not to attribute blame but to determine the pertinent facts so that repeat or similar occurrences can be avoided. An accident investigation form is presented in Attachment F of this HASP. The injured TerraTherm employee's supervisor should be notified immediately of the injury.

If a subcontractor employee is injured, they are required to notify the TerraTherm SSO. Once the incident is under control, the subcontractor shall submit a copy of their company's accident investigation report to the SSO for review.

12.8 Spill Response

All waste materials will be managed and handled in accordance with the project work plan requirements and applicable regulations. Solid materials will be contained in roll-off containers or drums. Roll-off containers and drums will be segregated from work areas to minimize damage to the container so as to prevent a spill. Given this, TerraTherm does not anticipate the need for significant spill response during ISTR program at the Site. However, TerraTherm will be prepared for primary spill response actions in the unlikely event of a spill. The field team will be equipped with spill response kits and will be prepared to create earthen berms, when necessary, to control the spread of any spilled materials. TerraTherm will notify the appropriate facility personnel in the event of a spill requiring a response.

Attachment A

Health and Safety Plan Receipt and Acceptance Form

Health and Safety Plan
Receipt and Acknowledgement Form

ISTR Program
Solvents Recovery Service of New England

I have received a copy of the Health and Safety Plan prepared for the above-referenced site and activities. I have read and understood its contents and I agree that I will abide by its requirements.

Name (Print): _____

Signature: _____

Date: _____

Representing (Print): _____
Company Name

Attachment B

Activity Hazard Analysis Forms

ACTIVITY HAZARDS ANALYSIS

Overall Risk Assessment Code (RAC) (Use highest code): M

Date: 1 April 2010 Project: SRSNE Superfund Site

Activity: TCH System Operation & Sampling

Activity Location: Thermal Treatment Zone

Prepared By: Robin Swift

Risk Assessment Code Matrix

E = Extremely High Risk
H = High Risk
M = Moderate Risk
L = Low Risk

Severity	Probability				
	Frequent	Likely	Occasional	Seldom	Unlikely
Catastrophic	E	E	H	H	M
Critical	E	H	H	M	L
Marginal	H	M	M	L	L
Negligible	M	L	L	L	L

Add Identified Hazards

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	TCH System Operation	Temperature Extremes	• Employees shall be trained in the recognition of heat stress symptoms and appropriate precautions to take. • Heat stress controls will be implemented per the Health and Safety Plan. • The SSO will monitor personnel for signs of heat stress. • Personnel will maintain fluid levels to avoid dehydration.	L
X		Noise Hazards	• Noise levels that exceed the OSHA PEL of 90 dBA for an 8-hour day require hearing protection. • Employees must follow this general rule of thumb: If the noise levels are such that you must shout at someone 5 feet away from you, you need to be wearing hearing protection. Employees can wear either disposable earplugs or earmuffs but all hearing protection must have a minimum noise reduction rating (NRR) of 27 db.	L
X		Severe Weather	• When weather interferes with safety, all work will stop until conditions are safe. • Work will stop and personnel will seek shelter during lightning storms.	L
X		Insects, Spiders, Ticks, Poisonous Plants	• Personnel will be instructed to be cautious of insects, spiders, ticks, and poisonous plants. • Workers will tuck pants into socks and wear long sleeves and sturdy leather boots when walking in tall grass. • Workers will use insect repellent when needed.	L
X		Injuries from Working with Hand and Power Tools	• Tools shall be inspected prior to use. • All power tools originally equipped with a safety guard of any type shall be used only with the guard in place and functioning properly. • Defective tools shall be tagged and removed from service. • Tools shall only be used for their intended purpose.	L

ACTIVITY HAZARDS ANALYSIS

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X		Chemical Exposure	• MSDSs are required for all chemicals brought to the site. • The MSDS book will be kept in the job trailer and will be available to all employees.	L
X		Spills	• Spill clean up materials will be located on the site. • SSO is to be notified immediately of the spill, regardless of the size or material spilled.	L
X		Back Strain	• Use proper lifting techniques at all times. Request assistance from other personal when weight limits exceeds 50lbs.	L
X		Hand Injuries	• Wear protective gloves; use hand tools in a safe manner and keep hand tools in good working condition.	L
X		Slips, Trips, & Falls	• Use extreme caution when walking in work areas, working on or around truck beds, and around equipment during unloading and staging activities.	L
X		Contact with Heavy Equipment While in Use	• Only trained and experienced personnel will be allowed to stage and unload heavy equipment. • Only trained operators will be authorized to operate equipment. • High visibility vests will be worn at all times while working in or around heavy equipment, trucks, or other mechanized equipment. • All ground personnel must maintain eye contact with operators at all times. Do not proceed toward or into blind spots of equipment without authorization to do so by the operator. • All ground personnel will stay outside the swing radius of equipment while in operation.	L
X		Refueling Equipment	• Shut down equipment during refueling. • Allow equipment to cool down before refueling. • Refuel from tank truck or OSHA-compliant portable fuel container. Container must be properly labeled. • Personnel performing the refueling operation will exercise caution to avoid spillage. • Absorbent pads will be kept near the refueling operations. • Prior to fueling, personnel shall bond the heavy equipment to fueling equipment. • A fire extinguisher will be located in the immediate area during refueling operations. • Secured fuel tanks will be allowed in company pick-up trucks. Fire extinguishers and proper labels are required if transporting fuel.	L
X		Controlling Work Areas	• Fencing, tape, cones or other SSO-approved boundaries will be erected to warn approaching personnel of the hazardous area. • Appropriate signs will be posted at the boundary to instruct personnel in entry requirements.	L

ACTIVITY HAZARDS ANALYSIS

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	Welding/Cutting	Hand, Foot,Head, & Eye Injury	• Employees must wear a welding helmet (filters w/ shade #10, #12, #14), leather gloves and boots, oil-free protective garments, dry and hole free insulating gloves, steel toed boots, flame-resistant coveralls that are cuffless, and hearing protection. • Do not touch live electrical parts. • Insulate yourself from work and ground using dry insulating mats. • Always verify the supply ground. • When making input connections, attach proper grounding conductor first. • Inspect power cord for damage or bare wiring. Replace immediately if damaged. • Warn others not to watch the arc and, if necessary, use a protective screen or barrier to protect others from flash and glare. • Monitor indoor welding gases and ensure ventilation is effective. • Work in a well ventilated area.	L
X		Fire Hazards	• Do not cut or weld where sparks can strike flammable materials. • Remove all flammables and combustibles within 35 feet of the welding arc or cut location. • Keep a fire extinguisher in the welding area. • Prior to refueling, stop the engine and let it cool off.	M
X	Compressed Cylinders	Fire/Explosive Hazards	• Cylinders should be secured and restrained in an upright position and stored at least 20 feet from any fuel, gas or diesel tanks. Keep away from exposure to open flame. • All cylinders must be labeled and indicated when empty. • Check all valves and fittings for leaks with each use. If a leak is found, tag it and report it. • Leak test all connections using soap solution where possible. • Keep valve caps screwed on at all times when moving the cylinder or when regulators and gauges are unattached. • Close the cylinder valve and bleed off the pressure in the hoses when not in use. • Never tamper with cylinder valves or safety devices. • Cylinders should not be lifted by the protective valve caps.	M

ACTIVITY HAZARDS ANALYSIS

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	Heater Circuit/Equipment Maintenance	Electrical Shock, Burns	• Access to the electrical distribution panels and the heater element electrical junction boxes will be restricted to authorized personnel only. • Electrical components will be equipped with appropriate warning labels (i.e., high voltage, arc flash, etc.) as required by the NEC. • Follow OSHA electrical regulations (29 CFR 1910.333) and National Electrical Code (NFPA 70 and 70E) and TerraTherm Lock-out/Tagout procedure. • Only qualified persons may work on energized electrical circuit parts or equipment or perform testing work on energized electrical circuits or equipment. • Even qualified persons working near exposed energized electrical parts cannot approach closer than ONE foot of a system that is OVER 300 volts but NOT OVER 750 volts. • Closer approaches by qualified personnel may be possible if wearing insulated gloves with the proper voltage rating. Wear rubber insulated gloves with a voltage rating of up to 1,000 volts (class O glove). Leather protector gloves will be worn over the rubber insulating gloves. • Wear arc flash protective PPE when working on energized electrical equipment.	M
X	Soil Sampling	Dermal-Burns/Ingestion/Inhalation Hazard	• Nitrile® gloves should be worn at all times during soil sampling collection. • Continuously monitor boring and breathing space of drilling personnel for potential vapors. • Use extreme care when handling core barrels as subsurface temperatures in the wellfield often reach greater than 212°F. • Immediately cover ends of core barrels with Teflon® tape and end cap to stop volatilization. • After cooling, carefully remove end cap and Teflon® tape from core barrel. • Collect aliquot from center of core barrel and place in laboratory preserved (typically acid) glassware. Cap and cover immediately to reduce dermal contact or inhalation of acid.	L
X		Contact with Utilities	• Above-ground utilities must be visibly identified with warning signs. • Any vehicle or mechanical equipment capable of having parts of its structure elevated (drill ring, crane, etc.) near energized overhead lines shall be operated so that a clearance of at least 10 feet is maintained. If the voltage is higher than 50kV, the clearance shall be increased 4 inches for every 10kV over.	M

ACTIVITY HAZARDS ANALYSIS

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X		Hand, Foot,Head, & Eye Injury	• Personnel shall not remain in the vicinity of operating equipment unless it is required for their work responsibilities. • All drill rigs and other machinery with exposed moving parts must be equipped with an operational emergency stop device. This device must be tested prior to job initiation and periodically thereafter. The drill crews shall not simultaneously handle augers while the rig is operating unless there is a standby person to activate the emergency stop. • The driller/operator must never leave the controls while the tools are rotating/driving unless all personnel are kept clear of rotating equipment. • A long-handled shovel or equivalent must be used to clear drill cuttings away from the hole and from rotating/driving tools. Hands and/or feet are not to be used for this purpose. • Samplers must not reach into or near the rotating equipment. If personnel must work near any tools that could rotate, the driller/ operator must shut down the rig prior to initiating such work. • Drillers, helpers, and technicians must secure all loose clothing, or other items that could become entangled in the machinery when in the vicinity of drilling/driving operations. • Only equipment that has been approved by the manufacturer may be used in conjunction with site equipment and specifically to attach sections of drilling tools together. Pins that protrude excessively from augers/casing segments shall not be allowed. • No person shall climb the drill mast while tools are rotating/operating. • No person shall climb the drill mast without the use of ANSI-approved fall protection (approved belts, lanyards, and a fall protection slide rail) or portable ladder that meets the requirements of OSHA standards.	M
X		Overhead Clearance	• Do not transport drilling equipment with mast in the upward position.	L
X		Environmental	• Channel the discharge of drilling fluids away from the work area. Contain fluids if contaminated. • Control dust.	L
X		Slips, Trips, & Falls	• Cap and flag open boreholes.	L
X	Vapor Sampling	Dermal-Burns/Ingestion/Inhalation Hazard	• Leather gloves and face shield should be worn during vapor sample collection. • Keep eyes, mouth, and extremities clear of vapor stream. • Allow Tedlar® bag to cool to ambient temperature before handling.	L
X				

Add Items

	EQUIPMENT	TRAINING	INSPECTION
X			

ACTIVITY HAZARDS ANALYSIS

Involved Personnel:

TerraTherm and associated subcontractors.

Acceptance Authority (digital signature): _____

ACTIVITY HAZARDS ANALYSIS

Overall Risk Assessment Code (RAC) (Use highest code): M

Date: 1 April 2010

Project: SRSNE Superfund Site

Activity: TCH System Mobilization & Construction

Activity Location: Thermal Treatment Zone

Prepared By: Robin Swift

Risk Assessment Code Matrix

E = Extremely High Risk
H = High Risk
M = Moderate Risk
L = Low Risk

Severity	Probability				
	Frequent	Likely	Occasional	Seldom	Unlikely
Catastrophic	E	E	H	H	M
Critical	E	H	H	M	L
Marginal	H	M	M	L	L
Negligible	M	L	L	L	L

Add Identified Hazards

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	General Construction	Temperature Extremes	• Employees shall be trained in the recognition of heat stress symptoms and appropriate precautions to take. • Heat stress controls will be implemented per the Health and Safety Plan. • The SSO will monitor personnel for signs of heat stress. • Personnel will maintain fluid levels to avoid dehydration.	L
X		Noise Hazards	• Noise levels that exceed the OSHA PEL of 90 dBA for an 8-hour day require hearing protection. • Employees must follow this general rule of thumb: If the noise levels are such that you must shout at someone 5 feet away from you, you need to be wearing hearing protection. Employees can wear either disposable earplugs or earmuffs but all hearing protection must have a minimum noise reduction rating (NRR) of 27 db.	L
X		Severe Weather	• When weather interferes with safety, all work will stop until conditions are safe. • Work will stop and personnel will seek shelter during lightning storms.	L
X		Insects, Spiders, Ticks, Poisonous Plants	• Personnel will be instructed to be cautious of insects, spiders, ticks, and poisonous plants. • Workers will tuck pants into socks and wear long sleeves and sturdy leather boots when walking in tall grass. • Workers will use insect repellent when needed.	L
X		Injuries from Working with Hand and Power Tools	• Tools shall be inspected prior to use. • All power tools originally equipped with a safety guard of any type shall be used only with the guard in place and functioning properly. • Defective tools shall be tagged and removed from service. • Tools shall only be used for their intended purpose.	L

ACTIVITY HAZARDS ANALYSIS

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X		Chemical Exposure	• MSDSs are required for all chemicals brought to the site. • The MSDS book will be kept in the job trailer and will be available to all employees .Use proper PPE suitable for the potential chemical exposure.	L
X		Spills	• Spill clean up materials will be located on the site. • SSO is to be notified immediately of the spill, regardless of the size or material spilled.	L
X	Unloading Equipment & TCH System Construction	Back Strain	• Use proper lifting techniques at all times. Request assistance from other personal when weight limits exceeds 50lbs.	L
X		Hand Injuries	• Wear protective gloves; use hand tools in a safe manner and keep hand tools in good working condition.	L
X		Slips, Trips, & Falls	• Use extreme caution when walking in work areas, working on or around truck beds, and around equipment during unloading and staging activities.	L
X		Contact with Heavy Equipment While in Use	• Only trained and experienced personnel will be allowed to stage and unload heavy equipment. • Only trained operators will be authorized to operate equipment. • High visibility vests will be worn at all times while working in or around heavy equipment, trucks, or other mechanized equipment. • All ground personnel must maintain eye contact with operators at all times. Do not proceed toward or into blind spots of equipment without authorization to do so by the operator. • All ground personnel will stay outside the swing radius of equipment while in operation.	L
X		Refueling Equipment	• Shut down equipment during refueling. • Allow equipment to cool down before refueling. • Refuel from tank truck or OSHA-compliant portable fuel container. Container must be properly labeled. • Personnel performing the refueling operation will exercise caution to avoid spillage. • Absorbent pads will be kept near the refueling operations. • Prior to fueling, personnel shall bond the heavy equipment to fueling equipment. • A fire extinguisher will be located in the immediate area during refueling operations. • Secured fuel tanks will be allowed in company pick-up trucks. Fire extinguishers and proper labels are required if transporting fuel.	L
X		Controlling Work Areas	• Fencing, tape, cones or other SSO-approved boundaries will be erected to warn approaching personnel of the hazardous area. • Appropriate signs will be posted at the boundary to instruct personnel in entry requirements.	L

ACTIVITY HAZARDS ANALYSIS

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	TCH Wellfield Installation	Contact with Utilities	• Contact local state operated "Digsafe" service or dial 811 (nationwide) to locate and identify underground utilities. • Once utilities are located, mark them with paint or flags. • In the absence of identified utilities, it may be necessary to identify a no drill zone or hand dig in the proposed drilling locations. • Barricade open excavations. • Communicate all utility markings at daily job planning reviews and weekly safety tailgate meetings. • Above-ground utilities must be visibly identified with warning signs. • Any vehicle or mechanical equipment capable of having parts of its structure elevated (drill ring, crane, etc.) near energized overhead lines shall be operated so that a clearance of at least 10 feet is maintained. If the voltage is higher than 50kV, the clearance shall be increased 4 inches for every 10kV over.	M
X		Hand, Foot,Head, & Eye Injury	• Personnel shall not remain in the vicinity of operating equipment unless it is required for their work responsibilities. • All drill rigs and other machinery with exposed moving parts must be equipped with an operational emergency stop device. This device must be tested prior to job initiation and periodically thereafter. The drill crews shall not simultaneously handle augers while the rig is operating unless there is a standby person to activate the emergency stop. • The driller/operator must never leave the controls while the tools are rotating/driving unless all personnel are kept clear of rotating equipment. • A long-handled shovel or equivalent must be used to clear drill cuttings away from the hole and from rotating/driving tools. Hands and/or feet are not to be used for this purpose. • Samplers must not reach into or near the rotating equipment. If personnel must work near any tools that could rotate, the driller/ operator must shut down the rig prior to initiating such work. • Drillers, helpers, and technicians must secure all loose clothing, or other items that could become entangled in the machinery when in the vicinity of drilling/driving operations. • Only equipment that has been approved by the manufacturer may be used in conjunction with site equipment and specifically to attach sections of drilling tools together. Pins that protrude excessively from augers/casing segments shall not be allowed. • No person shall climb the drill mast while tools are rotating/operating. • No person shall climb the drill mast without the use of ANSI-approved fall protection (approved belts, lanyards, and a fall protection slide rail) or portable ladder that meets the requirements of OSHA standards.	M
X		Overhead Clearance	• Do not transport drilling equipment with mast in the upward position.	L
X		Environmental	• Channel the discharge of drilling fluids away from the work area. Contain fluids if contaminated. • Control dust.	L

ACTIVITY HAZARDS ANALYSIS

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X		Slips, Trips, & Falls	• Cap and flag open boreholes.	L
X	Welding/Cutting	Hand, Foot,Head, & Eye Injury	• Employees must wear a welding helmet (filters w/ shade #10, #12, #14), leather gloves and boots, oil-free protective garments, dry and hole free insulating gloves, steel toed boots, flame-resistant coveralls that are cuffless, and hearing protection. • Do not touch live electrical parts. • Insulate yourself from work and ground using dry insulating mats. • Always verify the supply ground. • When making input connections, attach proper grounding conductor first. • Inspect power cord for damage or bare wiring. Replace immediately if damaged. • Warn others not to watch the arc and, if necessary, use a protective screen or barrier to protect others from flash and glare. • Monitor indoor welding gases and ensure ventilation is effective. • Work in a well ventilated area.	L
X		Fire Hazards	• Do not cut or weld where sparks can strike flammable materials. • Remove all flammables and combustibles within 35 feet of the welding arc or cut location. • Keep a fire extinguisher in the welding area. • Prior to refueling, stop the engine and let it cool off.	M
X	Compressed Cylinders	Fire/Explosive Hazards	• Cylinders should be secured and restrained in an upright position and stored at least 20 feet from any fuel, gas or diesel tanks. Keep away from exposure to open flame. • All cylinders must be labeled and indicated when empty. • Check all valves and fittings for leaks with each use. If a leak is found, tag it and report it. • Leak test all connections using soap solution where possible. • Keep valve caps screwed on at all times when moving the cylinder or when regulators and gauges are unattached. • Close the cylinder valve and bleed off the pressure in the hoses when not in use. • Never tamper with cylinder valves or safety devices. • Cylinders should not be lifted by the protective valve caps.	M
X	Cover Installation	Inhalation/Dermal Hazard	• Personnel may wear a dust mask in addition to general construction PPE if needed. • Stand upwind while fly ash is being transferred into hopper/mixture. • Stay clear (upwind) while cover is being sprayed. • Thoroughly wash hands, skin and equipment to remove any concrete dust or residue.	L

ACTIVITY HAZARDS ANALYSIS

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	Equipment Installation	Back Strain	• Practice proper lifting techniques. • Use mechanical devices to move objects that are too heavy to be moved manually. • If mechanical devices are not available, ask another person to assist you. • Bring a card table into the field so that work can be performed at waist level versus bending over from the ground surface.	L
X		Hand Injury	• Prior to lifting, consider how the object will be set down without pinching or crushing hands or fingers.	L
X		Slips, Trips, & Falls	• Inspect objects for slippery surfaces (i.e., grease) before lifting. • Be sure the path you are taking while carrying a heavy object is free of obstructions and slips, trip and fall hazards.	L
X		Falling Objects/Debris	• Wear hard hats when overhead hazards are present . Only authorized personnel shall operate forklifts • Inspect slings or straps before use – Do not use damaged or frayed slings.	L
X	Electrical Installation	Electrical Shock, Burns	• Access to the electrical distribution panels and the heater element electrical junction boxes will be restricted to authorized personnel only. • Electrical components will be equipped with appropriate warning labels (i.e., high voltage, arc flash, etc.) as required by the NEC. • Follow OSHA electrical regulations (29 CFR 1910.333) and National Electrical Code (NFPA 70 and 70E) and TerraTherm Lockout-Tagout Procedure. • Only qualified persons may work on energized electrical circuit parts or equipment or perform testing work on energized electrical circuits or equipment. • Even qualified persons working near exposed energized electrical parts cannot approach closer than ONE foot of a system that is OVER 300 volts but NOT OVER 750 volts. • Closer approaches by qualified personnel may be possible if wearing insulated gloves with the proper voltage rating. Wear rubber insulated gloves with a voltage rating of up to 1,000 volts (class O glove). Leather protector gloves will be worn over the rubber insulating gloves. • Wear arc flash protective PPE when working on energized electrical equipment.	M

Add Items

	EQUIPMENT	TRAINING	INSPECTION
X			

ACTIVITY HAZARDS ANALYSIS

Involved Personnel:

TerraTherm and associated subcontractors.

Acceptance Authority (digital signature): _____

ACTIVITY HAZARDS ANALYSIS

Overall Risk Assessment Code (RAC) (Use highest code): M

Date: 1 April 2010 Project: SRSNE Superfund Site

Activity: TCH System Demobilization

Activity Location: Thermal Treatment Zone

Prepared By: Robin Swift

Risk Assessment Code Matrix

E = Extremely High Risk
H = High Risk
M = Moderate Risk
L = Low Risk

Severity	Probability				
	Frequent	Likely	Occasional	Seldom	Unlikely
Catastrophic	E	E	H	H	M
Critical	E	H	H	M	L
Marginal	H	M	M	L	L
Negligible	M	L	L	L	L

Add Identified Hazards

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	System Demobilization	Temperature Extremes	• Employees shall be trained in the recognition of heat stress symptoms and appropriate precautions to take. • Heat stress controls will be implemented per the Health and Safety Plan. • The SSO will monitor personnel for signs of heat stress. • Personnel will maintain fluid levels to avoid dehydration.	L
X		Noise Hazards	• Noise levels that exceed the OSHA PEL of 90 dBA for an 8-hour day require hearing protection. • Employees must follow this general rule of thumb: If the noise levels are such that you must shout at someone 5 feet away from you, you need to be wearing hearing protection. Employees can wear either disposable earplugs or earmuffs but all hearing protection must have a minimum noise reduction rating (NRR) of 27 db.	L
X		Severe Weather	• When weather interferes with safety, all work will stop until conditions are safe. • Work will stop and personnel will seek shelter during lightning storms.	L
X		Insects, Spiders, Ticks, Poisonous Plants	• Personnel will be instructed to be cautious of insects, spiders, ticks, and poisonous plants. • Workers will tuck pants into socks and wear long sleeves and sturdy leather boots when walking in tall grass. • Workers will use insect repellent when needed.	L
X		Injuries from Working with Hand and Power Tools	• Tools shall be inspected prior to use. • All power tools originally equipped with a safety guard of any type shall be used only with the guard in place and functioning properly. • Defective tools shall be tagged and removed from service. • Tools shall only be used for their intended purpose.	L

ACTIVITY HAZARDS ANALYSIS

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X		Chemical Exposure	• MSDSs are required for all chemicals brought to the site. • The MSDS book will be kept in the job trailer and will be available to all employees. .Use proper PPE suitable for the potential chemical exposure.	L
X		Spills	• Spill clean up materials will be located on the site. • SSO is to be notified immediately of the spill, regardless of the size or material spilled.	L
X	Loading Equipment	Back Strain	• Use proper lifting techniques at all times. Request assistance from other personal when weight limits exceeds 50lbs.	L
X		Hand Injuries	• Wear protective gloves; use hand tools in a safe manner and keep hand tools in good working condition.	L
X		Slips, Trips, & Falls	• Use extreme caution when walking in work areas, working on or around truck beds, and around equipment during unloading and staging activities.	L
X		Contact with Heavy Equipment While in Use	• Only trained and experienced personnel will be allowed to stage and unload heavy equipment. • Only trained operators will be authorized to operate equipment. • High visibility vests will be worn at all times while working in or around heavy equipment, trucks, or other mechanized equipment. • All ground personnel must maintain eye contact with operators at all times. Do not proceed toward or into blind spots of equipment without authorization to do so by the operator. • All ground personnel will stay outside the swing radius of equipment while in operation.	L
X		Refueling Equipment	• Shut down equipment during refueling. • Allow equipment to cool down before refueling. • Refuel from tank truck or OSHA-compliant portable fuel container. Container must be properly labeled. • Personnel performing the refueling operation will exercise caution to avoid spillage. • Absorbent pads will be kept near the refueling operations. • Prior to fueling, personnel shall bond the heavy equipment to fueling equipment. • A fire extinguisher will be located in the immediate area during refueling operations. • Secured fuel tanks will be allowed in company pick-up trucks. Fire extinguishers and proper labels are required if transporting fuel.	L
X		Controlling Work Areas	• Fencing, tape, cones or other SSO-approved boundaries will be erected to warn approaching personnel of the hazardous area. • Appropriate signs will be posted at the boundary to instruct personnel in entry requirements.	L
X		Falling Objects/Debris	• Only authorized personnel shall operate forklifts. • Inspect slings or straps before use – Do not use damaged or frayed slings.	L

ACTIVITY HAZARDS ANALYSIS

	JOB STEPS	HAZARDS	ACTIONS TO ELIMINATE OR MINIMIZE HAZARDS	RAC
X	Electrical System Demobilization	Electrical Shock, Burns	• Access to the electrical distribution panels and the heater element electrical junction boxes will be restricted to authorized personnel only. • Electrical components will be equipped with appropriate warning labels (i.e., high voltage, arc flash, etc.) as required by the NEC. • Follow OSHA electrical regulations (29 CFR 1910.333) and National Electrical Code (NFPA 70 and 70E) and TerraTherm Lockout-Tagout procedure. • Only qualified persons may work on energized electrical circuit parts or equipment or perform testing work on energized electrical circuits or equipment. • Even qualified persons working near exposed energized electrical parts cannot approach closer than ONE foot of a system that is OVER 300 volts but NOT OVER 750 volts. • Closer approaches by qualified personnel may be possible if wearing insulated gloves with the proper voltage rating. Wear rubber insulated gloves with a voltage rating of up to 1,000 volts (class O glove). Leather protector gloves will be worn over the rubber insulating gloves. • Wear arc flash protective PPE when working on energized electrical equipment.	M

Add Items

	EQUIPMENT	TRAINING	INSPECTION
X			

Involved Personnel:

TerraTherm and associated subcontractors.

Acceptance Authority (digital signature): _____

Attachment C

OSHA/EPA Occupational Chemical Database Reports and MSDS for COCs

OSHA/EPA Occupational Chemical Database

Chemical Identification

Chemical Name: ZINC OXIDE, FUME
CAS #: 1314-13-2 **UN No:** 3077 **Formula:** ZnO
Synonyms: Zinc peroxide

Physical Properties

Physical Description: White, odorless solid.

BP: NA	**MW:** 81.4	**LEL:** NA	**NFPA Fire Rating:** NA
FRZ/MLT: MLT: 3587ºF	**VP:** 0 mmHg (approx)	**UEL:** NA	**NFPA Health Rating:** NA
FP: NA	**VD:** NA		**NFPA Reactivity Rating:** NA
Sp. GR: 5.61	**IP:** NA		**NFPA Sp. Inst.:** NA

Exposure Limits

OSHA	NIOSH	Related Information
PEL-TWA ppm: NA	**REL-TWA ppm:** NA	**AIHA Emergency Response Planning Guidelines - ERPG-1/ERPG-2/ERPG-3:** NA
PEL-TWA mg/m3: 5	**REL-TWA mg/m3:** 5	
PEL-STEL ppm: NA	**REL-STEL ppm:** NA	
PEL-STEL mg/m3: NA	**REL-STEL mg/m3:** 10	
PEL-C ppm: NA	**REL-C ppm:** NA	
PEL-C mg/m3: NA	**REL-C mg/m3:** NA	**Carcinogen Classifications:** NA
Skin Notation: No	**Skin Notation:** No	
Notes: NA	**Notes:** NA	
	IDLH ppm: NA	
	IDLH mg/m3: 500	
	IDLH Notes: NA	

NIOSH Pocket Guide to Chemical Hazards (Current through June 2006)

Zinc oxide			CAS: 1314-13-2
Formula: ZnO			RTECS: ZH4810000
Synonyms & Trade Names: Zinc peroxide			DOT ID & Guide: 1516 143
Exposure Limits			
NIOSH REL: Dust: TWA 5 mg/m3 C 15 mg/m3 Fume: TWA 5 mg/m3 ST 10 mg/m3		OSHA PEL : TWA 5 mg/m3 (fume) TWA 15 mg/m3 (total dust) TWA 5 mg/m3 (resp dust)	
IDLH: 500 mg/m3		Conversion: NA	
Physical Description			
White, odorless solid.			
MW: 81.4	BP: ?	MLT: 3587F	Sol(64F): 0.0004%
VP: 0 mmHg (approx)	IP: NA	RGasD: NA	Sp.Gr: 5.61
Fl.P: NA	UEL: NA	LEL: NA	MEC: NA
Noncombustible Solid (See flammable and combustible liquid classes)			
Incompatibilities & Reactivities			
Chlorinated rubber (at 419F), water [Note: Slowly decomposed by water.]			
Measurement Methods			
NIOSH 7303, 7502; OSHA ID121, ID143			
Personal Protection & Sanitation		**First Aid**	
Skin: N.R. Eyes: N.R. Wash skin: N.R. Remove: N.R. Change: N.R.		Breath: Resp support (See procedures)	
NIOSH Respirator Recommendations			

NIOSH/OSHA 50 mg/m3: DMFu/SA 125 mg/m3: SA:CF/PAPRDMFu 250 mg/m3: HiEF/SAT:CF/PAPRTHiE/SCBAF/SAF 500 mg/m3: SA:PD,PP : SCBAF:PD,PP/SAF:PD,PP:ASCBA Escape: HiEF/SCBAE
(See symbols and codes)

Exposure Routes

Inh

Symptoms

Metal fume fever: chills, musc ache, nau, fever, dry throat, cough; weak, lass; metallic taste; head; blurred vision; low back pain; vomit; ftg; mal; tight chest; dysp, rales, decr pulm func
(See abbreviations)

Target Organs

Resp sys
(See abbreviations)

DOT Emergency Response Guidebook (ERG 2004)

Guide Number: 171

171 Substances (Low to Moderate Hazard)
POTENTIAL HAZARDS
FIRE OR EXPLOSION
* Some may burn but none ignite readily.
* Those substances designated with a P may polymerize explosively when heated or involved in a fire.
* Containers may explode when heated.
* Some may be transported hot.

HEALTH
* Inhalation of material may be harmful.
* Contact may cause burns to skin and eyes.
* Inhalation of Asbestos dust may have a damaging effect on the lungs.
* Fire may produce irritating, corrosive and/or toxic gases.
* Runoff from fire control may cause pollution.

PUBLIC SAFETY
* CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, refer to appropriate telephone number listed on the inside back cover.
* Isolate spill or leak area immediately for at least 10 to 25 meters (30 to 80 feet) in all directions.
* Keep unauthorized personnel away.
* Stay upwind.

PROTECTIVE CLOTHING
* Wear positive pressure self-contained breathing apparatus (SCBA).
* Structural firefighters' protective clothing will only provide limited protection.

EVACUATION
Fire
* If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions.

EMERGENCY RESPONSE
FIRE
Small Fires
* Dry chemical, CO2, water spray or regular foam.

Large Fires
* Water spray, fog or regular foam.
* Move containers from fire area if you can do it without risk.
* Do not scatter spilled material with high pressure water streams.
* Dike fire-control water for later disposal.

Fire involving Tanks
* Cool containers with flooding quantities of water until well after fire is out.
* Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.
* ALWAYS stay away from tanks engulfed in fire.

SPILL OR LEAK
* Do not touch or walk through spilled material.
* Stop leak if you can do it without risk.
* Prevent dust cloud.
* Avoid inhalation of asbestos dust.

Small Dry Spills
* With clean shovel place material into clean, dry container and cover loosely; move containers from spill area.

Small Spills
* Take up with sand or other noncombustible absorbent material and place into containers for later disposal.

Large Spills
* Dike far ahead of liquid spill for later disposal.
* Cover powder spill with plastic sheet or tarp to minimize spreading.
* Prevent entry into waterways, sewers, basements or confined areas.

FIRST AID
* Move victim to fresh air.

* Call 911 or emergency medical service.
* Apply artificial respiration if victim is not breathing.
* Administer oxygen if breathing is difficult.
* Remove and isolate contaminated clothing and shoes.
* In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
* Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves.

Additional Emergency Response Information (CAMEO Data)

Non-fire Spill Response: Keep material out of water sources and sewers. Build dikes to contain flow as necessary. Keep material dry. Disperse vapors using fans or blowers. Land spill: Dig a pit, pond, lagoon, holding area to contain liquid or solid material. Cover solids with a plastic sheet to prevent dissolving in rain or fire fighting water. Water spill: Neutralize with agricultural lime (CaO), crushed limestone (CaCO3), or sodium bicarbonate (NaHCO3). Use mechanical dredges or lifts to remove immobilized masses of pollutants and precipitates. (AAR, 1999)

Firefighting: Extinguish fire using agent suitable for type of surrounding fire. (Material itself does not burn or burns with difficulty.) (AAR, 1999)

Reactivity: This compound is incompatible with the following:Chlorinated rubber (at 419F), water [Note: Slowly decomposed by water.] (NIOSH, 1997)

First Aid: Breathing: If a person breathes large amounts of this chemical, move the exposed person to fresh air at once. If breathing has stopped, perform mouth-to-mouth resuscitation. Keep the affected person warm and at rest. Get medical attention as soon as possible. (NIOSH, 1997)

OSHA/EPA Occupational Chemical Database

Chemical Identification

Chemical Name: XYLENE, ALL ISOMERS
CAS #: 1330-20-7 **UN No:** 1307 **Formula:** C8H10
Synonyms: 1,2(3 or 4)-Dimethylbenzene; ortho(meta or para)-Xylene; o(m or p)-Xylol

Physical Properties

Physical Description: Colorless liquid with an aromatic odor. [Note: A solid below 56ºF.]

BP: 281ºF	**MW:** 106.2	**LEL:** 0.9-1.1%	**NFPA Fire Rating:** 3
FRZ/MLT: FRZ: NA	**VP:** 9 mmHg	**UEL:** 6.7-7.0%	**NFPA Health Rating:** 2
FP: 81-90ºF	**VD:** NA		**NFPA Reactivity Rating:** 0
Sp. GR: 0.86-0.88	**IP:** 8.44-8.56 eV		**NFPA Sp. Inst.:** NA

Exposure Limits

OSHA	NIOSH	Related Information
PEL-TWA ppm: 100	**REL-TWA ppm:** 100	**AIHA Emergency Response Planning Guidelines - ERPG-1/ERPG-2/ERPG-3:** NA
PEL-TWA mg/m3: 435	**REL-TWA mg/m3:** 435	
PEL-STEL ppm: NA	**REL-STEL ppm:** 150	
PEL-STEL mg/m3: NA	**REL-STEL mg/m3:** 655	
PEL-C ppm: NA	**REL-C ppm:** NA	
PEL-C mg/m3: NA	**REL-C mg/m3:** NA	**Carcinogen Classifications:** IARC-3, TLV-A4
Skin Notation: No	**Skin Notation:** No	
Notes: NA	**Notes:** NA	
	IDLH ppm: 900	
	IDLH mg/m3: NA	
	IDLH Notes: NA	

NIOSH Pocket Guide to Chemical Hazards (Current through June 2006)

NA			CAS: NA
Formula: NA			RTECS: NA
Synonyms & Trade Names: NA			DOT ID & Guide: NA
Exposure Limits			
NIOSH REL: NA		OSHA PEL: NA	
IDLH: NIOSH IDLH: NA		Conversion: NA	
Physical Description			
Description: NA			
MW: NA	BP: NA	FRZ: NA	Sol: NA
VP: NA	IP: NA	RGasD: NA	SG: NA
FP: NA	UEL: NA	LEL: NA	MEC: NA
NA (See flammable and combustible liquid classes)			
Incompatibilities & Reactivities			
NA			
Measurement Methods			
NA			
Personal Protection & Sanitation		**First Aid**	
NA		NA (See procedures)	
NIOSH Respirator Recommendations			
NA (See symbols and codes)			

Exposure Routes

NA

Symptoms

NA
(See abbreviations)

Target Organs

NA
(See abbreviations)

DOT Emergency Response Guidebook (ERG 2004)

Guide Number: 130

130 Flammable Liquids (Non-Polar/Water-Immiscible/Noxious)
POTENTIAL HAZARDS
FIRE OR EXPLOSION
* HIGHLY FLAMMABLE: Will be easily ignited by heat, sparks or flames.
* Vapors may form explosive mixtures with air.
* Vapors may travel to source of ignition and flash back.
* Most vapors are heavier than air. They will spread along ground and collect in low or confined areas (sewers, basements, tanks).
* Vapor explosion hazard indoors, outdoors or in sewers.
* Those substances designated with a P may polymerize explosively when heated or involved in a fire.
* Runoff to sewer may create fire or explosion hazard.
* Containers may explode when heated.
* Many liquids are lighter than water.

HEALTH
* May cause toxic effects if inhaled or absorbed through skin.
* Inhalation or contact with material may irritate or burn skin and eyes.
* Fire will produce irritating, corrosive and/or toxic gases.
* Vapors may cause dizziness or suffocation.
* Runoff from fire control or dilution water may cause pollution.

PUBLIC SAFETY
* CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, refer to appropriate telephone number listed on the inside back cover.
* Isolate spill or leak area immediately for at least 50 to 100 meters (160 to 330 feet) in all directions.
* Keep unauthorized personnel away.
* Stay upwind.
* Keep out of low areas.
* Ventilate closed spaces before entering.

PROTECTIVE CLOTHING
* Wear positive pressure self-contained breathing apparatus (SCBA).
* Structural firefighters' protective clothing will only provide limited protection.

EVACUATION
Large Spill
* Consider initial downwind evacuation for at least 300 meters (1000 feet).

Fire
* If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions.

EMERGENCY RESPONSE
FIRE
CAUTION: All these products have a very low flash point: Use of water spray when fighting fire may be inefficient.
Small Fires
* Dry chemical, CO_2, water spray or regular foam.

Large Fires
* Water spray, fog or regular foam.
* Do not use straight streams.
* Move containers from fire area if you can do it without risk.

Fire involving Tanks or Car/Trailer Loads
* Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
* Cool containers with flooding quantities of water until well after fire is out.
* Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.
* ALWAYS stay away from tanks engulfed in fire.
* For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn.

SPILL OR LEAK
* ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area).
* All equipment used when handling the product must be grounded.
* Do not touch or walk through spilled material.
* Stop leak if you can do it without risk.

* Prevent entry into waterways, sewers, basements or confined areas.
* A vapor suppressing foam may be used to reduce vapors.
* Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers.
* Use clean non-sparking tools to collect absorbed material.

Large Spills

* Dike far ahead of liquid spill for later disposal.
* Water spray may reduce vapor; but may not prevent ignition in closed spaces.

FIRST AID

* Move victim to fresh air.
* Call 911 or emergency medical service.
* Apply artificial respiration if victim is not breathing.
* Administer oxygen if breathing is difficult.
* Remove and isolate contaminated clothing and shoes.
* In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
* Wash skin with soap and water.
* Keep victim warm and quiet.
* Effects of exposure (inhalation, ingestion or skin contact) to substance may be delayed.
* Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves.

Additional Emergency Response Information (CAMEO Data)

Non-fire Spill Response: Keep sparks, flames, and other sources of ignition away. Keep material out of water sources and sewers. Build dikes to contain flow as necessary. Attempt to stop leak if without undue personnel hazard. Use water spray to knock-down vapors. Land spill: Dig a pit, pond, lagoon, holding area to contain liquid or solid material. Dike surface flow using soil, sand bags, foamed polyurethane, or foamed concrete. Absorb bulk liquid with fly ash, cement powder, or commercial sorbents. Apply "universal" gelling agent to immobilize spill. Apply approriate foam to diminish vapor and fire hazard. Water spill: Use natural barriers or oil spill control booms to limit spill travel. Use surface active agent (e.g. detergent, soaps, alcohols), if approved by epa. Inject "universal" gelling agent to solidify encircled spill and increase effectiveness of booms. If dissolved, in region of 10 ppm or greater concentration, apply activated carbon at ten times the spilled amount. Remove trapped material with suction hoses. Use mechanical dredges or lifts to remove immobilized masses of pollutants and precipitates. (AAR, 1999)

Firefighting: Do not extinguish fire unless flow can be stopped. Use water in flooding quantities as fog. Solid streams of water may spread fire. Cool all affected containers with flooding quantities of water. Apply water from as far a distance as possible. Use foam, dry chemical, or carbon dioxide. (AAR, 1999)

Reactivity: CHEMICAL PROFILE: Xylene reacts with sulfuric acid, nitric acid, and strong oxidants liberating heat. (Handling Chemicals Safely 1980. p. 962). (REACTIVITY, 1999)

First Aid: EYES: First check the victim for contact lenses and remove if present. Flush victim's eyes with water or normal saline solution for 20 to 30 minutes while simultaneously calling a hospital or poison control center. Do not put any ointments, oils, or medication in the victim's eyes without specific instructions from a physician. IMMEDIATELY transport the victim after flushing eyes to a hospital even if no symptoms (such as redness or irritation) develop. SKIN: IMMEDIATELY flood affected skin with water while removing and isolating all contaminated clothing. Gently wash all affected skin areas thoroughly with soap and water. If symptoms such as redness or irritation develop, IMMEDIATELY call a physician and be prepared to transport the victim to a hospital for treatment. INHALATION: IMMEDIATELY leave the contaminated area; take deep breaths of fresh air. If symptoms (such as wheezing, coughing, shortness of Breathing, or burning in the mouth, throat, or chest) develop, call a physician and be prepared to transport the victim to a hospital. Provide proper respiratory protection to rescuers entering an unknown atmosphere. Whenever possible, Self-Contained Breathing Apparatus (SCBA) should be used; if not available, use a level of protection greater than or equal to that advised under Protective Clothing. INGESTION: DO NOT INDUCE VOMITING. If the victim is conscious and not convulsing, give 1 or 2 glasses of water to dilute the chemical and IMMEDIATELY call a hospital or poison control center. Be prepared to transport the victim to a hospital if advised by a physician. If the victim is convulsing or unconscious, do not give anything by mouth, ensure that the victim's airway is open and lay the victim on his/her side with the Headache lower than the body. DO NOT INDUCE VOMITING. IMMEDIATELY transport the victim to a hospital. (NTP, 1992)

OSHA/EPA Occupational Chemical Database

Chemical Identification

Chemical Name: VINYL CHLORIDE

CAS #: 75-01-4 **UN No:** 1086 **Formula:** C2H3Cl

Synonyms: Chloroethene; Chloroethylene; Ethylene monochloride; Monochloroethene; Monochloroethylene; VC; Vinyl chloride monomer (VCM)

Physical Properties

Physical Description: Colorless gas or liquid (below 7ºF) with a pleasant odor at high concentrations. [Note: Shipped as a liquefied compressed gas.]

BP: 7ºF	**MW:** 62.5	**LEL:** 3.6%	**NFPA Fire Rating:** 4
FRZ/MLT: FRZ: -256ºF	**VP:** 3.3 atm	**UEL:** 33.0%	**NFPA Health Rating:** 2
FP: NA (Gas)	**VD:** 2.21		**NFPA Reactivity Rating:** 2
Sp. GR: NA	**IP:** 9.99 eV		**NFPA Sp. Inst.:** NA

Exposure Limits

OSHA	NIOSH	Related Information
PEL-TWA ppm: 1	**REL-TWA ppm:** NA	**AIHA Emergency Response Planning Guidelines - ERPG-1/ERPG-2/ERPG-3:** NA
PEL-TWA mg/m3: NA	**REL-TWA mg/m3:** NA	
PEL-STEL ppm: NA	**REL-STEL ppm:** NA	
PEL-STEL mg/m3: NA	**REL-STEL mg/m3:** NA	
PEL-C ppm: 5	**REL-C ppm:** NA	
PEL-C mg/m3: NA	**REL-C mg/m3:** NA	**Carcinogen Classifications:** IARC-1, NIOSH-Ca, NTP-K, OSHA-Ca,TLV-A1
Skin Notation: No	**Skin Notation:** No	
Notes: SEE 29 CFR 1910.1017; 5 ppm IS THE AVERAGE CONCENTRATION THAT MUST NOT BE EXCEEDED DURING ANY PERIOD NOT EXCEED 15 MINUTES	**Notes:** CARCINOGEN (Ca); REDUCE EXPOSURE TO LOWEST FEASIBLE CONCENTRATION, USE 29 CFR 1910.1017	
	IDLH ppm: NA	
	IDLH mg/m3: NA	
	IDLH Notes: Ca	

NIOSH Pocket Guide to Chemical Hazards (Current through June 2006)

Vinyl chloride			CAS: 75-01-4
Formula: CH2=CHCl			RTECS: KU9625000
Synonyms & Trade Names: Chloroethene, Chloroethylene, Ethylene monochloride, Monochloroethene, Monochloroethylene, VC, Vinyl chloride monomer (VCM)			DOT ID & Guide: 1086 116P (inhibited)
Exposure Limits			
NIOSH REL: Ca See Appendix A		OSHA PEL: [1910.1017] TWA 1 ppm C 5 ppm [15-minute]	
IDLH: Ca [N.D.]		Conversion: 1 ppm = 2.56 mg/m3	
Physical Description			
Colorless gas or liquid (below 7F) with a pleasant odor at high concentrations. [Note: Shipped as a liquefied compressed gas.]			
MW: 62.5	BP: 7F	FRZ: -256F	Sol(77F): 0.1%
VP: 3.3 atm	IP: 9.99 eV	RGasD: 2.21	SG: NA
Fl.P: NA (Gas)	UEL: 33.0%	LEL: 3.6%	MEC: NA
Flammable Gas (See flammable and combustible liquid classes)			
Incompatibilities & Reactivities			
Copper, oxidizers, aluminum, peroxides, iron, steel [Note: Polymerizes in air, sunlight, or heat unless stabilized by inhibitors such as phenol. Attacks iron & steel in presence of moisture.]			
Measurement Methods			
NIOSH 1007; OSHA 4, 75			
Personal Protection & Sanitation		**First Aid**	

Skin: Frostbite Eyes: Frostbite Wash skin: N.R. Remove: When wet (flamm) Change: N.R. Provide: Frostbite	Eye: Frostbite Skin: Frostbite Breath: Resp support (See procedures)

NIOSH Respirator Recommendations

NIOSH : SCBAF:PD,PP/SAF:PD,PP:ASCBA Escape: GMFS/SCBAE
(See symbols and codes)

Exposure Routes

Inh Con (liquid)

Symptoms

Weak; abdom pain, GI bleeding; enlarged liver; pallor or cyan of extremities; liquid: frostbite; [carc]
(See abbreviations)

Target Organs

Liver, CNS, blood, resp sys, lymphatic sys
(See abbreviations)

DOT Emergency Response Guidebook (ERG 2004)

Guide Number: 116P

116 Gases - Flammable (Unstable)
POTENTIAL HAZARDS
FIRE OR EXPLOSION
* EXTREMELY FLAMMABLE.
* Will be easily ignited by heat, sparks or flames.
* Will form explosive mixtures with air.
* Silane will ignite spontaneously in air.
* Those substances designated with a P may polymerize explosively when heated or involved in a fire.
* Vapors from liquefied gas are initially heavier than air and spread along ground.
* Vapors may travel to source of ignition and flash back.
* Containers may explode when heated.
* Ruptured cylinders may rocket.

HEALTH
* Vapors may cause dizziness or asphyxiation without warning.
* Some may be toxic if inhaled at high concentrations.
* Contact with gas or liquefied gas may cause burns, severe injury and/or frostbite.
* Fire may produce irritating and/or toxic gases.

PUBLIC SAFETY
* CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, refer to appropriate telephone number listed on the inside back cover.
* Isolate spill or leak area immediately for at least 100 meters (330 feet) in all directions.
* Keep unauthorized personnel away.
* Stay upwind.
* Many gases are heavier than air and will spread along ground and collect in low or confined areas (sewers, basements, tanks).
* Keep out of low areas.

PROTECTIVE CLOTHING
* Wear positive pressure self-contained breathing apparatus (SCBA).
* Structural firefighters' protective clothing will only provide limited protection.

EVACUATION
Large Spill
* Consider initial downwind evacuation for at least 800 meters (1/2 mile).

Fire
* If tank, rail car or tank truck is involved in a fire, ISOLATE for 1600 meters (1 mile) in all directions; also, consider initial evacuation for 1600 meters (1 mile) in all directions.

EMERGENCY RESPONSE
FIRE
* DO NOT EXTINGUISH A LEAKING GAS **FIRE** UNLESS LEAK CAN BE STOPPED.

Small Fires
* Dry chemical or CO2.

Large Fires
* Water spray or fog.
* Move containers from fire area if you can do it without risk.

Fire involving Tanks
* Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
* Cool containers with flooding quantities of water until well after fire is out.
* Do not direct water at source of leak or safety devices; icing may occur.

* Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.
* ALWAYS stay away from tanks engulfed in fire.
* For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn.

SPILL OR LEAK

* ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area).
* All equipment used when handling the product must be grounded.
* Stop leak if you can do it without risk.
* Do not touch or walk through spilled material.
* Do not direct water at spill or source of leak.
* Use water spray to reduce vapors or divert vapor cloud drift. Avoid allowing water runoff to contact spilled material.
* If possible, turn leaking containers so that gas escapes rather than liquid.
* Prevent entry into waterways, sewers, basements or confined areas.
* Isolate area until gas has dispersed.

FIRST AID

* Move victim to fresh air.
* Call 911 or emergency medical service.
* Apply artificial respiration if victim is not breathing.
* Administer oxygen if breathing is difficult.
* Remove and isolate contaminated clothing and shoes.
* In case of contact with liquefied gas, thaw frosted parts with lukewarm water
* Keep victim warm and quiet.
* Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves.

The letter **P** following the guide number identifies those materials which present a polymerization hazard under certain conditions. First responders at the scene of a dangerous goods incident should seek additional specific information about any material in question as soon as possible. The information received by contacting the appropriate emergency response agency, the emergency response number on the shipping document, or by consulting the information on or accompanying the shipping document, may be more specific and accurate than this guidebook in providing guidance for the materials involved.

Additional Emergency Response Information (CAMEO Data)

Non-fire Spill Response: Keep sparks, flames, and other sources of ignition away. Keep material out of water sources and sewers. Attempt to stop leak if without undue personnel hazard. Use water spray to knock-down vapors. (AAR, 1999)

Firefighting: Do not extinguish fire unless flow can be stopped. Use water in flooding quantities as fog. Cool all affected containers with flooding quantities of water. Apply water from as far a distance as possible. (AAR, 1999)

Reactivity: CHEMICAL PROFILE: Light sensitive, peroxidizable monomer may initiate exothermic polymerization of the bulk material (Handling Chemicals Safely 1980.. p. 958; Bretherick 1979. p. 160); with air, it forms polymeric peroxides which are explosive (Bretherick 1979. p. 164). An unstable polyperoxide is formed in vinyl chloride through oxidation by atmospheric oxygen in the presence of any of a variety of catalysts. Storage under these conditions for long periods increases the concentration of the polyperoxides to hazardous levels (MCA Case History 1551. 1969). (REACTIVITY, 1999)

First Aid: EYES: First check the victim for contact lenses and remove if present. Flush victim's eyes with water or normal saline solution for 20 to 30 minutes while simultaneously calling a hospital or poison control center. Do not put any ointments, oils, or medication in the victim's eyes without specific instructions from a physician. IMMEDIATELY transport the victim after flushing eyes to a hospital even if no symptoms (such as redness or irritation) develop. SKIN: CAUTION: Exposure of skin to compressed gases may result in freezing of the skin. Treatment for frostbite may be necessary. Remove the victim from the source of contamination. IMMEDIATELY wash affected areas gently with COLD water (and soap, if necessary) while removing and isolating all contaminated clothing. Dry carefully with clean, soft towels. If symptoms such as inflammation or irritation develop, IMMEDIATELY call a physician or go to a hospital for treatment. INHALATION: IMMEDIATELY leave the contaminated area; take deep breaths of fresh air. IMMEDIATELY call a physician and be prepared to transport the victim to a hospital even if no symptoms (such as wheezing, coughing, shortness of Breathing, or burning in the mouth, throat, or chest) develop. Provide proper respiratory protection to rescuers entering an unknown atmosphere. Whenever possible, Self-Contained Breathing Apparatus (SCBA) should be used; if not available, use a level of protection greater than or equal to that advised under Protective Clothing. INGESTION: This compound is a gas, therefore inhalation is the first route of exposure. OTHER: Since this chemical is a known or suspected carcinogen you should contact a physician for advice regarding the possible long term health effects and potential recommendation for medical monitoring. Recommendations from the physician will depend upon the specific compound, its chemical, physical and toxicity properties, the exposure level, length of exposure, and the route of exposure. (NTP, 1992)

OSHA/EPA Occupational Chemical Database

Chemical Identification

Chemical Name: VANADIUM, RESPIRABLE DUST & FUME, as V2O5

CAS #: 1314-62-1 **UN No:** 2862 **Formula:** O5V2

Synonyms: Divanadium pentoxide dust; Vanadic anhydride dust; Vanadium oxide dust; Vanadium pentaoxide dust Other synonyms vary depending upon the specific vanadium compound.

Physical Properties

Physical Description: Yellow-orange powder or dark-gray, odorless flakes dispersed in air.

BP: 3182ºF (Decomposes)	**MW:** 181.9	**LEL:** NA	**NFPA Fire Rating:** NA
FRZ/MLT: MLT: 1274ºF	**VP:** 0 mmHg (approx)	**UEL:** NA	**NFPA Health Rating:** NA
FP: NA	**VD:** NA		**NFPA Reactivity Rating:** NA
Sp. GR: 3.36	**IP:** NA		**NFPA Sp. Inst.:** NA

Exposure Limits

OSHA	NIOSH	Related Information
PEL-TWA ppm: NA	**REL-TWA ppm:** NA	**AIHA Emergency Response Planning Guidelines - ERPG-1/ERPG-2/ERPG-3:** NA
PEL-TWA mg/m3: NA	**REL-TWA mg/m3:** NA	
PEL-STEL ppm: NA	**REL-STEL ppm:** NA	
PEL-STEL mg/m3: NA	**REL-STEL mg/m3:** NA	
PEL-C ppm: NA	**REL-C ppm:** NA	
PEL-C mg/m3: 0.1	**REL-C mg/m3:** 0.05	**Carcinogen Classifications:** TLV-A4
Skin Notation: No	**Skin Notation:** No	
Notes: FUME, 0.5 mg/m3 CEILING FOR RESPIRABLE DUST	**Notes:** 15 MINUTE CEILING, APPLIES TO TOTAL DUST, as V, EXCEPT VANADIUM METAL AND VANADIUM CARBIDE	
	IDLH ppm: NA	
	IDLH mg/m3: 35	
	IDLH Notes: as V	

NIOSH Pocket Guide to Chemical Hazards (Current through June 2006)

Vanadium fume			CAS: 1314-62-1
Formula: V2O5			RTECS: YW2460000
Synonyms & Trade Names: Divanadium pentoxide fume, Vanadic anhydride fume, Vanadium oxide fume, Vanadium pentaoxide fume Other synonyms vary depending upon the specific vanadium compound.			DOT ID & Guide: 2862 151
Exposure Limits			
NIOSH REL: C 0.05 mg V/m3 [15-minute]		OSHA PEL : C 0.1 mg V2O5/m3	
IDLH: 35 mg/m3 (as V)		Conversion: NA	
Physical Description			
Finely divided particulate dispersed in air.			
MW: 181.9	BP: 3182F (Decomposes)	MLT: 1274F	Sol: 0.8%
VP: 0 mmHg (approx)	IP: NA	RGasD: NA	Sp.Gr: 3.36
Fl.P: NA	UEL: NA	LEL: NA	MEC: NA
Noncombustible Solid (See flammable and combustible liquid classes)			
Incompatibilities & Reactivities			
Lithium, chlorine trifluoride			
Measurement Methods			
NIOSH 7300, 7301, 7303, 7504; OSHA ID185			
Personal Protection & Sanitation		**First Aid**	
Skin: N.R.			

Eyes: N.R. Wash skin: N.R. Remove: N.R. Change: N.R.	Breath: Resp support (See procedures)

NIOSH Respirator Recommendations

NIOSH (as V) 0.5 mg/m3: HiE*/SA* 1.25 mg/m3: SA:CF*/PAPRHiE* 2.5 mg/m3: HiEF/PAPRTHiE*/SCBAF/SAF 35 mg/m3: SAF:PD,PP : SCBAF:PD,PP/SAF:PD,PP:ASCBA Escape: HiEF/SCBAE
(See symbols and codes)

Exposure Routes

Inh Con

Symptoms

Irrit eyes, throat; green tongue, metallic taste; cough, fine rales, wheez, bron, dysp; eczema
(See abbreviations)

Target Organs

Eyes, skin, resp sys
(See abbreviations)

DOT Emergency Response Guidebook (ERG 2004)

Guide Number: 151

151 Substances - Toxic (Non-Combustible)
POTENTIAL HAZARDS
HEALTH
* Highly toxic, may be fatal if inhaled, swallowed or absorbed through skin.
* Avoid any skin contact.
* Effects of contact or inhalation may be delayed.
* Fire may produce irritating, corrosive and/or toxic gases.
* Runoff from fire control or dilution water may be corrosive and/or toxic and cause pollution.

FIRE OR EXPLOSION
* Non-combustible, substance itself does not burn but may decompose upon heating to produce corrosive and/or toxic fumes.
* Containers may explode when heated.
* Runoff may pollute waterways.

PUBLIC SAFETY
* CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, refer to appropriate telephone number listed on the inside back cover.
* Isolate spill or leak area immediately for at least 25 to 50 meters (80 to 160 feet) in all directions.
* Keep unauthorized personnel away.
* Stay upwind.
* Keep out of low areas.

PROTECTIVE CLOTHING
* Wear positive pressure self-contained breathing apparatus (SCBA).
* Wear chemical protective clothing which is specifically recommended by the manufacturer. It may provide little or no thermal protection.
* Structural firefighters' protective clothing provides limited protection in fire situations ONLY; it is not effective in spill situations.

EVACUATION
Spill
* See the Table of Initial Isolation and Protective Action Distances for highlighted substances. For non-highlighted substances, increase, in the downwind direction, as necessary, the isolation distance shown under **PUBLIC SAFETY**.

Fire
* If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions.

EMERGENCY RESPONSE
FIRE
Small Fires
* Dry chemical, CO2 or water spray.

Large Fires
* Water spray, fog or regular foam.
* Move containers from fire area if you can do it without risk.
* Dike fire control water for later disposal; do not scatter the material.
* Use water spray or fog; do not use straight streams.

Fire involving Tanks or Car/Trailer Loads
* Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
* Do not get water inside containers.
* Cool containers with flooding quantities of water until well after fire is out.
* Withdraw immediately in case of rising sound from venting safety

devices or discoloration of tank.
* ALWAYS stay away from tanks engulfed in fire.
* For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn.

SPILL OR LEAK

* Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.
* Stop leak if you can do it without risk.
* Prevent entry into waterways, sewers, basements or confined areas.
* Cover with plastic sheet to prevent spreading.
* Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers.
* DO NOT GET WATER INSIDE CONTAINERS.

FIRST AID

* Move victim to fresh air.
* Call 911 or emergency medical service.
* Apply artificial respiration if victim is not breathing.
* Do not use mouth-to-mouth method if victim ingested or inhaled the substance; induce artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device.
* Administer oxygen if breathing is difficult.
* Remove and isolate contaminated clothing and shoes.
* In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
* For minor skin contact, avoid spreading material on unaffected skin.
* Keep victim warm and quiet.
* Effects of exposure (inhalation, ingestion or skin contact) to substance may be delayed.
* Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves.

Additional Emergency Response Information (CAMEO Data)

Non-fire Spill Response: Keep sparks, flames, and other sources of ignition away. Keep material out of water sources and sewers. (AAR, 1999)

Firefighting: Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Ventilate closed spaces before entering them. Wear positive pressure breathing apparatus and special protective clothing. Remove and isolate contaminated clothing at the site.Small fires: dry chemical, carbon dioxide, water spray, or foam. Large fires: water spray, fog, or foam. Move container from fire area if you can do it without risk. Fight fire from maximum distance. Dike fire control water for later disposal; do not scatter the material. (EPA, 1998)

Reactivity: STABILITY: This chemical is stable under normal laboratory conditions. Solutions of this chemical in water, DMSO, 95% ethanol or acetone should be stable for 24 hours under normal lab conditions.REACTIVITY: This chemical can react with ClF3, Li, peroxyformic acid and (Ca+S+H2O). It also reacts with strong acids. (NTP, 1992)

First Aid: Signs and Symptoms of Acute Vanadium Pentoxide Exposure: Acute exposure to vanadium pentoxide may result in pulmonary irritation, bronchospasm, hemoptysis (coughing up of blood), pulmonary edema, emphysema, and pneumonia. Gastrointestinal effects may include nausea, abdominal cramping, diarrhea, anorexia, and black stools. Headache, dry mouth, dizziness, nervousness, insomnia, and tremor may be found. Vanadium pentoxide is irritating to the skin, eyes, and mucous membranes. Contact may result in a green staining of the tongue and skin. Blindness and epistaxis (bloody nose) are further complications. Emergency Life-Support Procedures: Acute exposure to vanadium pentoxide may require decontamination and life support for the victims. Emergency personnel should wear protective clothing appropriate to the type and degree of contamination. Air-purifying or supplied-air respiratory equipment should also be worn, as necessary. Rescue vehicles should carry supplies such as plastic sheeting and disposable plastic bags to assist in preventing spread of contamination. Inhalation Exposure: 1. Move victims to fresh air. Emergency personnel should avoid self-exposure to vanadium pentoxide. 2. Evaluate vital signs including pulse and respiratory rate, and note any trauma. If no pulse is detected, provide CPR. If not breathing, provide artificial respiration. If breathing is labored, administer oxygen or other respiratory support. 3. Obtain authorization and/or further instructions from the Localized hospital for administration of an antidote or performance of other invasive procedures. 4. Transport to a health care facility. Dermal/Eye Exposure: 1. Remove victims from exposure. Emergency personnel should avoid self-exposure to vanadium pentoxide. 2. Evaluate vital signs including pulse and respiratory rate, and note any trauma. If no pulse is detected, provide CPR. If not breathing, provide artificial respiration. If breathing is labored, administer oxygen or other respiratory support. 3. Remove contaminated clothing as soon as possible. 4. If eye exposure has occurred, eyes must be flushed with lukewarm water for at least 15 minutes. 5. Wash exposed skin areas THOROUGHLY with soap and water. 6. Obtain authorization and/or further instructions from the Localized hospital for administration of an antidote or performance of other invasive procedures. 7. Transport to a health care facility. Ingestion Exposure: 1. Evaluate vital signs including pulse and respiratory rate, and note any trauma. If no pulse is detected, provide CPR. If not breathing, provide artificial respiration. If breathing is labored, administer oxygen or other respiratory support. 2. Obtain authorization and/or further instructions from the Localized hospital for administration of an antidote or performance of other invasive procedures. 3. Give the victims water or milk: children up to 1 year old, 125 mL (4 oz or 1/2 cup); children 1 to 12 years old, 200 mL (6 oz or 3/4 cup); adults, 250 mL (8 oz or 1 cup). Water or milk should be given only if victims are conscious and alert. 4. Vomiting may be induced with syrup of Ipecac. If elapsed time since ingestion of vanadium pentoxide is unknown or suspected to be greater than 30 minutes, do not induce vomiting and proceed to Step 5.Ipecac should not be administered to children under 6 months of age. Warning: Syrup of Ipecac should be administered only if victims are alert, have an active gag-reflex, and show no signs of impending seizure or coma. If ANY uncertainty exists, proceed to Step 5. The following dosages of Ipecac are recommended: children up to 1 year old, 10 mL (1/3 oz); children 1 to 12 years old, 15 mL (1/2 oz); adults, 30 mL (1 oz). Ambulate (walk) the victims and give large quantities of water. If vomiting has not occurred after 15 minutes, Ipecac may be readministered. Continue to ambulate and give water to the victims. If vomiting has not occurred within 15 minutes after second administration of Ipecac, administer activated charcoal. 5. Activated charcoal may be administered if victims are conscious and alert. Use 15 to 30 g (1/2 to 1 oz) for children, 50 to 100 g (1-3/4 to 3-1/2 oz) for adults, with 125 to 250 mL (1/2 to 1 cup) of water. 6. Promote excretion by administering a saline cathartic or sorbitol to conscious and alert victims. Children require 15 to 30 g (1/2 to 1 oz) of cathartic; 50 to 100 g (1-3/4 to 3-1/2 oz) is recommended for adults. 7. Transport to a health care facility. (EPA, 1998)

OSHA/EPA Occupational Chemical Database

Chemical Identification

Chemical Name: TRICHLOROETHYLENE
CAS #: 79-01-6 **UN No:** 1710 **Formula:** C2HCl3
Synonyms: Ethylene trichloride; TCE; Trichloroethene; Trilene

Physical Properties

Physical Description: Colorless liquid (unless dyed blue) with a chloroform-like odor.

BP: 189ºF	**MW:** 131.4	**LEL:** (77ºF): 8%	**NFPA Fire Rating:** 2
FRZ/MLT: FRZ: -99ºF	**VP:** 58 mmHg	**UEL:** (77ºF): 10.5%	**NFPA Health Rating:** 2
FP: NA	**VD:** NA		**NFPA Reactivity Rating:** 0
Sp. GR: 1.46	**IP:** 9.45 eV		**NFPA Sp. Inst.:** NA

Exposure Limits

OSHA	NIOSH	Related Information
PEL-TWA ppm: 100	**REL-TWA ppm:** 25	**AIHA Emergency Response Planning Guidelines - ERPG-1/ERPG-2/ERPG-3:** 100 ppm/500 ppm/5000 ppm
PEL-TWA mg/m3: NA	**REL-TWA mg/m3:** NA	
PEL-STEL ppm: NA	**REL-STEL ppm:** NA	
PEL-STEL mg/m3: NA	**REL-STEL mg/m3:** NA	
PEL-C ppm: 200	**REL-C ppm:** NA	
PEL-C mg/m3: NA	**REL-C mg/m3:** 2	**Carcinogen Classifications:** IARC-2A, NIOSH-Ca, TLV-A5, NTP-R
Skin Notation: No	**Skin Notation:** No	
Notes: PEAK = 300 ppm FOR A 5 MINUTE INTERVAL DURING ANY 2 HOURS	**Notes:** CARCINOGEN (Ca); 60 MINUTE CEILING, CEILING IS FOR EXPOSURE TO WASTE ANESTHETIC GASES	
	IDLH ppm: 1000	
	IDLH mg/m3: NA	
	IDLH Notes: Ca	

NIOSH Pocket Guide to Chemical Hazards (Current through June 2006)

Trichloroethylene			CAS: 79-01-6
Formula: ClCH=CCl2			RTECS: KX4550000
Synonyms & Trade Names: Ethylene trichloride, TCE, Trichloroethene, Trilene			DOT ID & Guide: 1710 160
Exposure Limits			
NIOSH REL: Ca See Appendix A See Appendix C		OSHA PEL : TWA 100 ppm C 200 ppm 300 ppm (5-minute maximum peak in any 2 hours)	
IDLH: Ca [1000 ppm]		Conversion: 1 ppm = 5.37 mg/m3	
Physical Description			
Colorless liquid (unless dyed blue) with a chloroform-like odor.			
MW: 131.4	BP: 189F	FRZ: -99F	Sol: 0.1%
VP: 58 mmHg	IP: 9.45 eV	RGasD: NA	Sp.Gr: 1.46
Fl.P: ?	UEL(77F): 10.5%	LEL(77F): 8%	MEC: NA
Combustible Liquid, but burns with difficulty. (See flammable and combustible liquid classes)			
Incompatibilities & Reactivities			
Strong caustics & alkalis; chemically-active metals (such as barium, lithium, sodium, magnesium, titanium & beryllium)			
Measurement Methods			
NIOSH 1022, 3800; OSHA 1001			
Personal Protection & Sanitation		**First Aid**	
Skin: Prevent skin contact Eyes: Prevent eye contact		Eye: Irr immed Skin: Soap wash prompt	

Wash skin: When contam Remove: When wet or contam Change: N.R. Provide: Eyewash, Quick drench	Breath: Resp support Swallow: Medical attention immed (See procedures)

NIOSH Respirator Recommendations

NIOSH : SCBAF:PD,PP/SAF:PD,PP:ASCBA Escape: GMFOV/SCBAE
(See symbols and codes)

Exposure Routes

Inh Abs Ing Con

Symptoms

Irrit eyes, skin; head, verti; vis dist, ftg, gidd, tremor, som, nau, vomit; derm; card arrhy, pares; liver inj; [carc]
(See abbreviations)

Target Organs

Eyes, skin, resp sys, heart, liver, kidneys, CNS
(See abbreviations)

DOT Emergency Response Guidebook (ERG 2004)

Guide Number: 160

160 Halogenated Solvents
POTENTIAL HAZARDS
HEALTH
* Vapors may cause dizziness or suffocation.
* Exposure in an enclosed area may be very harmful.
* Contact may irritate or burn skin and eyes.
* Fire may produce irritating and/or toxic gases.
* Runoff from fire control or dilution water may cause pollution.

FIRE OR EXPLOSION
* Some of these materials may burn, but none ignite readily.
* Most vapors are heavier than air.
* Air/vapor mixtures may explode when ignited.
* Container may explode in heat of fire.

PUBLIC SAFETY
* CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, refer to appropriate telephone number listed on the inside back cover.
* Isolate spill or leak area immediately for at least 25 to 50 meters (80 to 160 feet) in all directions.
* Keep unauthorized personnel away.
* Stay upwind.
* Many gases are heavier than air and will spread along ground and collect in low or confined areas (sewers, basements, tanks).
* Keep out of low areas.
* Ventilate closed spaces before entering.

PROTECTIVE CLOTHING
* Wear positive pressure self-contained breathing apparatus (SCBA).
* Structural firefighters' protective clothing will only provide limited protection.

EVACUATION
Large Spill
* Consider initial downwind evacuation for at least 100 meters (330 feet).

Fire
* If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions.

EMERGENCY RESPONSE
FIRE
Small Fires
* Dry chemical, CO2 or water spray.

Large Fires
* Dry chemical, CO2, alcohol-resistant foam or water spray.
* Move containers from fire area if you can do it without risk.
* Dike fire control water for later disposal; do not scatter the material.

Fire involving Tanks or Car/Trailer Loads
* Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
* Cool containers with flooding quantities of water until well after fire is out.
* Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.
* ALWAYS stay away from tanks engulfed in fire.

SPILL OR LEAK
* ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area).
* Stop leak if you can do it without risk.

Small Liquid Spills
* Take up with sand, earth or other noncombustible absorbent material.

Large Spills
* Dike far ahead of liquid spill for later disposal.
* Prevent entry into waterways, sewers, basements or confined areas.

FIRST AID
* Move victim to fresh air.
* Call 911 or emergency medical service.
* Apply artificial respiration if victim is not breathing.
* Administer oxygen if breathing is difficult.
* Remove and isolate contaminated clothing and shoes.
* In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
* For minor skin contact, avoid spreading material on unaffected skin.
* Wash skin with soap and water.
* Keep victim warm and quiet.
* Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves.

Additional Emergency Response Information (CAMEO Data)

Non-fire Spill Response: Keep material out of water sources and sewers. Build dikes to contain flow as necessary. Apply water spray or mist to knock down vapors. Combustion products include corrosive or toxic vapors. Land spill: Dig a pit, pond, lagoon, holding area to contain liquid or solid material. Dike surface flow using soil, sand bags, foamed polyurethane, or foamed concrete. Absorb bulk liquid with fly ash or cement powder. Water spill: If dissolved, in region of 10 ppm or greater concentration, apply activated carbon at ten times the spilled amount. Remove trapped material with suction hoses. Use mechanical dredges or lifts to remove immobilized masses of pollutants and precipitates. (AAR, 1999)

Firefighting: Extinguish fire using agent suitable for type of surrounding fire. (Material itself does not burn or burns with difficulty.) (AAR, 1999)

Reactivity: CHEMICAL PROFILE: It has been determined experimentally that mixtures of finely divided barium metal and a number of halogenated hydrocarbons possess an explosive capability. Specifically, impact sensitivity tests have shown that granular barium in contact with monofluorotrichloromethane, trichlorotrifluoroethane, carbon tetrachloride, trichloroethylene, or tetrachloroethylene can detonate (ASESB Pot. Incid. 39. 1968; Chem. Eng. News 46(9):38. 1968). It has been determined experimentally that a mixture of beryllium powder with carbon tetrachloride or with trichloroethylene will flash or spark on heavy impact (ASESB Pot. Incid. 39. 1968). A mixture of powdered magnesium with trichloroethylene or with carbon tetrachloride will flash or spark under heavy impact (ASESB Pot. Incid, 39. 1968). (REACTIVITY, 1999)

First Aid: EYES: First check the victim for contact lenses and remove if present. Flush victim's eyes with water or normal saline solution for 20 to 30 minutes while simultaneously calling a hospital or poison control center. Do not put any ointments, oils, or medication in the victim's eyes without specific instructions from a physician. IMMEDIATELY transport the victim after flushing eyes to a hospital even if no symptoms (such as redness or irritation) develop. SKIN: IMMEDIATELY flood affected skin with water while removing and isolating all contaminated clothing. Gently wash all affected skin areas thoroughly with soap and water. IMMEDIATELY call a hospital or poison control center even if no symptoms (such as redness or irritation) develop. IMMEDIATELY transport the victim to a hospital for treatment after washing the affected areas. INHALATION: IMMEDIATELY leave the contaminated area; take deep breaths of fresh air. IMMEDIATELY call a physician and be prepared to transport the victim to a hospital even if no symptoms (such as wheezing, coughing, shortness of Breathing, or burning in the mouth, throat, or chest) develop. Provide proper respiratory protection to rescuers entering an unknown atmosphere. Whenever possible, Self-Contained Breathing Apparatus (SCBA) should be used; if not available, use a level of protection greater than or equal to that advised under Protective Clothing. INGESTION: DO NOT INDUCE VOMITING. Volatile chemicals have a high risk of being aspirated into the victim's lungs during vomiting which increases the medical problems. If the victim is conscious and not convulsing, give 1 or 2 glasses of water to dilute the chemical and IMMEDIATELY call a hospital or poison control center. IMMEDIATELY transport the victim to a hospital. If the victim is convulsing or unconscious, do not give anything by mouth, ensure that the victim's airway is open and lay the victim on his/her side with the Headache lower than the body. DO NOT INDUCE VOMITING. IMMEDIATELY transport the victim to a hospital. OTHER: Since this chemical is a known or suspected carcinogen you should contact a physician for advice regarding the possible long term health effects and potential recommendation for medical monitoring. Recommendations from the physician will depend upon the specific compound, its chemical, physical and toxicity properties, the exposure level, length of exposure, and the route of exposure. (NTP, 1992)

OSHA/EPA Occupational Chemical Database

Chemical Identification

Chemical Name: THALLIUM, SOLUBLE COMPOUNDS, as Tl

CAS #: 7440-28-0 **UN No:** **Formula:** Tl

Synonyms: Synonyms vary depending upon the specific soluble thallium compound.

Physical Properties

Physical Description: Light-gray to tan powder with a slightly aromatic odor.

BP: NA	**MW:** 358.6	**LEL:** NA	**NFPA Fire Rating:** NA
FRZ/MLT: MLT: 302ºF	**VP:** 0.0000006 mmHg	**UEL:** NA	**NFPA Health Rating:** NA
FP: 420ºF	**VD:** NA		**NFPA Reactivity Rating:** NA
Sp. GR: 1.10	**IP:** NA		**NFPA Sp. Inst.:** NA

Exposure Limits

OSHA	NIOSH	Related Information
PEL-TWA ppm: NA	**REL-TWA ppm:** NA	**AIHA Emergency Response Planning Guidelines - ERPG-1/ERPG-2/ERPG-3:** NA
PEL-TWA mg/m3: 0.1	**REL-TWA mg/m3:** 0.1	
PEL-STEL ppm: NA	**REL-STEL ppm:** NA	
PEL-STEL mg/m3: NA	**REL-STEL mg/m3:** NA	
PEL-C ppm: NA	**REL-C ppm:** NA	
PEL-C mg/m3: NA	**REL-C mg/m3:** NA	**Carcinogen Classifications:** NA
Skin Notation: Yes	**Skin Notation:** Yes	
Notes: NA	**Notes:** NA	
	IDLH ppm: NA	
	IDLH mg/m3: 15	
	IDLH Notes: NA	

NIOSH Pocket Guide to Chemical Hazards (Current through June 2006)

Thallium (soluble compounds, as Tl)	CAS: 7440-28-0
Formula: NA	RTECS: NA
Synonyms & Trade Names: Synonyms vary depending upon the specific soluble thallium compound.	DOT ID & Guide: 1707 151 (compounds, n.o.s.)

Exposure Limits	
NIOSH REL: TWA 0.1 mg/m3 [skin]	OSHA PEL: TWA 0.1 mg/m3 [skin]
IDLH: 15 mg/m3 (as Tl)	Conversion: NA

Physical Description

Appearance and odor vary depending upon the specific soluble thallium compound.

Properties vary depending upon the specific soluble thallium compound.	BP: NA	FRZ: NA	Sol: NA
VP: NA	IP: NA	RGasD: NA	SG: NA
FP: NA	UEL: NA	LEL: NA	MEC: NA

NA (See flammable and combustible liquid classes)

Incompatibilities & Reactivities

Varies

Measurement Methods

NIOSH 7300, 7301, 7303, 9102; OSHA ID121

Personal Protection & Sanitation	First Aid
Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet or contam Change: Daily	Eye: Irr immed Skin: Water flush prompt Breath: Resp support Swallow: Medical attention immed (See procedures)

NIOSH Respirator Recommendations

NIOSH/OSHA 0.5 mg/m3: DM^ 1 mg/m3: DMXSQ^/SA 2.5 mg/m3: SA:CF/PAPRDM^ 5 mg/m3: HiEF/SAT:CF/PAPRTHiE/SCBAF/SAF 15 mg/m3: SAF:PD,PP : SCBAF:PD,PP/SAF:PD,PP:ASCBA Escape: HiEF/SCBAE
(See symbols and codes)

Exposure Routes

Inh Abs Ing Con

Symptoms

Nau, diarr, abdom pain, vomit; ptosis, strabismus; peri neuritis, tremor; retster tight, chest pain, pulm edema; sez, chorea, psychosis; liver, kidney damage; alopecia; pares legs
(See abbreviations)

Target Organs

Eyes, resp sys, CNS, liver, kidneys, GI tract, body hair
(See abbreviations)

DOT Emergency Response Guidebook (ERG 2004)

Guide Number: 151

151 Substances - Toxic (Non-Combustible)
POTENTIAL HAZARDS
HEALTH
* Highly toxic, may be fatal if inhaled, swallowed or absorbed through skin.
* Avoid any skin contact.
* Effects of contact or inhalation may be delayed.
* Fire may produce irritating, corrosive and/or toxic gases.
* Runoff from fire control or dilution water may be corrosive and/or toxic and cause pollution.

FIRE OR EXPLOSION
* Non-combustible, substance itself does not burn but may decompose upon heating to produce corrosive and/or toxic fumes.
* Containers may explode when heated.
* Runoff may pollute waterways.

PUBLIC SAFETY
* CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, refer to appropriate telephone number listed on the inside back cover.
* Isolate spill or leak area immediately for at least 25 to 50 meters (80 to 160 feet) in all directions.
* Keep unauthorized personnel away.
* Stay upwind.
* Keep out of low areas.

PROTECTIVE CLOTHING
* Wear positive pressure self-contained breathing apparatus (SCBA).
* Wear chemical protective clothing which is specifically recommended by the manufacturer. It may provide little or no thermal protection.
* Structural firefighters' protective clothing provides limited protection in fire situations ONLY; it is not effective in spill situations.

EVACUATION
Spill
* See the Table of Initial Isolation and Protective Action Distances for highlighted substances. For non-highlighted substances, increase, in the downwind direction, as necessary, the isolation distance shown under **PUBLIC SAFETY**.

Fire
* If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions.

EMERGENCY RESPONSE
FIRE
Small Fires
* Dry chemical, CO2 or water spray.

Large Fires
* Water spray, fog or regular foam.
* Move containers from fire area if you can do it without risk.
* Dike fire control water for later disposal; do not scatter the material.
* Use water spray or fog; do not use straight streams.

Fire involving Tanks or Car/Trailer Loads
* Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
* Do not get water inside containers.
* Cool containers with flooding quantities of water until well after fire is out.
* Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.
* ALWAYS stay away from tanks engulfed in fire.
* For massive fire, use unmanned hose holders or monitor nozzles; if this

is impossible, withdraw from area and let fire burn.

SPILL OR LEAK

* Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.
* Stop leak if you can do it without risk.
* Prevent entry into waterways, sewers, basements or confined areas.
* Cover with plastic sheet to prevent spreading.
* Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers.
* DO NOT GET WATER INSIDE CONTAINERS.

FIRST AID

* Move victim to fresh air.
* Call 911 or emergency medical service.
* Apply artificial respiration if victim is not breathing.
* Do not use mouth-to-mouth method if victim ingested or inhaled the substance; induce artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device.
* Administer oxygen if breathing is difficult.
* Remove and isolate contaminated clothing and shoes.
* In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
* For minor skin contact, avoid spreading material on unaffected skin.
* Keep victim warm and quiet.
* Effects of exposure (inhalation, ingestion or skin contact) to substance may be delayed.
* Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves.

Additional Emergency Response Information (CAMEO Data)

Non-fire Spill Response: NA

Firefighting: NA

Reactivity: CHEMICAL PROFILE: Fluorine acts so vigorously on thallium that it turns the metal incandescent (Mellor 5:421 1946-47). (REACTIVITY, 1999)

First Aid: NA

OSHA/EPA Occupational Chemical Database

Chemical Identification

Chemical Name: PERCHLOROETHYLENE

CAS #: 127-18-4 **UN No:** 1897 **Formula:** C2Cl4

Synonyms: Perchlorethylene; Perchloroethylene; Perk; Tetrachlorethylene

Physical Properties

Physical Description: Colorless liquid with a mild, chloroform-like odor.

BP: 250ºF	**MW:** 165.8	**LEL:** NA	**NFPA Fire Rating:** 0
FRZ/MLT: FRZ: -2ºF	**VP:** 14 mmHg	**UEL:** NA	**NFPA Health Rating:** 2
FP: NA	**VD:** NA		**NFPA Reactivity Rating:** 0
Sp. GR: 1.62	**IP:** 9.32 eV		**NFPA Sp. Inst.:** NA

Exposure Limits

OSHA	NIOSH	Related Information
PEL-TWA ppm: 100	**REL-TWA ppm:** NA	**AIHA Emergency Response Planning Guidelines - ERPG-1/ERPG-2/ERPG-3:** 100 ppm/200 ppm/1000 ppm
PEL-TWA mg/m3: NA	**REL-TWA mg/m3:** NA	
PEL-STEL ppm: NA	**REL-STEL ppm:** NA	
PEL-STEL mg/m3: NA	**REL-STEL mg/m3:** NA	
PEL-C ppm: 200	**REL-C ppm:** NA	
PEL-C mg/m3: NA	**REL-C mg/m3:** NA	**Carcinogen Classifications:** IARC-2A, NIOSH-Ca, NTP-R, TLV-A3
Skin Notation: No	**Skin Notation:** No	
Notes: PEAK = 300 ppm FOR A 5 MINUTE INTERVAL DURING ANY 3 HOURS	**Notes:** CARCINOGEN (CA); Reduce exposure to LOWEST FEASIBLE CONCENTRATION (LOQ 0.4 ppm)	
	IDLH ppm: 150	
	IDLH mg/m3: NA	
	IDLH Notes: Ca	

NIOSH Pocket Guide to Chemical Hazards (Current through June 2006)

Tetrachloroethylene			CAS: 127-18-4
Formula: Cl2C=CCl2			RTECS: KX3850000
Synonyms & Trade Names: Perchlorethylene, Perchloroethylene, Perk, Tetrachlorethylene			DOT ID & Guide: 1897 160
Exposure Limits			
NIOSH REL: Ca Minimize workplace exposure concentrations. See Appendix A		OSHA PEL : TWA 100 ppm C 200 ppm 300 ppm (5-minute maximum peak in any 3-hours)	
IDLH: Ca [150 ppm]		Conversion: 1 ppm = 6.78 mg/m3	
Physical Description			
Colorless liquid with a mild, chloroform-like odor.			
MW: 165.8	BP: 250F	FRZ: -2F	Sol: 0.02%
VP: 14 mmHg	IP: 9.32 eV	RGasD: NA	Sp.Gr: 1.62
Fl.P: NA	UEL: NA	LEL: NA	MEC: NA
Noncombustible Liquid, but decomposes in a fire to hydrogen chloride and phosgene. (See flammable and combustible liquid classes)			
Incompatibilities & Reactivities			
Strong oxidizers; chemically-active metals such as lithium, beryllium & barium; caustic soda; sodium hydroxide; potash			
Measurement Methods			
NIOSH 1003; OSHA 1001			
Personal Protection & Sanitation		**First Aid**	
Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet or contam Change: N.R.		Eye: Irr immed Skin: Soap wash prompt Breath: Resp support Swallow: Medical attention immed (See procedures)	

Provide: Eyewash, Quick drench
NIOSH Respirator Recommendations
NIOSH : SCBAF:PD,PP/SAF:PD,PP:ASCBA Escape: GMFOV/SCBAE (See symbols and codes)
Exposure Routes
Inh Abs Ing Con
Symptoms
Irrit eyes, skin, nose, throat, resp sys; nau; flush face, neck; verti, dizz, inco; head, som; skin eryt; liver damage; [carc] (See abbreviations)
Target Organs
Eyes, skin, resp sys, liver, kidneys, CNS (See abbreviations)

DOT Emergency Response Guidebook (ERG 2004)

Guide Number: 160

160 Halogenated Solvents
POTENTIAL HAZARDS
HEALTH
* Vapors may cause dizziness or suffocation.
* Exposure in an enclosed area may be very harmful.
* Contact may irritate or burn skin and eyes.
* Fire may produce irritating and/or toxic gases.
* Runoff from fire control or dilution water may cause pollution.

FIRE OR EXPLOSION
* Some of these materials may burn, but none ignite readily.
* Most vapors are heavier than air.
* Air/vapor mixtures may explode when ignited.
* Container may explode in heat of fire.

PUBLIC SAFETY
* CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, refer to appropriate telephone number listed on the inside back cover.
* Isolate spill or leak area immediately for at least 25 to 50 meters (80 to 160 feet) in all directions.
* Keep unauthorized personnel away.
* Stay upwind.
* Many gases are heavier than air and will spread along ground and collect in low or confined areas (sewers, basements, tanks).
* Keep out of low areas.
* Ventilate closed spaces before entering.

PROTECTIVE CLOTHING
* Wear positive pressure self-contained breathing apparatus (SCBA).
* Structural firefighters' protective clothing will only provide limited protection.

EVACUATION
Large Spill
* Consider initial downwind evacuation for at least 100 meters (330 feet).

Fire
* If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions.

EMERGENCY RESPONSE
FIRE
Small Fires
* Dry chemical, CO2 or water spray.

Large Fires
* Dry chemical, CO2, alcohol-resistant foam or water spray.
* Move containers from fire area if you can do it without risk.
* Dike fire control water for later disposal; do not scatter the material.

Fire involving Tanks or Car/Trailer Loads
* Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
* Cool containers with flooding quantities of water until well after fire is out.
* Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.
* ALWAYS stay away from tanks engulfed in fire.

SPILL OR LEAK
* ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area).
* Stop leak if you can do it without risk.

Small Liquid Spills
* Take up with sand, earth or other noncombustible absorbent material.

Large Spills
* Dike far ahead of liquid spill for later disposal.
* Prevent entry into waterways, sewers, basements or confined areas.

FIRST AID

* Move victim to fresh air.
* Call 911 or emergency medical service.
* Apply artificial respiration if victim is not breathing.
* Administer oxygen if breathing is difficult.
* Remove and isolate contaminated clothing and shoes.
* In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
* For minor skin contact, avoid spreading material on unaffected skin.
* Wash skin with soap and water.
* Keep victim warm and quiet.
* Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves.

Additional Emergency Response Information (CAMEO Data)

Non-fire Spill Response: Keep material out of water sources and sewers. Build dikes to contain flow as necessary. Attempt to stop leak if without undue personnel hazard. Apply water spray or mist to knock down vapors. Vapor knockdown water is corrosive or toxic and should be diked for containment. Land spill: Dig a pit, pond, lagoon, holding area to contain liquid or solid material. Dike surface flow using soil, sand bags, foamed polyurethane, or foamed concrete. Absorb bulk liquid with fly ash or cement powder. Water spill: If dissolved, in region of 10 ppm or greater concentration, apply activated carbon at ten times the spilled amount. Remove trapped material with suction hoses. (AAR, 1999)

Firefighting: Extinguish fire using agent suitable for type of surrounding fire. (Material itself does not burn or burns with difficulty.) (AAR, 1999)

Reactivity: CHEMICAL PROFILE: Decomposed upon heating and by UV light forming phosgene and HCl; reacts violently with finely dispersed light metals and zinc. (Handling Chemicals Safely 1980 p. 887). It has been determined experimentally that mixtures of finely divided barium metal and a number of halogenated hydrocarbons possess an explosive capability. Specifically, impact sensitivity tests have shown that granular barium in contact with monofluorotrichloro- methane, trichlorotrifluoroethane, carbon tetrachloride, trichloroethylene, or tetrachloroethylene can detonate (ASESB Pot. Incid. 39. 1968; Chem. Eng. News 46(9):38. 1968). Decomposes very slowly in water to form trichloroacetic acid and hydrochloric acid (REACTIVITY, 1999)

First Aid: EYES: First check the victim for contact lenses and remove if present. Flush victim's eyes with water or normal saline solution for 20 to 30 minutes while simultaneously calling a hospital or poison control center. Do not put any ointments, oils, or medication in the victim's eyes without specific instructions from a physician. IMMEDIATELY transport the victim after flushing eyes to a hospital even if no symptoms (such as redness or irritation) develop. SKIN: IMMEDIATELY flood affected skin with water while removing and isolating all contaminated clothing. Gently wash all affected skin areas thoroughly with soap and water. IMMEDIATELY call a hospital or poison control center even if no symptoms (such as redness or irritation) develop. IMMEDIATELY transport the victim to a hospital for treatment after washing the affected areas. INHALATION: IMMEDIATELY leave the contaminated area; take deep breaths of fresh air. IMMEDIATELY call a physician and be prepared to transport the victim to a hospital even if no symptoms (such as wheezing, coughing, shortness of Breathing, or burning in the mouth, throat, or chest) develop. Provide proper respiratory protection to rescuers entering an unknown atmosphere. Whenever possible, Self-Contained Breathing Apparatus (SCBA) should be used; if not available, use a level of protection greater than or equal to that advised under Protective Clothing. INGESTION: DO NOT INDUCE VOMITING. Corrosive chemicals will destroy the membranes of the mouth, throat, and esophagus and, in addition, have a high risk of being aspirated into the victim's lungs during vomiting which increases the medical problems. If the victim is conscious and not convulsing, give 1 or 2 glasses of water to dilute the chemical and IMMEDIATELY call a hospital or poison control center. IMMEDIATELY transport the victim to a hospital. If the victim is convulsing or unconscious, do not give anything by mouth, ensure that the victim's airway is open and lay the victim on his/her side with the Headache lower than the body. DO NOT INDUCE VOMITING. Transport the victim IMMEDIATELY to a hospital. OTHER: Since this chemical is a known or suspected carcinogen you should contact a physician for advice regarding the possible long term health effects and potential recommendation for medical monitoring. Recommendations from the physician will depend upon the specific compound, its chemical, physical and toxicity properties, the exposure level, length of exposure, and the route of exposure. (NTP, 1992)

OSHA/EPA Occupational Chemical Database

Chemical Identification

Chemical Name: STYRENE

CAS #: 100-42-5 **UN No:** 2055 **Formula:** C8H8

Synonyms: Ethenyl benzene; Phenylethylen; Styrene monomer; Styrene monomer inhibited; Styrol; Vinyl benzene

Physical Properties

Physical Description: Colorless to yellow, oily liquid with a sweet, floral odor.

BP: 293ºF	**MW:** 104.2	**LEL:** 0.9%	**NFPA Fire Rating:** 3
FRZ/MLT: FRZ: -23ºF	**VP:** 5 mmHg	**UEL:** 6.8%	**NFPA Health Rating:** 2
FP: 88ºF	**VD:** NA		**NFPA Reactivity Rating:** 2
Sp. GR: 0.91	**IP:** 8.40 eV		**NFPA Sp. Inst.:** NA

Exposure Limits

OSHA	NIOSH	Related Information
PEL-TWA ppm: 100	**REL-TWA ppm:** 50	**AIHA Emergency Response Planning Guidelines - ERPG-1/ERPG-2/ERPG-3:** 50 ppm/250 ppm/1000 ppm
PEL-TWA mg/m3: NA	**REL-TWA mg/m3:** 215	
PEL-STEL ppm: NA	**REL-STEL ppm:** 100	
PEL-STEL mg/m3: NA	**REL-STEL mg/m3:** 425	
PEL-C ppm: 200	**REL-C ppm:** NA	
PEL-C mg/m3: NA	**REL-C mg/m3:** NA	**Carcinogen Classifications:** IARC-2B, TLV-A4
Skin Notation: No	**Skin Notation:** No	
Notes: PEAK = 600 ppm FOR A 5 MINUTE INTERVAL DURING ANY 3 HOURS	**Notes:** NA	
	IDLH ppm: NA	
	IDLH mg/m3: 700	
	IDLH Notes: NA	

NIOSH Pocket Guide to Chemical Hazards (Current through June 2006)

Styrene			CAS: 100-42-5
Formula: C6H5CH=CH2			RTECS: WL3675000
Synonyms & Trade Names: Ethenyl benzene, Phenylethylene, Styrene monomer, Styrol, Vinyl benzene			DOT ID & Guide: 2055 128P (inhibited)
Exposure Limits			
NIOSH REL: TWA 50 ppm (215 mg/m3) ST 100 ppm (425 mg/m3)		OSHA PEL : TWA 100 ppm C 200 ppm 600 ppm (5-minute maximum peak in any 3 hours)	
IDLH: 700 ppm		Conversion: 1 ppm = 4.26 mg/m3	
Physical Description			
Colorless to yellow, oily liquid with a sweet, floral odor.			
MW: 104.2	BP: 293F	FRZ: -23F	Sol: 0.03%
VP: 5 mmHg	IP: 8.40 eV	RGasD: NA	Sp.Gr: 0.91
Fl.P: 88F	UEL: 6.8%	LEL: 0.9%	MEC: NA
Class IC Flammable Liquid (See flammable and combustible liquid classes)			
Incompatibilities & Reactivities			
Oxidizers, catalysts for vinyl polymers, peroxides, strong acids, aluminum chloride [Note: May polymerize if contaminated or subjected to heat. Usually contains an inhibitor such as tert-butylcatechol.]			
Measurement Methods			
NIOSH 1501, 3800; OSHA 9, 89			
Personal Protection & Sanitation		**First Aid**	
Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam		Eye: Irr immed Skin: Water flush Breath: Resp support	

Remove: When wet (flamm) Change: N.R.	Swallow: Medical attention immed (See procedures)

NIOSH Respirator Recommendations

NIOSH/OSHA 500 ppm: CCROV*/SA* 700 ppm: SA:CF*/CCRFOV/GMFOV/PAPROV*/SCBAF/SAF : SCBAF:PD,PP/SAF:PD,PP:ASCBA
Escape: GMFOV/SCBAE
(See symbols and codes)

Exposure Routes

Inh Abs Ing Con

Symptoms

Irrit eyes, nose, resp sys; head, ftg, dizz, conf, mal, drow, weak, unsteady gait; narco; defatting derm; possible liver inj; repro effects
(See abbreviations)

Target Organs

Eyes, skin, resp sys, CNS, liver, repro sys
(See abbreviations)

DOT Emergency Response Guidebook (ERG 2004)

Guide Number: 128P

128 Flammable Liquids (Non-Polar/Water-Immiscible)
POTENTIAL HAZARDS
FIRE OR EXPLOSION
* HIGHLY FLAMMABLE: Will be easily ignited by heat, sparks or flames.
* Vapors may form explosive mixtures with air.
* Vapors may travel to source of ignition and flash back.
* Most vapors are heavier than air. They will spread along ground and collect in low or confined areas (sewers, basements, tanks).
* Vapor explosion hazard indoors, outdoors or in sewers.
* Those substances designated with a P may polymerize explosively when heated or involved in a fire.
* Runoff to sewer may create fire or explosion hazard.
* Containers may explode when heated.
* Many liquids are lighter than water.
* Substance may be transported hot.

HEALTH
* Inhalation or contact with material may irritate or burn skin and eyes.
* Fire may produce irritating, corrosive and/or toxic gases.
* Vapors may cause dizziness or suffocation.
* Runoff from fire control or dilution water may cause pollution.

PUBLIC SAFETY
* CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, refer to appropriate telephone number listed on the inside back cover.
* Isolate spill or leak area immediately for at least 25 to 50 meters (80 to 160 feet) in all directions.
* Keep unauthorized personnel away.
* Stay upwind.
* Keep out of low areas.
* Ventilate closed spaces before entering.

PROTECTIVE CLOTHING
* Wear positive pressure self-contained breathing apparatus (SCBA).
* Structural firefighters' protective clothing will only provide limited protection.

EVACUATION
Large Spill
* Consider initial downwind evacuation for at least 300 meters (1000 feet).

Fire
* If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions.

EMERGENCY RESPONSE
FIRE
CAUTION: All these products have a very low flash point: Use of water spray when fighting fire may be inefficient.

Small Fires
* Dry chemical, CO2, water spray or regular foam.

Large Fires
* Water spray, fog or regular foam.
* Use water spray or fog; do not use straight streams.
* Move containers from fire area if you can do it without risk.

Fire involving Tanks or Car/Trailer Loads
* Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
* Cool containers with flooding quantities of water until well after fire is out.
* Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.
* ALWAYS stay away from tanks engulfed in fire.

* For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn.

SPILL OR LEAK

* ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area).
* All equipment used when handling the product must be grounded.
* Do not touch or walk through spilled material.
* Stop leak if you can do it without risk.
* Prevent entry into waterways, sewers, basements or confined areas.
* A vapor suppressing foam may be used to reduce vapors.
* Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers.
* Use clean non-sparking tools to collect absorbed material.

Large Spills

* Dike far ahead of liquid spill for later disposal.
* Water spray may reduce vapor; but may not prevent ignition in closed spaces.

FIRST AID

* Move victim to fresh air.
* Call 911 or emergency medical service.
* Apply artificial respiration if victim is not breathing.
* Administer oxygen if breathing is difficult.
* Remove and isolate contaminated clothing and shoes.
* In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
* Wash skin with soap and water.
* Keep victim warm and quiet.
* Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves.

The letter **P** following the guide number identifies those materials which present a polymerization hazard under certain conditions. First responders at the scene of a dangerous goods incident should seek additional specific information about any material in question as soon as possible. The information received by contacting the appropriate emergency response agency, the emergency response number on the shipping document, or by consulting the information on or accompanying the shipping document, may be more specific and accurate than this guidebook in providing guidance for the materials involved.

Additional Emergency Response Information (CAMEO Data)

Non-fire Spill Response: Keep sparks, flames, and other sources of ignition away. Keep material out of water sources and sewers. Build dikes to contain flow as necessary. Attempt to stop leak if without undue personnel hazard. Use water spray to knock-down vapors. Land spill: Dig a pit, pond, lagoon, holding area to contain liquid or solid material. Dike surface flow using soil, sand bags, foamed polyurethane, or foamed concrete. Absorb bulk liquid with fly ash, cement powder, or commercial sorbents. Apply "universal" gelling agent to immobilize spill. Apply approriate foam to diminish vapor and fire hazard. Water spill: Use natural barriers or oil spill control booms to limit spill travel. Use surface active agent (e.g. detergent, soaps, alcohols), if approved by epa. Inject "universal" gelling agent to solidify encircled spill and increase effectiveness of booms. If dissolved, in region of 10 ppm or greater concentration, apply activated carbon at ten times the spilled amount. Remove trapped material with suction hoses. Use mechanical dredges or lifts to remove immobilized masses of pollutants and precipitates. (AAR, 1999)

Firefighting: Do not extinguish fire unless flow can be stopped. Use water in flooding quantities as fog. Solid streams of water may spread fire. Cool all affected containers with flooding quantities of water. Apply water from as far a distance as possible. Use foam, dry chemical, or carbon dioxide. (AAR, 1999)

Reactivity: CHEMICAL PROFILE: Colorless, oily liquid, moderately toxic, flammable. A storage hazard above 32 deg. C, involved in several industrial explosions caused by violent, exothermic polymerization [Bond, J., Loss Prev. Bull., 1985, (065), p. 25]. Polymerization becomes self-sustaining above 95 deg. C [MCA SD-37, 1971]. Violent polymerization leading to explosion may be initiated by peroxides (e.g., di-tert-butyl peroxide, dibenzoyl peroxide), butyllithium, initiators (e.g., azoisobutyronitrile). Reacts violently on contact with strong acids (sulfuric acid, oleum, chlorosulfonic acid), strong oxidizeres [Lewis, 3rd ed., 1993, p. 1185]. Reacts with oxygen above 40 deg. C to form explosive peroxide [Barnes, C. E. et al., J. Amer. Chem. Soc., 1950, 72, p. 210]. Oxidizes readily in air to form unstable peroxides that may explode spontaneously (Bretherick 1979 p.151-154, 164). Mixing styrene in equal molar portions with any of the following substances in a closed container caused the temperature and pressure to increase: chlorosulfonic acid, oleum, and sulfuric acid (NFPA 1991). (REACTIVITY, 1999)

First Aid: EYES: First check the victim for contact lenses and remove if present. Flush victim's eyes with water or normal saline solution for 20 to 30 minutes while simultaneously calling a hospital or poison control center. Do not put any ointments, oils, or medication in the victim's eyes without specific instructions from a physician. IMMEDIATELY transport the victim after flushing eyes to a hospital even if no symptoms (such as redness or irritation) develop. SKIN: IMMEDIATELY flood affected skin with water while removing and isolating all contaminated clothing. Gently wash all affected skin areas thoroughly with soap and water. IMMEDIATELY call a hospital or poison control center even if no symptoms (such as redness or irritation) develop. IMMEDIATELY transport the victim to a hospital for treatment after washing the affected areas. INHALATION: IMMEDIATELY leave the contaminated area; take deep breaths of fresh air. IMMEDIATELY call a physician and be prepared to transport the victim to a hospital even if no symptoms (such as wheezing, coughing, shortness of Breathing, or burning in the mouth, throat, or chest) develop. Provide proper respiratory protection to rescuers entering an unknown atmosphere. Whenever possible, Self-Contained Breathing Apparatus (SCBA) should be used; if not available, use a level of protection greater than or equal to that advised under Protective Clothing. INGESTION: DO NOT INDUCE VOMITING. If the victim is conscious and not convulsing, give 1 or 2 glasses of water to dilute the chemical and IMMEDIATELY call a hospital or poison control center. Be prepared to transport the victim to a hospital if advised by a physician. If the victim is convulsing or unconscious, do not give anything by mouth, ensure that the victim's airway is open and lay the victim on his/her side with the Headache lower than the body. DO NOT INDUCE VOMITING. IMMEDIATELY transport the victim to a hospital. OTHER: Since this chemical is a known or suspected carcinogen you should contact a physician for advice regarding the possible long term health effects and potential recommendation for medical monitoring. Recommendations from the physician will depend upon the specific compound, its chemical, physical and toxicity properties, the exposure level, length of exposure, and the route of exposure. (NTP, 1992)

OSHA/EPA Occupational Chemical Database

Chemical Identification

Chemical Name: SILVER METAL
CAS #: 7440-22-4 **UN No:** **Formula:** Ag
Synonyms: Silver metal: Argentum

Physical Properties

Physical Description: Metal: White, lustrous solid.

BP: 3632ºF	**MW:** 107.9	**LEL:** NA	**NFPA Fire Rating:** NA
FRZ/MLT: MLT: 1761ºF	**VP:** 0 mmHg (approx)	**UEL:** NA	**NFPA Health Rating:** NA
FP: NA	**VD:** NA		**NFPA Reactivity Rating:** NA
Sp. GR: 10.49 (metal)	**IP:** NA		**NFPA Sp. Inst.:** NA

Exposure Limits

OSHA	NIOSH	Related Information
PEL-TWA ppm: NA	**REL-TWA ppm:** NA	**AIHA Emergency Response Planning Guidelines - ERPG-1/ERPG-2/ERPG-3:** NA
PEL-TWA mg/m3: 0.01	**REL-TWA mg/m3:** 0.01	
PEL-STEL ppm: NA	**REL-STEL ppm:** NA	
PEL-STEL mg/m3: NA	**REL-STEL mg/m3:** NA	
PEL-C ppm: NA	**REL-C ppm:** NA	
PEL-C mg/m3: NA	**REL-C mg/m3:** NA	**Carcinogen Classifications:** NA
Skin Notation: No	**Skin Notation:** No	
Notes: NA	**Notes:** NA	
	IDLH ppm: NA	
	IDLH mg/m3: 10	
	IDLH Notes: NA	

NIOSH Pocket Guide to Chemical Hazards (Current through June 2006)

Silver (metal dust and soluble compounds, as Ag)	CAS: 7440-22-4
Formula: Ag (metal)	RTECS: VW3500000 (metal)
Synonyms & Trade Names: Silver metal: Argentum Synonyms of soluble silver compounds such as Silver nitrate (AgNO3) vary depending upon the specific compound.	DOT ID & Guide: NA

Exposure Limits

NIOSH REL: TWA 0.01 mg/m3	OSHA PEL: TWA 0.01 mg/m3
IDLH: 10 mg/m3 (as Ag)	Conversion: NA

Physical Description

Metal: White, lustrous solid.

MW: 107.9	BP: 3632F	MLT: 1761F	Sol: Insoluble
VP: 0 mmHg (approx)	IP: NA	RGasD: NA	Sp.Gr: 10.49 (metal)
Fl.P: NA	UEL: NA	LEL: NA	MEC: NA

Metal: Noncombustible Solid, but flammable in form of dust or powder. (See flammable and combustible liquid classes)

Incompatibilities & Reactivities

Acetylene, ammonia, hydrogen peroxide, bromoazide, chlorine trifluoride, ethyleneimine, oxalic acid, tartaric acid

Measurement Methods

NIOSH 7300, 7301, 9102; OSHA ID121

Personal Protection & Sanitation	First Aid
Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet or contam (AgNO3) Change: Daily Provide: Eyewash	Eye: Irr immed Skin: Water flush Breath: Resp support Swallow: Medical attention immed (See procedures)

NIOSH Respirator Recommendations

NIOSH/OSHA 0.25 mg/m3: SA:CF/PAPRHiE 0.5 mg/m3: HiEF/SCBAF/SAF 10 mg/m3: SAF:PD,PP : SCBAF:PD,PP/SAF:PD,PP:ASCBA Escape: HiEF/SCBAE
(See symbols and codes)

Exposure Routes

Inh Ing Con

Symptoms

Blue-gray eyes, nasal septum, throat, skin; irrit, ulceration skin; GI dist
(See abbreviations)

Target Organs

Nasal septum, skin, eyes
(See abbreviations)

DOT Emergency Response Guidebook (ERG 2004)

Guide: NA

Additional Emergency Response Information (CAMEO Data)

Non-fire Spill Response: SMALL SPILLS AND LEAKAGE: If you spill this chemical, you should dampen the solid spill material with 5% acetic acid, then transfer the dampened material to a suitable container. Use absorbent paper dampened with 5% acetic acid to pick up any remaining material. Your contaminated clothing and the absorbent paper should be sealed in a vapor-tight plastic bag for eventual disposal. Wash all contaminated surfaces with 5% acetic acid followed by washing with a strong soap and water solution. Do not reenter the contaminated area until the Safety Officer (or other responsible person) has verified that the area has been properly cleaned.STORAGE PRECAUTIONS: You should store this chemical in a freezer and away from all mineral acids and bases. (NTP, 1992)

Firefighting: A fire in your laboratory involving this chemical should be extinguished with a dry chemical, carbon dioxide or halon extinguisher. (NTP, 1992)

Reactivity: CHEMICAL PROFILE: In the presence of carbon, the combination of chlorine trifluoride with aluminum, copper, lead, magnesium, silver, tin, or zinc results in a violent reaction (Mellor 2 Supp. 1 1956). Bromoazide explodes on contact with antimony, arsenic, phosphorus, silver foil or sodium. Acetylene forms an insoluble acetylide with silver (Von Schwartz 1918 p. 142). When silver is treated with nitric acid in the presence of ethyl alcohol, silver fulminate may be formed, which can be detonated. Ethyleneimine forms explosive compounds with siver, hence silver solder should not be used to fabricate equipment for handling ethyleneimine. Finely divided silver and strong solutions of hydrogen peroxide may explode (Mellor 1:936 1946-47). Silver is incompatible with oxalic acid and tartaric acid (Nav Aer. 09-01-505 1956). (REACTIVITY, 1999)

First Aid: EYES: First check the victim for contact lenses and remove if present. Flush victim's eyes with water or normal saline solution for 20 to 30 minutes while simultaneously calling a hospital or poison control center. Do not put any ointments, oils, or medication in the victim's eyes without specific instructions from a physician. IMMEDIATELY transport the victim after flushing eyes to a hospital even if no symptoms (such as redness or irritation) develop. SKIN: IMMEDIATELY flood affected skin with water while removing and isolating all contaminated clothing. Gently wash all affected skin areas thoroughly with soap and water. If symptoms such as redness or irritation develop, IMMEDIATELY call a physician and be prepared to transport the victim to a hospital for treatment. INHALATION: IMMEDIATELY leave the contaminated area; take deep breaths of fresh air. IMMEDIATELY call a physician and be prepared to transport the victim to a hospital even if no symptoms (such as wheezing, coughing, shortness of Breathing, or burning in the mouth, throat, or chest) develop. Provide proper respiratory protection to rescuers entering an unknown atmosphere. Whenever possible, Self-Contained Breathing Apparatus (SCBA) should be used; if not available, use a level of protection greater than or equal to that advised under Protective Clothing. INGESTION: Some heavy metals are VERY TOXIC POISONS, especially if their salts are very soluble in water (e.g., lead, chromium, mercury, bismuth, osmium, and arsenic). IMMEDIATELY call a hospital or poison control center and locate activated charcoal, egg whites, or milk in case the medical advisor recommends administering one of them. Also locate Ipecac syrup or a glass of salt water in case the medical advisor recommends inducing vomiting. Usually, this is NOT RECOMMENDED outside of a physician's care. If advice from a physician is not readily available and the victim is conscious and not convulsing, give the victim a glass of activated charcoal slurry in water or, if this is not available, a glass of milk, or beaten egg whites and IMMEDIATELY transport victim to a hospital. If the victim is convulsing or unconscious, do not give anything by mouth, assure that the victim's airway is open and lay the victim on his/her side with the Headache lower than the body. DO NOT INDUCE VOMITING. IMMEDIATELY transport the victim to a hospital. (NTP, 1992)

OSHA/EPA Occupational Chemical Database

Chemical Identification

Chemical Name: P-XYLENE

CAS #: 106-42-3 **UN No:** 1307 **Formula:** C8H10

Synonyms: 1,4-Dimethylbenzene; para-Xylene; p-Xylol

Physical Properties

Physical Description: Colorless liquid with an aromatic odor. [Note: A solid below 56ºF.]

BP: 281ºF	**MW:** 106.2	**LEL:** 1.1%	**NFPA Fire Rating:** 3
FRZ/MLT: FRZ: 56ºF	**VP:** 9 mmHg	**UEL:** 7.0%	**NFPA Health Rating:** 2
FP: 81ºF	**VD:** NA		**NFPA Reactivity Rating:** 0
Sp. GR: 0.86	**IP:** 8.44 eV		**NFPA Sp. Inst.:** NA

Exposure Limits

OSHA	NIOSH	Related Information
PEL-TWA ppm: 100	**REL-TWA ppm:** 100	**AIHA Emergency Response Planning Guidelines - ERPG-1/ERPG-2/ERPG-3:** NA
PEL-TWA mg/m3: 435	**REL-TWA mg/m3:** 435	
PEL-STEL ppm: NA	**REL-STEL ppm:** 150	
PEL-STEL mg/m3: NA	**REL-STEL mg/m3:** 655	
PEL-C ppm: NA	**REL-C ppm:** NA	
PEL-C mg/m3: NA	**REL-C mg/m3:** NA	**Carcinogen Classifications:** IARC-3, TLV-A4
Skin Notation: No	**Skin Notation:** No	
Notes: NA	**Notes:** NA	
	IDLH ppm: 900	
	IDLH mg/m3: NA	
	IDLH Notes: NA	

NIOSH Pocket Guide to Chemical Hazards (Current through June 2006)

p-Xylene			CAS: 106-42-3
Formula: C6H4(CH3)2			RTECS: ZE2625000
Synonyms & Trade Names: 1,4-Dimethylbenzene; para-Xylene; p-Xylol			DOT ID & Guide: 1307 130
Exposure Limits			
NIOSH REL: TWA 100 ppm (435 mg/m3) ST 150 ppm (655 mg/m3)		OSHA PEL : TWA 100 ppm (435 mg/m3)	
IDLH: 900 ppm		Conversion: 1 ppm = 4.41 mg/m3	
Physical Description			
Colorless liquid with an aromatic odor. [Note: A solid below 56F.]			
MW: 106.2	BP: 281F	FRZ: 56F	Sol: 0.02%
VP: 9 mmHg	IP: 8.44 eV	RGasD: NA	Sp.Gr: 0.86
Fl.P: 81F	UEL: 7.0%	LEL: 1.1%	MEC: NA
Class IC Flammable Liquid (See flammable and combustible liquid classes)			
Incompatibilities & Reactivities			
Strong oxidizers, strong acids			
Measurement Methods			
NIOSH 1501, 3800; OSHA 1002			
Personal Protection & Sanitation		**First Aid**	
Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet (flamm) Change: N.R.		Eye: Irr immed Skin: Soap wash prompt Breath: Resp support Swallow: Medical attention immed (See procedures)	
NIOSH Respirator Recommendations			

NIOSH/OSHA 900 ppm: CCROV*/PAPROV*/SA*/SCBAF : SCBAF:PD,PP/SAF:PD,PP:ASCBA Escape: GMFOV/SCBAE
(See symbols and codes)

Exposure Routes

Inh Abs Ing Con

Symptoms

Irrit eyes, skin, nose, throat; dizz, excitement, drow, inco, staggering gait; corn vacuolization; anor, nau, vomit, abdom pain; derm
(See abbreviations)

Target Organs

Eyes, skin, resp sys, CNS, GI tract, blood, liver, kidneys
(See abbreviations)

DOT Emergency Response Guidebook (ERG 2004)

Guide Number: 130

130 Flammable Liquids (Non-Polar/Water-Immiscible/Noxious)
POTENTIAL HAZARDS
FIRE OR EXPLOSION
* HIGHLY FLAMMABLE: Will be easily ignited by heat, sparks or flames.
* Vapors may form explosive mixtures with air.
* Vapors may travel to source of ignition and flash back.
* Most vapors are heavier than air. They will spread along ground and collect in low or confined areas (sewers, basements, tanks).
* Vapor explosion hazard indoors, outdoors or in sewers.
* Those substances designated with a P may polymerize explosively when heated or involved in a fire.
* Runoff to sewer may create fire or explosion hazard.
* Containers may explode when heated.
* Many liquids are lighter than water.

HEALTH
* May cause toxic effects if inhaled or absorbed through skin.
* Inhalation or contact with material may irritate or burn skin and eyes.
* Fire will produce irritating, corrosive and/or toxic gases.
* Vapors may cause dizziness or suffocation.
* Runoff from fire control or dilution water may cause pollution.

PUBLIC SAFETY
* CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, refer to appropriate telephone number listed on the inside back cover.
* Isolate spill or leak area immediately for at least 50 to 100 meters (160 to 330 feet) in all directions.
* Keep unauthorized personnel away.
* Stay upwind.
* Keep out of low areas.
* Ventilate closed spaces before entering.

PROTECTIVE CLOTHING
* Wear positive pressure self-contained breathing apparatus (SCBA).
* Structural firefighters' protective clothing will only provide limited protection.

EVACUATION
Large Spill
* Consider initial downwind evacuation for at least 300 meters (1000 feet).

Fire
* If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions.

EMERGENCY RESPONSE
FIRE
CAUTION: All these products have a very low flash point: Use of water spray when fighting fire may be inefficient.
Small Fires
* Dry chemical, CO2, water spray or regular foam.

Large Fires
* Water spray, fog or regular foam.
* Do not use straight streams.
* Move containers from fire area if you can do it without risk.

Fire involving Tanks or Car/Trailer Loads
* Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
* Cool containers with flooding quantities of water until well after fire is out.
* Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.
* ALWAYS stay away from tanks engulfed in fire.
* For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn.

SPILL OR LEAK
* ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area).

* All equipment used when handling the product must be grounded.
* Do not touch or walk through spilled material.
* Stop leak if you can do it without risk.
* Prevent entry into waterways, sewers, basements or confined areas.
* A vapor suppressing foam may be used to reduce vapors.
* Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers.
* Use clean non-sparking tools to collect absorbed material.

Large Spills
* Dike far ahead of liquid spill for later disposal.
* Water spray may reduce vapor; but may not prevent ignition in closed spaces.

FIRST AID
* Move victim to fresh air.
* Call 911 or emergency medical service.
* Apply artificial respiration if victim is not breathing.
* Administer oxygen if breathing is difficult.
* Remove and isolate contaminated clothing and shoes.
* In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
* Wash skin with soap and water.
* Keep victim warm and quiet.
* Effects of exposure (inhalation, ingestion or skin contact) to substance may be delayed.
* Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves.

Additional Emergency Response Information (CAMEO Data)

Non-fire Spill Response: SMALL SPILLS AND LEAKAGE: If you should spill this chemical, use absorbent paper to pick up all liquid spill material. Your contaminated clothing and absorbent paper should be sealed in a vapor-tight plastic bag for eventual disposal. Solvent wash all contaminated surfaces with acetone followed by washing with a strong soap and water solution. Do not reenter the contaminated area until the Safety Officer (or other responsible person) has verified that the area has been properly cleaned.STORAGE PRECAUTIONS: You should store this material in a refrigerator. (NTP, 1992)

Firefighting: Fire Extinguishing Agents Not to Be Used: Water may be ineffective.Fire Extinguishing Agents: Foam, dry chemical, or carbon dioxide (USCG, 1999)

Reactivity: STABILITY: Stable under normal laboratory conditions.REACTIVITY: May react with oxidizing materials. (NTP, 1992)

First Aid: EYES: First check the victim for contact lenses and remove if present. Flush victim's eyes with water or normal saline solution for 20 to 30 minutes while simultaneously calling a hospital or poison control center. Do not put any ointments, oils, or medication in the victim's eyes without specific instructions from a physician. IMMEDIATELY transport the victim after flushing eyes to a hospital even if no symptoms (such as redness or irritation) develop. SKIN: IMMEDIATELY flood affected skin with water while removing and isolating all contaminated clothing. Gently wash all affected skin areas thoroughly with soap and water. If symptoms such as redness or irritation develop, IMMEDIATELY call a physician and be prepared to transport the victim to a hospital for treatment. INHALATION: IMMEDIATELY leave the contaminated area; take deep breaths of fresh air. If symptoms (such as wheezing, coughing, shortness of Breathing, or burning in the mouth, throat, or chest) develop, call a physician and be prepared to transport the victim to a hospital. Provide proper respiratory protection to rescuers entering an unknown atmosphere. Whenever possible, Self-Contained Breathing Apparatus (SCBA) should be used; if not available, use a level of protection greater than or equal to that advised under Protective Clothing. INGESTION: DO NOT INDUCE VOMITING. If the victim is conscious and not convulsing, give 1 or 2 glasses of water to dilute the chemical and IMMEDIATELY call a hospital or poison control center. Be prepared to transport the victim to a hospital if advised by a physician. If the victim is convulsing or unconscious, do not give anything by mouth, ensure that the victim's airway is open and lay the victim on his/her side with the Headache lower than the body. DO NOT INDUCE VOMITING. IMMEDIATELY transport the victim to a hospital. (NTP, 1992)

OSHA/EPA Occupational Chemical Database

Chemical Identification

Chemical Name: PHENOL

CAS #: 108-95-2 **UN No:** 2821 **Formula:** C6H6O

Synonyms: Carbolic acid; Hydroxybenzene; Monohydroxybenzene; Phenyl alcohol; Phenyl hydroxide

Physical Properties

Physical Description: Colorless to light-pink, crystalline solid with a sweet, acrid odor. [Note: Phenol liquefies by mixing with about 8% water.]

BP: 359ºF	**MW:** 94.1	**LEL:** 1.8%	**NFPA Fire Rating:** 2
FRZ/MLT: MLT: 109ºF	**VP:** 0.4 mmHg	**UEL:** 8.6%	**NFPA Health Rating:** 3
FP: 175ºF	**VD:** NA		**NFPA Reactivity Rating:** 0
Sp. GR: 1.06	**IP:** 8.50 eV		**NFPA Sp. Inst.:** NA

Exposure Limits

OSHA	NIOSH	Related Information
PEL-TWA ppm: 5	**REL-TWA ppm:** 5	**AIHA Emergency Response Planning Guidelines - ERPG-1/ERPG-2/ERPG-3:** 10 ppm/50 ppm/200 ppm
PEL-TWA mg/m3: 19	**REL-TWA mg/m3:** 19	
PEL-STEL ppm: NA	**REL-STEL ppm:** NA	
PEL-STEL mg/m3: NA	**REL-STEL mg/m3:** NA	
PEL-C ppm: NA	**REL-C ppm:** 15.6	
PEL-C mg/m3: NA	**REL-C mg/m3:** 60	**Carcinogen Classifications:** IARC-3, TLV-A4
Skin Notation: Yes	**Skin Notation:** Yes	
Notes: NA	**Notes:** 15 MINUTE CEILING	
	IDLH ppm: 250	
	IDLH mg/m3: NA	
	IDLH Notes: NA	

NIOSH Pocket Guide to Chemical Hazards (Current through June 2006)

Phenol	CAS: 108-95-2
Formula: C6H5OH	RTECS: SJ3325000
Synonyms & Trade Names: Carbolic acid, Hydroxybenzene, Monohydroxybenzene, Phenyl alcohol, Phenyl hydroxide	DOT ID & Guide: 1671 153 (solid) 2312 153 (molten) 2821 153 (solution)

Exposure Limits

NIOSH REL: TWA 5 ppm (19 mg/m3) C 15.6 ppm (60 mg/m3) [15-minute] [skin]	OSHA PEL: TWA 5 ppm (19 mg/m3) [skin]
IDLH: 250 ppm	Conversion: 1 ppm = 3.85 mg/m3

Physical Description

Colorless to light-pink, crystalline solid with a sweet, acrid odor. [Note: Phenol liquefies by mixing with about 8% water.]

MW: 94.1	BP: 359F	MLT: 109F	Sol(77F): 9%
VP: 0.4 mmHg	IP: 8.50 eV	RGasD: NA	Sp.Gr: 1.06
Fl.P: 175F	UEL: 8.6%	LEL: 1.8%	MEC: NA

Combustible Solid (See flammable and combustible liquid classes)

Incompatibilities & Reactivities

Strong oxidizers, calcium hypochlorite, aluminum chloride, acids

Measurement Methods

NIOSH 2546; OSHA 32

Personal Protection & Sanitation	First Aid
Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet or contam	Eye: Irr immed Skin: Soap wash immed Breath: Resp support Swallow: Medical attention immed

Change: Daily Provide: Eyewash, Quick drench	(See procedures)

NIOSH Respirator Recommendations

NIOSH/OSHA 50 ppm: CCROVDM/SA 125 ppm: SA:CF/PAPROVDM 250 ppm: CCRFOVHiE/GMFOVHiE/PAPRTOVHiE/SCBAF/SAF : SCBAF:PD,PP/SAF:PD,PP:ASCBA Escape: GMFOVHiE/SCBAE
(See symbols and codes)

Exposure Routes

Inh Abs Ing Con

Symptoms

Irrit eyes, nose, throat; anor, low-wgt; weak, musc ache, pain; dark urine; cyan; liver, kidney damage; skin burns; derm; ochronosis; tremor, convuls, twitch
(See abbreviations)

Target Organs

Eyes, skin, resp sys, liver, kidneys
(See abbreviations)

DOT Emergency Response Guidebook (ERG 2004)

Guide Number: 153

153 Substances - Toxic and/or Corrosive (Combustible)
POTENTIAL HAZARDS
HEALTH
* TOXIC; inhalation, ingestion, or skin contact with material may cause severe injury or death.
* Contact with molten substance may cause severe burns to skin and eyes.
* Avoid any skin contact.
* Effects of contact or inhalation may be delayed.
* Fire may produce irritating, corrosive and/or toxic gases.
* Runoff from fire control or dilution water may be corrosive and/or toxic and cause pollution.

FIRE OR EXPLOSION
* Combustible material: may burn but does not ignite readily.
* When heated, vapors may form explosive mixtures with air: indoors, outdoors, and sewers explosion hazards.
* Those substances designated with a P may polymerize explosively when heated or involved in a fire.
* Contact with metals may evolve flammable hydrogen gas.
* Containers may explode when heated.
* Runoff may pollute waterways.
* Substance may be transported in a molten form.

PUBLIC SAFETY
* CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, refer to appropriate telephone number listed on the inside back cover.
* Isolate spill or leak area immediately for at least 25 to 50 meters (80 to 160 feet) in all directions.
* Keep unauthorized personnel away.
* Stay upwind.
* Keep out of low areas.
* Ventilate enclosed areas.

PROTECTIVE CLOTHING
* Wear positive pressure self-contained breathing apparatus (SCBA).
* Wear chemical protective clothing which is specifically recommended by the manufacturer. It may provide little or no thermal protection.
* Structural firefighters' protective clothing provides limited protection in fire situations ONLY; it is not effective in spill situations.

EVACUATION
Spill
* See the Table of Initial Isolation and Protective Action Distances for highlighted substances. For non-highlighted substances, increase, in the downwind direction, as necessary, the isolation distance shown under **PUBLIC SAFETY**.

Fire
* If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions.

EMERGENCY RESPONSE
FIRE
Small Fires
* Dry chemical, CO2 or water spray.

Large Fires
* Dry chemical, CO2, alcohol-resistant foam or water spray.
* Move containers from fire area if you can do it without risk.
* Dike fire control water for later disposal; do not scatter the material.

Fire involving Tanks or Car/Trailer Loads
* Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.

* Do not get water inside containers.
* Cool containers with flooding quantities of water until well after fire is out.
* Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.
* ALWAYS stay away from tanks engulfed in fire.

SPILL OR LEAK

* ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area).
* Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.
* Stop leak if you can do it without risk.
* Prevent entry into waterways, sewers, basements or confined areas.
* Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers.
* DO NOT GET WATER INSIDE CONTAINERS.

FIRST AID

* Move victim to fresh air.
* Call 911 or emergency medical service.
* Apply artificial respiration if victim is not breathing.
* Do not use mouth-to-mouth method if victim ingested or inhaled the substance; induce artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device.
* Administer oxygen if breathing is difficult.
* Remove and isolate contaminated clothing and shoes.
* In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
* For minor skin contact, avoid spreading material on unaffected skin.
* Keep victim warm and quiet.
* Effects of exposure (inhalation, ingestion or skin contact) to substance may be delayed.
* Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves.

Additional Emergency Response Information (CAMEO Data)

Non-fire Spill Response: Keep sparks, flames, and other sources of ignition away. Keep material out of water sources and sewers. Build dikes to contain flow as necessary. Attempt to stop leak if without undue personnel hazard. Neutralize spilled material with crushed limestone, soda ash, or lime. Apply water spray or mist to knock down vapors. Vapor knockdown water is corrosive or toxic and should be diked for containment. Land spill: Dig a pit, pond, lagoon, holding area to contain liquid or solid material. Dike surface flow using soil, sand bags, foamed polyurethane, or foamed concrete. Absorb bulk liquid with fly ash or cement powder. Water spill: If dissolved, in region of 10 ppm or greater concentration, apply activated carbon at ten times the spilled amount. Use mechanical dredges or lifts to remove immobilized masses of pollutants and precipitates. (AAR, 1999)

Firefighting: Do not extinguish fire unless flow can be stopped. Use water in flooding quantities as fog. Solid streams of water may be ineffective. Cool all affected containers with flooding quantities of water. Apply water from as far a distance as possible. Use "alcohol" foam, dry chemical or carbon dioxide. Keep run-off water out of sewers and water sources. (AAR, 1999)

Reactivity: CHEMICAL PROFILE: A liquid containing over 50% phenol. See Phenol (solid). (REACTIVITY, 1999)

First Aid: EYES: First check the victim for contact lenses and remove if present. Flush victim's eyes with water or normal saline solution for 20 to 30 minutes while simultaneously calling a hospital or poison control center. Do not put any ointments, oils, or medication in the victim's eyes without specific instructions from a physician. IMMEDIATELY transport the victim after flushing eyes to a hospital even if no symptoms (such as redness or irritation) develop. SKIN: IMMEDIATELY flood affected skin with water while removing and isolating all contaminated clothing. Gently wash all affected skin areas thoroughly with soap and water. IMMEDIATELY call a hospital or poison control center even if no symptoms (such as redness or irritation) develop. IMMEDIATELY transport the victim to a hospital for treatment after washing the affected areas. INHALATION: IMMEDIATELY leave the contaminated area; take deep breaths of fresh air. If symptoms (such as wheezing, coughing, shortness of Breathing, or burning in the mouth, throat, or chest) develop, call a physician and be prepared to transport the victim to a hospital. Provide proper respiratory protection to rescuers entering an unknown atmosphere. Whenever possible, Self-Contained Breathing Apparatus (SCBA) should be used; if not available, use a level of protection greater than or equal to that advised under Protective Clothing. INGESTION: DO NOT INDUCE VOMITING. Phenols are very toxic poisons AND corrosive and irritating, so that inducing vomiting may make medical problems worse. IMMEDIATELY call a hospital or poison control center and locate activated charcoal, egg whites, or milk in case the medical advisor recommends administering one of them. If advice from a physician is not readily available and the victim is conscious and not convulsing, give the victim a glass of activated charcoal slurry in water or, if this is not available, a glass of milk, or beaten egg whites and IMMEDIATELY transport victim to a hospital. If the victim is convulsing or unconscious, do not give anything by mouth, assure that the victim's airway is open and lay the victim on his/her side with the Headache lower than the body. DO NOT INDUCE VOMITING. IMMEDIATELY transport the victim to a hospital. (NTP, 1992)

OSHA/EPA Occupational Chemical Database

Chemical Identification

Chemical Name: CHLORODIPHENYL (54% CHLORINE)
CAS #: 11097-69-1 **UN No:** 2315 **Formula:** C6H3Cl2C6H2Cl3 (approx)
Synonyms: Aroclor®1254; PCB; Polychlorinated biphenyl

Physical Properties

Physical Description: Colorless to pale-yellow, viscous liquid or solid (below 50ºF) with a mild, hydrocarbon odor.

BP: 689-734ºF	**MW:** 326 (approx)	**LEL:** NA	**NFPA Fire Rating:** 1
FRZ/MLT: FRZ: 50ºF	**VP:** 0.00006 mmHg	**UEL:** NA	**NFPA Health Rating:** 2
FP: NA	**VD:** NA		**NFPA Reactivity Rating:** 0
Sp. GR: (77ºF): 1.38	**IP:** NA		**NFPA Sp. Inst.:** NA

Exposure Limits

OSHA	NIOSH	Related Information
PEL-TWA ppm: NA	**REL-TWA ppm:** NA	**AIHA Emergency Response Planning Guidelines - ERPG-1/ERPG-2/ERPG-3:** NA
PEL-TWA mg/m3: 0.5	**REL-TWA mg/m3:** 0.001	
PEL-STEL ppm: NA	**REL-STEL ppm:** NA	
PEL-STEL mg/m3: NA	**REL-STEL mg/m3:** NA	
PEL-C ppm: NA	**REL-C ppm:** NA	
PEL-C mg/m3: NA	**REL-C mg/m3:** NA	**Carcinogen Classifications:** IARC-2A, NIOSH-Ca, NTP-R, TLV-A3
Skin Notation: Yes	**Skin Notation:** No	
Notes: NA	**Notes:** CARCINOGEN (Ca), REL ALSO APPLIES TO OTHER PCBs	
	IDLH ppm: NA	
	IDLH mg/m3: 5	
	IDLH Notes: Ca	

NIOSH Pocket Guide to Chemical Hazards (Current through June 2006)

Chlorodiphenyl (54% chlorine)			CAS: 11097-69-1
Formula: C6H3Cl2C6H2Cl3 (approx)			RTECS: TQ1360000
Synonyms & Trade Names: Aroclor 1254, PCB, Polychlorinated biphenyl			DOT ID & Guide: 2315 171
Exposure Limits			
NIOSH REL*: Ca TWA 0.001 mg/m3 See Appendix A [*Note: The REL also applies to other PCBs.]		OSHA PEL: TWA 0.5 mg/m3 [skin]	
IDLH: Ca [5 mg/m3]		Conversion: NA	
Physical Description			
Colorless to pale-yellow, viscous liquid or solid (below 50F) with a mild, hydrocarbon odor.			
MW: 326 (approx)	BP: 689-734F	FRZ: 50F	Sol: Insoluble
VP: 0.00006 mmHg	IP: ?	RGasD: NA	Sp.Gr(77F): 1.38
Fl.P: NA	UEL: NA	LEL: NA	MEC: NA
Nonflammable Liquid, but exposure in a fire results in the formation of a black soot containing PCBs, polychlorinated dibenzofurans, and chlorinated dibenzo-p-dioxins. (See flammable and combustible liquid classes)			
Incompatibilities & Reactivities			
Strong oxidizers			
Measurement Methods			
NIOSH 5503; OSHA PV2088			

Personal Protection & Sanitation	First Aid
Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet or contam Change: Daily	Eye: Irr immed Skin: Soap wash immed Breath: Resp support Swallow: Medical attention immed (See procedures)

Provide: Eyewash, Quick drench

NIOSH Respirator Recommendations

NIOSH : SCBAF:PD,PP/SAF:PD,PP:ASCBA Escape: GMFOVHiE/SCBAE
(See symbols and codes)

Exposure Routes

Inh Abs Ing Con

Symptoms

Irrit eyes, chloracne; liver damage; repro effects; [carc]
(See abbreviations)

Target Organs

Skin, eyes, liver, repro sys
(See abbreviations)

DOT Emergency Response Guidebook (ERG 2004)

Guide Number: 171

171 Substances (Low to Moderate Hazard)
POTENTIAL HAZARDS
FIRE OR EXPLOSION
* Some may burn but none ignite readily.
* Those substances designated with a P may polymerize explosively when heated or involved in a fire.
* Containers may explode when heated.
* Some may be transported hot.

HEALTH
* Inhalation of material may be harmful.
* Contact may cause burns to skin and eyes.
* Inhalation of Asbestos dust may have a damaging effect on the lungs.
* Fire may produce irritating, corrosive and/or toxic gases.
* Runoff from fire control may cause pollution.

PUBLIC SAFETY
* CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, refer to appropriate telephone number listed on the inside back cover.
* Isolate spill or leak area immediately for at least 10 to 25 meters (30 to 80 feet) in all directions.
* Keep unauthorized personnel away.
* Stay upwind.

PROTECTIVE CLOTHING
* Wear positive pressure self-contained breathing apparatus (SCBA).
* Structural firefighters' protective clothing will only provide limited protection.

EVACUATION
Fire
* If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions.

EMERGENCY RESPONSE
FIRE
Small Fires
* Dry chemical, CO2, water spray or regular foam.

Large Fires
* Water spray, fog or regular foam.
* Move containers from fire area if you can do it without risk.
* Do not scatter spilled material with high pressure water streams.
* Dike fire-control water for later disposal.

Fire involving Tanks
* Cool containers with flooding quantities of water until well after fire is out.
* Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.
* ALWAYS stay away from tanks engulfed in fire.

SPILL OR LEAK
* Do not touch or walk through spilled material.
* Stop leak if you can do it without risk.
* Prevent dust cloud.
* Avoid inhalation of asbestos dust.

Small Dry Spills
* With clean shovel place material into clean, dry container and cover loosely; move containers from spill area.

Small Spills
* Take up with sand or other noncombustible absorbent material and place into containers for later disposal.

Large Spills
* Dike far ahead of liquid spill for later disposal.
* Cover powder spill with plastic sheet or tarp to minimize spreading.
* Prevent entry into waterways, sewers, basements or confined areas.

FIRST AID
* Move victim to fresh air.

* Call 911 or emergency medical service.
* Apply artificial respiration if victim is not breathing.
* Administer oxygen if breathing is difficult.
* Remove and isolate contaminated clothing and shoes.
* In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
* Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves.

Additional Emergency Response Information (CAMEO Data)

Non-fire Spill Response: Keep material out of water sources and sewers. Build dikes to contain flow as necessary. Attempt to stop leak if without undue personnel hazard. Apply water spray or mist to knock down vapors. Land spill: Dig a pit, pond, lagoon, holding area to contain liquid or solid material. Dike surface flow using soil, sand bags, foamed polyurethane, or foamed concrete. Absorb bulk liquid with fly ash, cement powder, or commercial sorbents. Water spill: Use natural barriers or oil spill control booms to limit spill travel. Remove trapped material with suction hoses. (AAR, 1999)

Firefighting: Use foam, dry chemical, or carbon dioxide. Keep run-off water out of sewers and water sources. Cool all affected containers with flooding quantities of water. Apply water from as far a distance as possible. (AAR, 1999)

Reactivity: This compound is incompatible with the following:Strong oxidizers (NIOSH, 1997)

First Aid: Eye: If this chemical contacts the eyes, immediately wash the eyes with large amounts of water, occasionally lifting the lower and upper lids. Get medical attention immediately. Contact lenses should not be worn when working with this chemical. Skin: If this chemical contacts the skin, immediately wash the contaminated skin with soap and water. If this chemical penetrates the clothing immediately remove the clothing and wash the skin with soap and water. Get medical attention promptly. Breathing: If a person breathes large amounts of this chemical, move the exposed person to fresh air at once. If breathing has stopped, perform mouth-to-mouth resuscitation. Keep the affected person warm and at rest. Get medical attention as soon as possible. Swallow: If this chemical has been swallowed, get medical attention immediately. (NIOSH, 1997)

OSHA/EPA Occupational Chemical Database

Chemical Identification

Chemical Name: CHLORODIPHENYL (42% CHLORINE)
CAS #: 53469-21-9 **UN No:** 2315 **Formula:** C6H4ClC6H3Cl2 (approx)
Synonyms: Aroclor®1242; PCB; Polychlorinated biphenyl

Physical Properties

Physical Description: Colorless to light-colored, viscous liquid with a mild, hydrocarbon odor.

BP: 617-691ºF	**MW:** 258 (approx)	**LEL:** NA	**NFPA Fire Rating:** 1
FRZ/MLT: FRZ: -2ºF	**VP:** 0.001 mmHg	**UEL:** NA	**NFPA Health Rating:** 2
FP: NA	**VD:** NA		**NFPA Reactivity Rating:** 0
Sp. GR: (77ºF): 1.39	**IP:** NA		**NFPA Sp. Inst.:** NA

Exposure Limits

OSHA	NIOSH	Related Information
PEL-TWA ppm: NA	**REL-TWA ppm:** NA	**AIHA Emergency Response Planning Guidelines - ERPG-1/ERPG-2/ERPG-3:** NA
PEL-TWA mg/m3: 1	**REL-TWA mg/m3:** 0.001	
PEL-STEL ppm: NA	**REL-STEL ppm:** NA	
PEL-STEL mg/m3: NA	**REL-STEL mg/m3:** NA	
PEL-C ppm: NA	**REL-C ppm:** NA	
PEL-C mg/m3: NA	**REL-C mg/m3:** NA	**Carcinogen Classifications:** IARC-2A, NIOSH-Ca, NTP-R
Skin Notation: Yes	**Skin Notation:** No	
Notes: NA	**Notes:** CARCINOGEN (Ca); TWA applies to other PCBs	
	IDLH ppm: NA	
	IDLH mg/m3: 5	
	IDLH Notes: Ca	

NIOSH Pocket Guide to Chemical Hazards (Current through June 2006)

Chlorodiphenyl (42% chlorine)	CAS: 53469-21-9
Formula: C6H4ClC6H3Cl2 (approx)	RTECS: TQ1356000
Synonyms & Trade Names: Aroclor 1242, PCB, Polychlorinated biphenyl	DOT ID & Guide: 2315 171

Exposure Limits

NIOSH REL*: Ca TWA 0.001 mg/m3 See Appendix A [*Note: The REL also applies to other PCBs.]	OSHA PEL: TWA 1 mg/m3 [skin]
IDLH: Ca [5 mg/m3]	Conversion: NA

Physical Description

Colorless to light-colored, viscous liquid with a mild, hydrocarbon odor.

MW: 258 (approx)	BP: 617-691F	FRZ: -2F	Sol: Insoluble
VP: 0.001 mmHg	IP: ?	RGasD: NA	Sp.Gr(77F): 1.39
Fl.P: NA	UEL: NA	LEL: NA	MEC: NA

Nonflammable Liquid, but exposure in a fire results in the formation of a black soot containing PCBs, polychlorinated dibenzofurans & chlorinated dibenzo-p-dioxins. (See flammable and combustible liquid classes)

Incompatibilities & Reactivities

Strong oxidizers

Measurement Methods

NIOSH 5503; OSHA PV2089

Personal Protection & Sanitation	First Aid
Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet or contam Change: Daily	Eye: Irr immed Skin: Soap wash immed Breath: Resp support Swallow: Medical attention immed (See procedures)

Provide: Eyewash, Quick drench

NIOSH Respirator Recommendations

NIOSH : SCBAF:PD,PP/SAF:PD,PP:ASCBA Escape: GMFOVHiE/SCBAE
(See symbols and codes)

Exposure Routes

Inh Abs Ing Con

Symptoms

Irrit eyes; chloracne; liver damage; repro effects; [carc]
(See abbreviations)

Target Organs

Skin, eyes, liver, repro sys
(See abbreviations)

DOT Emergency Response Guidebook (ERG 2004)

Guide Number: 171

171 Substances (Low to Moderate Hazard)
POTENTIAL HAZARDS
FIRE OR EXPLOSION
* Some may burn but none ignite readily.
* Those substances designated with a P may polymerize explosively when heated or involved in a fire.
* Containers may explode when heated.
* Some may be transported hot.

HEALTH
* Inhalation of material may be harmful.
* Contact may cause burns to skin and eyes.
* Inhalation of Asbestos dust may have a damaging effect on the lungs.
* Fire may produce irritating, corrosive and/or toxic gases.
* Runoff from fire control may cause pollution.

PUBLIC SAFETY
* CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, refer to appropriate telephone number listed on the inside back cover.
* Isolate spill or leak area immediately for at least 10 to 25 meters (30 to 80 feet) in all directions.
* Keep unauthorized personnel away.
* Stay upwind.

PROTECTIVE CLOTHING
* Wear positive pressure self-contained breathing apparatus (SCBA).
* Structural firefighters' protective clothing will only provide limited protection.

EVACUATION
Fire
* If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions.

EMERGENCY RESPONSE
FIRE
Small Fires
* Dry chemical, CO2, water spray or regular foam.

Large Fires
* Water spray, fog or regular foam.
* Move containers from fire area if you can do it without risk.
* Do not scatter spilled material with high pressure water streams.
* Dike fire-control water for later disposal.

Fire involving Tanks
* Cool containers with flooding quantities of water until well after fire is out.
* Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.
* ALWAYS stay away from tanks engulfed in fire.

SPILL OR LEAK
* Do not touch or walk through spilled material.
* Stop leak if you can do it without risk.
* Prevent dust cloud.
* Avoid inhalation of asbestos dust.

Small Dry Spills
* With clean shovel place material into clean, dry container and cover loosely; move containers from spill area.

Small Spills
* Take up with sand or other noncombustible absorbent material and place into containers for later disposal.

Large Spills
* Dike far ahead of liquid spill for later disposal.
* Cover powder spill with plastic sheet or tarp to minimize spreading.
* Prevent entry into waterways, sewers, basements or confined areas.

FIRST AID
* Move victim to fresh air.

* Call 911 or emergency medical service.
* Apply artificial respiration if victim is not breathing.
* Administer oxygen if breathing is difficult.
* Remove and isolate contaminated clothing and shoes.
* In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
* Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves.

Additional Emergency Response Information (CAMEO Data)

Non-fire Spill Response: Keep material out of water sources and sewers. Build dikes to contain flow as necessary. Attempt to stop leak if without undue personnel hazard. Apply water spray or mist to knock down vapors. Land spill: Dig a pit, pond, lagoon, holding area to contain liquid or solid material. Dike surface flow using soil, sand bags, foamed polyurethane, or foamed concrete. Absorb bulk liquid with fly ash, cement powder, or commercial sorbents. Water spill: Use natural barriers or oil spill control booms to limit spill travel. Remove trapped material with suction hoses. (AAR, 1999)

Firefighting: Use foam, dry chemical, or carbon dioxide. Keep run-off water out of sewers and water sources. Cool all affected containers with flooding quantities of water. Apply water from as far a distance as possible. (AAR, 1999)

Reactivity: This compound is incompatible with the following:Strong oxidizers (NIOSH, 1997)

First Aid: Eye: If this chemical contacts the eyes, immediately wash the eyes with large amounts of water, occasionally lifting the lower and upper lids. Get medical attention immediately. Contact lenses should not be worn when working with this chemical. Skin: If this chemical contacts the skin, immediately wash the contaminated skin with soap and water. If this chemical penetrates the clothing immediately remove the clothing and wash the skin with soap and water. Get medical attention promptly. Breathing: If a person breathes large amounts of this chemical, move the exposed person to fresh air at once. If breathing has stopped, perform mouth-to-mouth resuscitation. Keep the affected person warm and at rest. Get medical attention as soon as possible. Swallow: If this chemical has been swallowed, get medical attention immediately. (NIOSH, 1997)

OSHA/EPA Occupational Chemical Database

Chemical Identification

Chemical Name: O-XYLENE

CAS #: 95-47-6 **UN No:** 1307 **Formula:** C8H10

Synonyms: 1,2-Dimethylbenzene; ortho-Xylene; o-Xylol

Physical Properties

Physical Description: Colorless liquid with an aromatic odor.

BP: 292ºF	**MW:** 106.2	**LEL:** 0.9%	**NFPA Fire Rating:** 3
FRZ/MLT: FRZ: -13ºF	**VP:** 7 mmHg	**UEL:** 6.7%	**NFPA Health Rating:** 2
FP: 90ºF	**VD:** NA		**NFPA Reactivity Rating:** 0
Sp. GR: 0.88	**IP:** 8.56 eV		**NFPA Sp. Inst.:** NA

Exposure Limits

OSHA	NIOSH	Related Information
PEL-TWA ppm: 100	**REL-TWA ppm:** 100	**AIHA Emergency Response Planning Guidelines - ERPG-1/ERPG-2/ERPG-3:** NA
PEL-TWA mg/m3: 435	**REL-TWA mg/m3:** 435	
PEL-STEL ppm: NA	**REL-STEL ppm:** 150	
PEL-STEL mg/m3: NA	**REL-STEL mg/m3:** 655	
PEL-C ppm: NA	**REL-C ppm:** NA	
PEL-C mg/m3: NA	**REL-C mg/m3:** NA	**Carcinogen Classifications:** IARC-3, TLV-A4
Skin Notation: No	**Skin Notation:** No	
Notes: NA	**Notes:** NA	
	IDLH ppm: 900	
	IDLH mg/m3: NA	
	IDLH Notes: NA	

NIOSH Pocket Guide to Chemical Hazards (Current through June 2006)

o-Xylene			CAS: 95-47-6
Formula: C6H4(CH3)2			RTECS: ZE2450000
Synonyms & Trade Names: 1,2-Dimethylbenzene; ortho-Xylene; o-Xylol			DOT ID & Guide: 1307 130
Exposure Limits			
NIOSH REL: TWA 100 ppm (435 mg/m3) ST 150 ppm (655 mg/m3)		OSHA PEL : TWA 100 ppm (435 mg/m3)	
IDLH: 900 ppm		Conversion: 1 ppm = 4.34 mg/m3	
Physical Description			
Colorless liquid with an aromatic odor.			
MW: 106.2	BP: 292F	FRZ: -13F	Sol: 0.02%
VP: 7 mmHg	IP: 8.56 eV	RGasD: NA	Sp.Gr: 0.88
Fl.P: 90F	UEL: 6.7%	LEL: 0.9%	MEC: NA
Class IC Flammable Liquid (See flammable and combustible liquid classes)			
Incompatibilities & Reactivities			
Strong oxidizers, strong acids			
Measurement Methods			
NIOSH 1501, 3800; OSHA 1002			
Personal Protection & Sanitation		**First Aid**	
Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet (flamm) Change: N.R.		Eye: Irr immed Skin: Soap wash prompt Breath: Resp support Swallow: Medical attention immed (See procedures)	
NIOSH Respirator Recommendations			

NIOSH/OSHA 900 ppm: CCROV*/PAPROV*/SA*/SCBAF : SCBAF:PD,PP/SAF:PD,PP:ASCBA Escape: GMFOV/SCBAE
(See symbols and codes)

Exposure Routes

Inh Abs Ing Con

Symptoms

Irrit eyes, skin, nose, throat; dizz, excitement, drow, inco, staggering gait; corn vacuolization; anor, nau, vomit, abdom pain; derm
(See abbreviations)

Target Organs

Eyes, skin, resp sys, CNS, GI tract, blood, liver, kidneys
(See abbreviations)

DOT Emergency Response Guidebook (ERG 2004)

Guide Number: 130

130 Flammable Liquids (Non-Polar/Water-Immiscible/Noxious)
POTENTIAL HAZARDS
FIRE OR EXPLOSION
* HIGHLY FLAMMABLE: Will be easily ignited by heat, sparks or flames.
* Vapors may form explosive mixtures with air.
* Vapors may travel to source of ignition and flash back.
* Most vapors are heavier than air. They will spread along ground and collect in low or confined areas (sewers, basements, tanks).
* Vapor explosion hazard indoors, outdoors or in sewers.
* Those substances designated with a P may polymerize explosively when heated or involved in a fire.
* Runoff to sewer may create fire or explosion hazard.
* Containers may explode when heated.
* Many liquids are lighter than water.

HEALTH
* May cause toxic effects if inhaled or absorbed through skin.
* Inhalation or contact with material may irritate or burn skin and eyes.
* Fire will produce irritating, corrosive and/or toxic gases.
* Vapors may cause dizziness or suffocation.
* Runoff from fire control or dilution water may cause pollution.

PUBLIC SAFETY
* CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, refer to appropriate telephone number listed on the inside back cover.
* Isolate spill or leak area immediately for at least 50 to 100 meters (160 to 330 feet) in all directions.
* Keep unauthorized personnel away.
* Stay upwind.
* Keep out of low areas.
* Ventilate closed spaces before entering.

PROTECTIVE CLOTHING
* Wear positive pressure self-contained breathing apparatus (SCBA).
* Structural firefighters' protective clothing will only provide limited protection.

EVACUATION
Large Spill
* Consider initial downwind evacuation for at least 300 meters (1000 feet).

Fire
* If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions.

EMERGENCY RESPONSE
FIRE
CAUTION: All these products have a very low flash point: Use of water spray when fighting fire may be inefficient.

Small Fires
* Dry chemical, CO2, water spray or regular foam.

Large Fires
* Water spray, fog or regular foam.
* Do not use straight streams.
* Move containers from fire area if you can do it without risk.

Fire involving Tanks or Car/Trailer Loads
* Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
* Cool containers with flooding quantities of water until well after fire is out.
* Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.
* ALWAYS stay away from tanks engulfed in fire.
* For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn.

SPILL OR LEAK
* ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area).

* All equipment used when handling the product must be grounded.
* Do not touch or walk through spilled material.
* Stop leak if you can do it without risk.
* Prevent entry into waterways, sewers, basements or confined areas.
* A vapor suppressing foam may be used to reduce vapors.
* Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers.
* Use clean non-sparking tools to collect absorbed material.

Large Spills
* Dike far ahead of liquid spill for later disposal.
* Water spray may reduce vapor; but may not prevent ignition in closed spaces.

FIRST AID
* Move victim to fresh air.
* Call 911 or emergency medical service.
* Apply artificial respiration if victim is not breathing.
* Administer oxygen if breathing is difficult.
* Remove and isolate contaminated clothing and shoes.
* In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
* Wash skin with soap and water.
* Keep victim warm and quiet.
* Effects of exposure (inhalation, ingestion or skin contact) to substance may be delayed.
* Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves.

Additional Emergency Response Information (CAMEO Data)

Non-fire Spill Response: SMALL SPILLS AND LEAKAGE: If you should spill this chemical, use absorbent paper to pick up all liquid spill material. Your contaminated clothing and absorbent paper should be sealed in a vapor-tight plastic bag for eventual disposal. Solvent wash all contaminated surfaces with acetone followed by washing with a strong soap and water solution. Do not reenter the contaminated area until the Safety Officer (or other responsible person) has verified that the area has been properly cleaned.STORAGE PRECAUTIONS: You should store this material in a refrigerator. (NTP, 1992)

Firefighting: Fire Extinguishing Agents Not to Be Used: Water may be ineffective.Fire Extinguishing Agents: Foam, dry chemical, or carbon dioxide (USCG, 1999)

Reactivity: STABILITY: This chemical is stable under normal laboratory conditions.REACTIVITY: This compound may react with oxidizing materials. (NTP, 1992)

First Aid: EYES: First check the victim for contact lenses and remove if present. Flush victim's eyes with water or normal saline solution for 20 to 30 minutes while simultaneously calling a hospital or poison control center. Do not put any ointments, oils, or medication in the victim's eyes without specific instructions from a physician. IMMEDIATELY transport the victim after flushing eyes to a hospital even if no symptoms (such as redness or irritation) develop. SKIN: IMMEDIATELY flood affected skin with water while removing and isolating all contaminated clothing. Gently wash all affected skin areas thoroughly with soap and water. If symptoms such as redness or irritation develop, IMMEDIATELY call a physician and be prepared to transport the victim to a hospital for treatment. INHALATION: IMMEDIATELY leave the contaminated area; take deep breaths of fresh air. If symptoms (such as wheezing, coughing, shortness of Breathing, or burning in the mouth, throat, or chest) develop, call a physician and be prepared to transport the victim to a hospital. Provide proper respiratory protection to rescuers entering an unknown atmosphere. Whenever possible, Self-Contained Breathing Apparatus (SCBA) should be used; if not available, use a level of protection greater than or equal to that advised under Protective Clothing. INGESTION: DO NOT INDUCE VOMITING. If the victim is conscious and not convulsing, give 1 or 2 glasses of water to dilute the chemical and IMMEDIATELY call a hospital or poison control center. Be prepared to transport the victim to a hospital if advised by a physician. If the victim is convulsing or unconscious, do not give anything by mouth, ensure that the victim's airway is open and lay the victim on his/her side with the Headache lower than the body. DO NOT INDUCE VOMITING. IMMEDIATELY transport the victim to a hospital. (NTP, 1992)

OSHA/EPA Occupational Chemical Database

Chemical Identification

Chemical Name: NICKEL METAL
CAS #: 7440-02-0 **UN No:** 2881 **Formula:** Ni
Synonyms: Nickel metal: Elemental nickel; Nickel catalyst

Physical Properties

Physical Description: Metal: Lustrous, silvery, odorless solid.

BP: 5139ºF	**MW:** 58.7	**LEL:** NA	**NFPA Fire Rating:** 3
FRZ/MLT: FRZ: NA	**VP:** NA	**UEL:** 2831ºF	**NFPA Health Rating:** 2
FP: NA	**VD:** NA		**NFPA Reactivity Rating:** 3
Sp. GR: 8.90 (Metal)	**IP:** NA		**NFPA Sp. Inst.:** NA

Exposure Limits

OSHA	NIOSH	Related Information
PEL-TWA ppm: NA	**REL-TWA ppm:** NA	**AIHA Emergency Response Planning Guidelines - ERPG-1/ERPG-2/ERPG-3:** NA
PEL-TWA mg/m3: 1	**REL-TWA mg/m3:** 0.015	
PEL-STEL ppm: NA	**REL-STEL ppm:** NA	
PEL-STEL mg/m3: NA	**REL-STEL mg/m3:** NA	
PEL-C ppm: NA	**REL-C ppm:** NA	
PEL-C mg/m3: NA	**REL-C mg/m3:** NA	**Carcinogen Classifications:** IARC-2B, NIOSH-Ca, NTP-R, TLV-A5
Skin Notation: No	**Skin Notation:** No	
Notes: NA	**Notes:** CARCINOGEN (Ca)	
	IDLH ppm: NA	
	IDLH mg/m3: 10	
	IDLH Notes: Ca	

NIOSH Pocket Guide to Chemical Hazards (Current through June 2006)

Nickel metal and other compounds (as Ni)	CAS: 7440-02-0
Formula: Ni (Metal)	RTECS: QR5950000 (Metal)
Synonyms & Trade Names: Nickel metal: Elemental nickel, Nickel catalyst Synonyms of other nickel compounds vary depending upon the specific compound.	DOT ID & Guide: NA

Exposure Limits

NIOSH REL*: Ca TWA 0.015 mg/m3 See Appendix A [*Note: The REL does not apply to Nickel carbonyl.]	OSHA PEL* : TWA 1 mg/m3 [*Note: The PEL does not apply to Nickel carbonyl.]
IDLH: Ca [10 mg/m3 (as Ni)]	Conversion: NA

Physical Description

Metal: Lustrous, silvery, odorless solid.

MW: 58.7	BP: 5139F	MLT: 2831F	Sol: Insoluble
VP: 0 mmHg (approx)	IP: NA	RGasD: NA	Sp.Gr: 8.90 (Metal)
Fl.P: NA	UEL: NA	LEL: NA	MEC: NA

Metal: Combustible Solid; nickel sponge catalyst may ignite SPONTANEOUSLY in air. (See flammable and combustible liquid classes)

Incompatibilities & Reactivities

Strong acids, sulfur, selenium, wood & other combustibles, nickel nitrate

Measurement Methods

NIOSH 7300, 7301, 7303, 9102; OSHA ID121, ID125G

Personal Protection & Sanitation	First Aid
Skin: Prevent skin contact Eyes: N.R. Wash skin: When contam/Daily Remove: When wet or contam Change: Daily	Skin: Water flush immed Breath: Resp support Swallow: Medical attention immed (See procedures)

NIOSH Respirator Recommendations

NIOSH : SCBAF:PD,PP/SAF:PD,PP:ASCBA Escape: HiEF/SCBAE
(See symbols and codes)

Exposure Routes

Inh Ing Con

Symptoms

Sens derm, allergic asthma, pneuitis; [carc]
(See abbreviations)

Target Organs

Nasal cavities, lungs, skin
(See abbreviations)

DOT Emergency Response Guidebook (ERG 2004)

Guide Number: 135

135 Substances - Spontaneously Combustible
POTENTIAL HAZARDS
FIRE OR EXPLOSION
* Flammable/combustible material.
* May ignite on contact with moist air or moisture.
* May burn rapidly with flare-burning effect.
* Some react vigorously or explosively on contact with water.
* Some may decompose explosively when heated or involved in a fire.
* May re-ignite after fire is extinguished.
* Runoff may create fire or explosion hazard.

HEALTH
* Fire will produce irritating, corrosive and/or toxic gases.
* Inhalation of decomposition products may cause severe injury or death.
* Contact with substance may cause severe burns to skin and eyes.
* Runoff from fire control may cause pollution.

PUBLIC SAFETY
* CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, refer to appropriate telephone number listed on the inside back cover.
* Isolate spill or leak area immediately for at least 100 to 150 meters (330 to 490 feet) in all directions.
* Stay upwind.
* Keep unauthorized personnel away.
* Keep out of low areas.

PROTECTIVE CLOTHING
* Wear positive pressure self-contained breathing apparatus (SCBA).
* Wear chemical protective clothing which is specifically recommended by the manufacturer. It may provide little or no thermal protection.
* Structural firefighters' protective clothing will only provide limited protection.

EVACUATION
Spill
* See the Table of Initial Isolation and Protective Action Distances for highlighted substances. For non-highlighted substances, increase, in the downwind direction, as necessary, the isolation distance shown under **PUBLIC SAFETY**.

Fire
* If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions.

EMERGENCY RESPONSE
FIRE
* DO NOT USE WATER, CO2 OR FOAM ON MATERIAL ITSELF.
* Some of these materials may react violently with water.

EXCEPTION: For Dithionite (Hydrosulfite/Hydrosulphite) UN1384, UN1923 and UN1929, USE FLOODING AMOUNTS OF WATER for SMALL AND LARGE fires to stop the reaction. Smothering will not work for these materials. They do not need air to burn.

Small Fires
* Dry chemical, soda ash, lime or DRY sand, EXCEPT for UN1384, UN1923 and UN1929.

Large Fires
* DRY sand, dry chemical, soda ash or lime, EXCEPT for UN1384, UN1923 and UN1929, or withdraw from area and let fire burn.
* Move containers from fire area if you can do it without risk.

Fire involving Tanks or Car/Trailer Loads
* Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
* Do not get water inside containers or in contact with substance.
* Cool containers with flooding quantities of water until well after fire is out.
* Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.

* ALWAYS stay away from tanks engulfed in fire.

SPILL OR LEAK

* Fully encapsulating, vapor protective clothing should be worn for spills and leaks with no fire.
* ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area).
* Do not touch or walk through spilled material.
* Stop leak if you can do it without risk.

Small Spills

EXCEPTION: For Dithionite (Hydrosulfite/Hydrosulphite) spills, UN1384, UN1923 and UN1929, dissolve with 5 parts water and collect for proper disposal.

* Cover with DRY earth, DRY sand, or other non-combustible material followed with plastic sheet to minimize spreading or contact with rain.
* Use clean non-sparking tools to collect material and place it into loosley covered plastic containers for later disposal.
* Prevent entry into waterways, sewers, basements or confined areas.

FIRST AID

* Move victim to fresh air.
* Call 911 or emergency medical service.
* Apply artificial respiration if victim is not breathing.
* Administer oxygen if breathing is difficult.
* Remove and isolate contaminated clothing and shoes.
* In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
* Keep victim warm and quiet.
* Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves.

Additional Emergency Response Information (CAMEO Data)

Non-fire Spill Response: Keep sparks, flames, and other sources of ignition away. Keep material out of water sources and sewers. Keep material dry. (AAR, 1999)

Firefighting: Flood with water. Use dry chemical, graphite, or dry earth. (AAR, 1999)

Reactivity: AIR AND WATER REACTIONS: Pyrophoric, Ignites spontaneously in the presence of air; during storage, H2 escapes with fire and explosion hazards; reacts violently with acids forming H2. (Handling Chemicals Safely 1980. p. 807). (REACTIVITY, 1999)

First Aid: EYES: First check the victim for contact lenses and remove if present. Flush victim's eyes with water or normal saline solution for 20 to 30 minutes while simultaneously calling a hospital or poison control center. Do not put any ointments, oils, or medication in the victim's eyes without specific instructions from a physician. IMMEDIATELY transport the victim after flushing eyes to a hospital even if no symptoms (such as redness or irritation) develop. SKIN: IMMEDIATELY flood affected skin with water while removing and isolating all contaminated clothing. Gently wash all affected skin areas thoroughly with soap and water. If symptoms such as redness or irritation develop, IMMEDIATELY call a physician and be prepared to transport the victim to a hospital for treatment. INHALATION: IMMEDIATELY leave the contaminated area; take deep breaths of fresh air. IMMEDIATELY call a physician and be prepared to transport the victim to a hospital even if no symptoms (such as wheezing, coughing, shortness of Breathing, or burning in the mouth, throat, or chest) develop. Provide proper respiratory protection to rescuers entering an unknown atmosphere. Whenever possible, Self-Contained Breathing Apparatus (SCBA) should be used; if not available, use a level of protection greater than or equal to that advised under Protective Clothing. INGESTION: Some heavy metals are VERY TOXIC POISONS, especially if their salts are very soluble in water (e.g., lead, chromium, mercury, bismuth, osmium, and arsenic). IMMEDIATELY call a hospital or poison control center and locate activated charcoal, egg whites, or milk in case the medical advisor recommends administering one of them. Also locate Ipecac syrup or a glass of salt water in case the medical advisor recommends inducing vomiting. Usually, this is NOT RECOMMENDED outside of a physician's care. If advice from a physician is not readily available and the victim is conscious and not convulsing, give the victim a glass of activated charcoal slurry in water or, if this is not available, a glass of milk, or beaten egg whites and IMMEDIATELY transport victim to a hospital. If the victim is convulsing or unconscious, do not give anything by mouth, assure that the victim's airway is open and lay the victim on his/her side with the Headache lower than the body. DO NOT INDUCE VOMITING. IMMEDIATELY transport the victim to a hospital. OTHER: Since this chemical is a known or suspected carcinogen you should contact a physician for advice regarding the possible long term health effects and potential recommendation for medical monitoring. Recommendations from the physician will depend upon the specific compound, its chemical, physical and toxicity properties, the exposure level, length of exposure, and the route of exposure. (NTP, 1992)

OSHA/EPA Occupational Chemical Database

Chemical Identification

Chemical Name: NAPHTHALENE
CAS #: 91-20-3 **UN No:** 1334 **Formula:** C10H8
Synonyms: Naphthalin; Tar camphor; White tar

Physical Properties			
Physical Description: Colorless to brown solid with an odor of mothballs. [Note: Shipped as a molten solid.]			
BP: 424ºF	**MW:** 128.2	**LEL:** 0.9%	**NFPA Fire Rating:** 2
FRZ/MLT: MLT: 176ºF	**VP:** 0.08 mmHg	**UEL:** 5.9%	**NFPA Health Rating:** 2
FP: 174ºF	**VD:** NA		**NFPA Reactivity Rating:** 0
Sp. GR: 1.15	**IP:** 8.12 eV		**NFPA Sp. Inst.:** NA

Exposure Limits		
OSHA	**NIOSH**	**Related Information**
PEL-TWA ppm: 10	**REL-TWA ppm:** 10	**AIHA Emergency Response Planning Guidelines - ERPG-1/ERPG-2/ERPG-3:** NA
PEL-TWA mg/m3: 50	**REL-TWA mg/m3:** 50	
PEL-STEL ppm: NA	**REL-STEL ppm:** 15	
PEL-STEL mg/m3: NA	**REL-STEL mg/m3:** 75	
PEL-C ppm: NA	**REL-C ppm:** NA	
PEL-C mg/m3: NA	**REL-C mg/m3:** NA	**Carcinogen Classifications:** TLV-A4
Skin Notation: No	**Skin Notation:** No	
Notes: NA	**Notes:** NA	
	IDLH ppm: 250	
	IDLH mg/m3: NA	
	IDLH Notes: NA	

NIOSH Pocket Guide to Chemical Hazards (Current through June 2006)			
Naphthalene			CAS: 91-20-3
Formula: C10H8			RTECS: QJ0525000
Synonyms & Trade Names: Naphthalin, Tar camphor, White tar			DOT ID & Guide: 1334 133 (crude or refined) 2304 133 (molten)
Exposure Limits			
NIOSH REL: TWA 10 ppm (50 mg/m3) ST 15 ppm (75 mg/m3)		OSHA PEL : TWA 10 ppm (50 mg/m3)	
IDLH: 250 ppm		Conversion: 1 ppm = 5.24 mg/m3	
Physical Description			
Colorless to brown solid with an odor of mothballs. [Note: Shipped as a molten solid.]			
MW: 128.2	BP: 424F	MLT: 176F	Sol: 0.003%
VP: 0.08 mmHg	IP: 8.12 eV	RGasD: NA	Sp.Gr: 1.15
Fl.P: 174F	UEL: 5.9%	LEL: 0.9%	MEC: NA
Combustible Solid, but will take some effort to ignite. (See flammable and combustible liquid classes)			
Incompatibilities & Reactivities			
Strong oxidizers, chromic anhydride			
Measurement Methods			
NIOSH 1501; OSHA 35			
Personal Protection & Sanitation		**First Aid**	
Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet or contam Change: Daily		Eye: Irr immed Skin: Molten flush immed/sol-liq soap wash prompt Breath: Resp support Swallow: Medical attention immed (See procedures)	
NIOSH Respirator Recommendations			

NIOSH/OSHA 100 ppm: CCROVDM*/SA* 250 ppm: SA:CF*/CCRFOVHiE/PAPROVDM*/SCBAF/SAF : SCBAF:PD,PP/SAF:PD,PP:ASCBA
Escape: GMFOVHiE/SCBAE
(See symbols and codes)

Exposure Routes

Inh Abs Ing Con

Symptoms

Irrit eyes; head, conf, excitement, mal; nau, vomit, abdom pain; irrit bladder; profuse sweat; jaun; hema, hemog, renal shutdown; derm, optical neuritis, corn damage
(See abbreviations)

Target Organs

Eyes, skin, blood, liver, kidneys, CNS
(See abbreviations)

DOT Emergency Response Guidebook (ERG 2004)

Guide Number: 133

133 Flammable Solids
POTENTIAL HAZARDS
FIRE OR EXPLOSION
* Flammable/combustible material.
* May be ignited by friction, heat, sparks or flames.
* Some may burn rapidly with flare burning effect.
* Powders, dusts, shavings, borings, turnings or cuttings may explode or burn with explosive violence.
* Substance may be transported in a molten form.
* May re-ignite after fire is extinguished.

HEALTH
* Fire may produce irritating and/or toxic gases.
* Contact may cause burns to skin and eyes.
* Contact with molten substance may cause severe burns to skin and eyes.
* Runoff from fire control may cause pollution.

PUBLIC SAFETY
* CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, refer to appropriate telephone number listed on the inside back cover.
* Isolate spill or leak area immediately for at least 10 to 25 meters (30 to 80 feet) in all directions.
* Keep unauthorized personnel away.
* Stay upwind.
* Keep out of low areas.

PROTECTIVE CLOTHING
* Wear positive pressure self-contained breathing apparatus (SCBA).
* Structural firefighters' protective clothing will only provide limited protection.

EVACUATION
Large Spill
* Consider initial downwind evacuation for at least 100 meters (330 feet).

Fire
* If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions.

EMERGENCY RESPONSE
FIRE
Small Fires
* Dry chemical, CO2, sand, earth, water spray or regular foam.

Large Fires
* Water spray, fog or regular foam.
* Move containers from fire area if you can do it without risk.

Fire involving Tanks or Car/Trailer Loads
* Cool containers with flooding quantities of water until well after fire is out.
* For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn.
* Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.
* ALWAYS stay away from tanks engulfed in fire.

SPILL OR LEAK
* ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area).
* Do not touch or walk through spilled material.

Small Dry Spills
* With clean shovel place material into clean, dry container and cover loosely; move containers from spill area.

Large Spills
* Wet down with water and dike for later disposal.
* Prevent entry into waterways, sewers, basements or confined areas.

FIRST AID
* Move victim to fresh air.

* Call 911 or emergency medical service.
* Apply artificial respiration if victim is not breathing.
* Administer oxygen if breathing is difficult.
* Remove and isolate contaminated clothing and shoes.
* In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
* Removal of solidified molten material from skin requires medical assistance.
* Keep victim warm and quiet.
* Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves.

Additional Emergency Response Information (CAMEO Data)

Non-fire Spill Response: Keep sparks, flames, and other sources of ignition away. Keep material out of water sources and sewers. Build dikes to contain flow as necessary. Land spill: Dig a pit, pond, lagoon, holding area to contain liquid or solid material. Cover solids with a plastic sheet to prevent dissolving in rain or fire fighting water. Water spill: Use natural deep water pockets, excavated lagoons, or sand bag barriers to trap material at bottom. If dissolved, in region of 10 ppm or greater concentration, apply activated carbon at ten times the spilled amount. Remove trapped material with suction hoses. Use mechanical dredges or lifts to remove immobilized masses of pollutants and precipitates. (AAR, 1999)

Firefighting: Do not extinguish fire unless flow can be stopped. Use water in flooding quantities as fog. Cool all affected containers with flooding quantities of water. Apply water from as far a distance as possible. Solid streams of water may be ineffective. Use "alcohol" foam, dry chemical or carbon dioxide. (AAR, 1999)

Reactivity: CHEMICAL PROFILE: Naphthalene, camphor, glycerol, or turpentine will react violently with chromic anhydride (Haz. Chem. Data 1967. p 68). (REACTIVITY, 1999)

First Aid: EYES: First check the victim for contact lenses and remove if present. Flush victim's eyes with water or normal saline solution for 20 to 30 minutes while simultaneously calling a hospital or poison control center. Do not put any ointments, oils, or medication in the victim's eyes without specific instructions from a physician. IMMEDIATELY transport the victim after flushing eyes to a hospital even if no symptoms (such as redness or irritation) develop. SKIN: IMMEDIATELY flood affected skin with water while removing and isolating all contaminated clothing. Gently wash all affected skin areas thoroughly with soap and water. IMMEDIATELY call a hospital or poison control center even if no symptoms (such as redness or irritation) develop. IMMEDIATELY transport the victim to a hospital for treatment after washing the affected areas. INHALATION: IMMEDIATELY leave the contaminated area; take deep breaths of fresh air. IMMEDIATELY call a physician and be prepared to transport the victim to a hospital even if no symptoms (such as wheezing, coughing, shortness of Breathing, or burning in the mouth, throat, or chest) develop. Provide proper respiratory protection to rescuers entering an unknown atmosphere. Whenever possible, Self-Contained Breathing Apparatus (SCBA) should be used; if not available, use a level of protection greater than or equal to that advised under Protective Clothing. INGESTION: If the victim is conscious and not convulsing, give 1 or 2 glasses of water to dilute the chemical and IMMEDIATELY call a hospital or poison control center. Generally, the induction of vomiting is NOT recommended outside of a physician's care due to the risk of aspirating the chemical into the victim's lungs. However, if the victim is conscious and not convulsing and if medical help is not readily available, consider the risk of inducing vomiting because of the high toxicity of the chemical ingested. Ipecac syrup or salt water may be used in such an emergency. IMMEDIATELY transport the victim to a hospital. If the victim is convulsing or unconscious, do not give anything by mouth, ensure that the victim's airway is open and lay the victim on his/her side with the Headache lower than the body. DO NOT INDUCE VOMITING. IMMEDIATELY transport the victim to a hospital. (NTP, 1992)

OSHA/EPA Occupational Chemical Database

Chemical Identification

Chemical Name: M-XYLENE

CAS #: 108-38-3 **UN No:** 1307 **Formula:** C8H10

Synonyms: 1,3-Dimethylbenzene; meta-Xylene; m-Xylol

Physical Properties

Physical Description: Colorless liquid with an aromatic odor.

BP: 282ºF	**MW:** 106.2	**LEL:** 1.1%	**NFPA Fire Rating:** 3
FRZ/MLT: FRZ: -54ºF	**VP:** 9 mmHg	**UEL:** 7.0%	**NFPA Health Rating:** 2
FP: 82ºF	**VD:** NA		**NFPA Reactivity Rating:** 0
Sp. GR: 0.86	**IP:** 8.56 eV		**NFPA Sp. Inst.:** NA

Exposure Limits

OSHA	NIOSH	Related Information
PEL-TWA ppm: 100	**REL-TWA ppm:** 100	**AIHA Emergency Response Planning Guidelines - ERPG-1/ERPG-2/ERPG-3:** NA
PEL-TWA mg/m3: 435	**REL-TWA mg/m3:** 435	
PEL-STEL ppm: NA	**REL-STEL ppm:** 150	
PEL-STEL mg/m3: NA	**REL-STEL mg/m3:** 655	
PEL-C ppm: NA	**REL-C ppm:** NA	
PEL-C mg/m3: NA	**REL-C mg/m3:** NA	**Carcinogen Classifications:** IARC-3, TLV-A4
Skin Notation: No	**Skin Notation:** No	
Notes: NA	**Notes:** NA	
	IDLH ppm: 900	
	IDLH mg/m3: NA	
	IDLH Notes: NA	

NIOSH Pocket Guide to Chemical Hazards (Current through June 2006)

m-Xylene			CAS: 108-38-3
Formula: C6H4(CH3)2			RTECS: ZE2275000
Synonyms & Trade Names: 1,3-Dimethylbenzene; meta-Xylene; m-Xylol			DOT ID & Guide: 1307 130
Exposure Limits			
NIOSH REL: TWA 100 ppm (435 mg/m3) ST 150 ppm (655 mg/m3)		OSHA PEL : TWA 100 ppm (435 mg/m3)	
IDLH: 900 ppm		Conversion: 1 ppm = 4.34 mg/m3	
Physical Description			
Colorless liquid with an aromatic odor.			
MW: 106.2	BP: 282F	FRZ: -54F	Sol: Slight
VP: 9 mmHg	IP: 8.56 eV	RGasD: NA	Sp.Gr: 0.86
Fl.P: 82F	UEL: 7.0%	LEL: 1.1%	MEC: NA
Class IC Flammable Liquid (See flammable and combustible liquid classes)			
Incompatibilities & Reactivities			
Strong oxidizers, strong acids			
Measurement Methods			
NIOSH 1501, 3800; OSHA 1002			
Personal Protection & Sanitation		**First Aid**	
Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet (flamm) Change: N.R.		Eye: Irr immed Skin: Soap wash prompt Breath: Resp support Swallow: Medical attention immed (See procedures)	
NIOSH Respirator Recommendations			

NIOSH/OSHA 900 ppm: CCROV*/PAPROV*/SA*/SCBAF : SCBAF:PD,PP/SAF:PD,PP:ASCBA Escape: GMFOV/SCBAE
(See symbols and codes)

Exposure Routes

Inh Abs Ing Con

Symptoms

Irrit eyes, skin, nose, throat; dizz, excitement, drow, inco, staggering gait; corn vacuolization; anor, nau, vomit, abdom pain; derm
(See abbreviations)

Target Organs

Eyes, skin, resp sys, CNS, GI tract, blood, liver, kidneys
(See abbreviations)

DOT Emergency Response Guidebook (ERG 2004)

Guide Number: 130

130 Flammable Liquids (Non-Polar/Water-Immiscible/Noxious)
POTENTIAL HAZARDS
FIRE OR EXPLOSION
* HIGHLY FLAMMABLE: Will be easily ignited by heat, sparks or flames.
* Vapors may form explosive mixtures with air.
* Vapors may travel to source of ignition and flash back.
* Most vapors are heavier than air. They will spread along ground and collect in low or confined areas (sewers, basements, tanks).
* Vapor explosion hazard indoors, outdoors or in sewers.
* Those substances designated with a P may polymerize explosively when heated or involved in a fire.
* Runoff to sewer may create fire or explosion hazard.
* Containers may explode when heated.
* Many liquids are lighter than water.

HEALTH
* May cause toxic effects if inhaled or absorbed through skin.
* Inhalation or contact with material may irritate or burn skin and eyes.
* Fire will produce irritating, corrosive and/or toxic gases.
* Vapors may cause dizziness or suffocation.
* Runoff from fire control or dilution water may cause pollution.

PUBLIC SAFETY
* CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, refer to appropriate telephone number listed on the inside back cover.
* Isolate spill or leak area immediately for at least 50 to 100 meters (160 to 330 feet) in all directions.
* Keep unauthorized personnel away.
* Stay upwind.
* Keep out of low areas.
* Ventilate closed spaces before entering.

PROTECTIVE CLOTHING
* Wear positive pressure self-contained breathing apparatus (SCBA).
* Structural firefighters' protective clothing will only provide limited protection.

EVACUATION
Large Spill
* Consider initial downwind evacuation for at least 300 meters (1000 feet).

Fire
* If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions.

EMERGENCY RESPONSE
FIRE
CAUTION: All these products have a very low flash point: Use of water spray when fighting fire may be inefficient.

Small Fires
* Dry chemical, CO2, water spray or regular foam.

Large Fires
* Water spray, fog or regular foam.
* Do not use straight streams.
* Move containers from fire area if you can do it without risk.

Fire involving Tanks or Car/Trailer Loads
* Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
* Cool containers with flooding quantities of water until well after fire is out.
* Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.
* ALWAYS stay away from tanks engulfed in fire.
* For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn.

SPILL OR LEAK
* ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area).

* All equipment used when handling the product must be grounded.
* Do not touch or walk through spilled material.
* Stop leak if you can do it without risk.
* Prevent entry into waterways, sewers, basements or confined areas.
* A vapor suppressing foam may be used to reduce vapors.
* Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers.
* Use clean non-sparking tools to collect absorbed material.

Large Spills
* Dike far ahead of liquid spill for later disposal.
* Water spray may reduce vapor; but may not prevent ignition in closed spaces.

FIRST AID
* Move victim to fresh air.
* Call 911 or emergency medical service.
* Apply artificial respiration if victim is not breathing.
* Administer oxygen if breathing is difficult.
* Remove and isolate contaminated clothing and shoes.
* In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
* Wash skin with soap and water.
* Keep victim warm and quiet.
* Effects of exposure (inhalation, ingestion or skin contact) to substance may be delayed.
* Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves.

Additional Emergency Response Information (CAMEO Data)

Non-fire Spill Response: SMALL SPILLS AND LEAKAGE: If you should spill this chemical, use absorbent paper to pick up all liquid spill material. Your contaminated clothing and absorbent paper should be sealed in a vapor-tight plastic bag for eventual disposal. Solvent wash all contaminated surfaces with acetone followed by washing with a strong soap and water solution. Do not reenter the contaminated area until the Safety Officer (or other responsible person) has verified that the area has been properly cleaned.STORAGE PRECAUTIONS: You should store this material in a refrigerator away from oxidizers. STORE AWAY FROM SOURCES OF IGNITION. (NTP, 1992)

Firefighting: Fire Extinguishing Agents Not to Be Used: Water may be ineffective.Fire Extinguishing Agents: Foam, dry chemical, or carbon dioxide (USCG, 1999)

Reactivity: STABILITY: This chemical is stable under normal laboratory conditions.REACTIVITY: This compound may react with oxidizing materials. (NTP, 1992)

First Aid: EYES: First check the victim for contact lenses and remove if present. Flush victim's eyes with water or normal saline solution for 20 to 30 minutes while simultaneously calling a hospital or poison control center. Do not put any ointments, oils, or medication in the victim's eyes without specific instructions from a physician. IMMEDIATELY transport the victim after flushing eyes to a hospital even if no symptoms (such as redness or irritation) develop. SKIN: IMMEDIATELY flood affected skin with water while removing and isolating all contaminated clothing. Gently wash all affected skin areas thoroughly with soap and water. If symptoms such as redness or irritation develop, IMMEDIATELY call a physician and be prepared to transport the victim to a hospital for treatment. INHALATION: IMMEDIATELY leave the contaminated area; take deep breaths of fresh air. If symptoms (such as wheezing, coughing, shortness of Breathing, or burning in the mouth, throat, or chest) develop, call a physician and be prepared to transport the victim to a hospital. Provide proper respiratory protection to rescuers entering an unknown atmosphere. Whenever possible, Self-Contained Breathing Apparatus (SCBA) should be used; if not available, use a level of protection greater than or equal to that advised under Protective Clothing. INGESTION: DO NOT INDUCE VOMITING. If the victim is conscious and not convulsing, give 1 or 2 glasses of water to dilute the chemical and IMMEDIATELY call a hospital or poison control center. Be prepared to transport the victim to a hospital if advised by a physician. If the victim is convulsing or unconscious, do not give anything by mouth, ensure that the victim's airway is open and lay the victim on his/her side with the Headache lower than the body. DO NOT INDUCE VOMITING. IMMEDIATELY transport the victim to a hospital. (NTP, 1992)

OSHA/EPA Occupational Chemical Database

Chemical Identification

Chemical Name: METHYLENE CHLORIDE
CAS #: 75-09-2 **UN No:** 1593 **Formula:** CH2Cl2
Synonyms: Dichloromethane; Methylene dichloride

Physical Properties

Physical Description: Colorless liquid with a chloroform-like odor. [Note: A gas above 104ºF.]

BP: 104ºF	**MW:** 84.9	**LEL:** 13%	**NFPA Fire Rating:** 1
FRZ/MLT: FRZ: -139ºF	**VP:** 350 mmHg	**UEL:** 23%	**NFPA Health Rating:** 2
FP: NA	**VD:** NA		**NFPA Reactivity Rating:** 0
Sp. GR: 1.33	**IP:** 11.32 eV		**NFPA Sp. Inst.:** NA

Exposure Limits

OSHA	NIOSH	Related Information
PEL-TWA ppm: 25	**REL-TWA ppm:** NA	**AIHA Emergency Response Planning Guidelines - ERPG-1/ERPG-2/ERPG-3:** NA
PEL-TWA mg/m3: NA	**REL-TWA mg/m3:** NA	
PEL-STEL ppm: 125	**REL-STEL ppm:** NA	
PEL-STEL mg/m3: NA	**REL-STEL mg/m3:** NA	
PEL-C ppm: NA	**REL-C ppm:** NA	
PEL-C mg/m3: NA	**REL-C mg/m3:** NA	**Carcinogen Classifications:** IARC-2B, NIOSH-Ca, NTP-R, OSHA-Ca, TLV-A3
Skin Notation: Yes	**Skin Notation:** Yes	
Notes: SEE 29 CFR 1910.1052	**Notes:** CARCINOGEN (Ca); Reduce exposure to LOWEST FEASIBLE CONCENTRATION	
	IDLH ppm: 2300	
	IDLH mg/m3: NA	
	IDLH Notes: Ca	

NIOSH Pocket Guide to Chemical Hazards (Current through June 2006)

Methylene chloride			CAS: 75-09-2
Formula: CH2Cl2			RTECS: PA8050000
Synonyms & Trade Names: Dichloromethane, Methylene dichloride			DOT ID & Guide: 1593 160
Exposure Limits			
NIOSH REL: Ca See Appendix A		OSHA PEL: [1910.1052] TWA 25 ppm ST 125 ppm	
IDLH: Ca [2300 ppm]		Conversion: 1 ppm = 3.47 mg/m3	
Physical Description			
Colorless liquid with a chloroform-like odor. [Note: A gas above 104F.]			
MW: 84.9	BP: 104F	FRZ: -139F	Sol: 2%
VP: 350 mmHg	IP: 11.32 eV	RGasD: NA	Sp.Gr: 1.33
Fl.P: ?	UEL: 23%	LEL: 13%	MEC: NA
Combustible Liquid (See flammable and combustible liquid classes)			
Incompatibilities & Reactivities			
Strong oxidizers; caustics; chemically-active metals such as aluminum, magnesium powders, potassium & sodium; concentrated nitric acid			
Measurement Methods			
NIOSH 1005, 3800; OSHA 59, 80			

Personal Protection & Sanitation	First Aid
Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet or contam Change: N.R.	Eye: Irr immed Skin: Soap wash prompt Breath: Resp support Swallow: Medical attention immed (See procedures)

Provide: Eyewash, Quick drench

NIOSH Respirator Recommendations

NIOSH : SCBAF:PD,PP/SAF:PD,PP:ASCBA Escape: GMFOV/SCBAE
(See symbols and codes)

Exposure Routes

Inh Abs Ing Con

Symptoms

Irrit eyes, skin; ftg, weak, som, li-head; numb, tingle limbs; nau; [carc]
(See abbreviations)

Target Organs

Eyes, skin, CVS, CNS
(See abbreviations)

DOT Emergency Response Guidebook (ERG 2004)

Guide Number: 160

160 Halogenated Solvents
POTENTIAL HAZARDS
HEALTH
* Vapors may cause dizziness or suffocation.
* Exposure in an enclosed area may be very harmful.
* Contact may irritate or burn skin and eyes.
* Fire may produce irritating and/or toxic gases.
* Runoff from fire control or dilution water may cause pollution.

FIRE OR EXPLOSION
* Some of these materials may burn, but none ignite readily.
* Most vapors are heavier than air.
* Air/vapor mixtures may explode when ignited.
* Container may explode in heat of fire.

PUBLIC SAFETY
* CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, refer to appropriate telephone number listed on the inside back cover.
* Isolate spill or leak area immediately for at least 25 to 50 meters (80 to 160 feet) in all directions.
* Keep unauthorized personnel away.
* Stay upwind.
* Many gases are heavier than air and will spread along ground and collect in low or confined areas (sewers, basements, tanks).
* Keep out of low areas.
* Ventilate closed spaces before entering.

PROTECTIVE CLOTHING
* Wear positive pressure self-contained breathing apparatus (SCBA).
* Structural firefighters' protective clothing will only provide limited protection.

EVACUATION
Large Spill
* Consider initial downwind evacuation for at least 100 meters (330 feet).

Fire
* If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions.

EMERGENCY RESPONSE
FIRE
Small Fires
* Dry chemical, CO2 or water spray.

Large Fires
* Dry chemical, CO2, alcohol-resistant foam or water spray.
* Move containers from fire area if you can do it without risk.
* Dike fire control water for later disposal; do not scatter the material.

Fire involving Tanks or Car/Trailer Loads
* Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
* Cool containers with flooding quantities of water until well after fire is out.
* Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.
* ALWAYS stay away from tanks engulfed in fire.

SPILL OR LEAK
* ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area).
* Stop leak if you can do it without risk.

Small Liquid Spills
* Take up with sand, earth or other noncombustible absorbent material.

Large Spills
* Dike far ahead of liquid spill for later disposal.
* Prevent entry into waterways, sewers, basements or confined areas.

FIRST AID

* Move victim to fresh air.
* Call 911 or emergency medical service.
* Apply artificial respiration if victim is not breathing.
* Administer oxygen if breathing is difficult.
* Remove and isolate contaminated clothing and shoes.
* In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
* For minor skin contact, avoid spreading material on unaffected skin.
* Wash skin with soap and water.
* Keep victim warm and quiet.
* Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves.

Additional Emergency Response Information (CAMEO Data)

Non-fire Spill Response: Keep material out of water sources and sewers. Build dikes to contain flow as necessary. Attempt to stop leak if without undue personnel hazard. Use water spray to knock-down vapors. Land spill: Dig a pit, pond, lagoon, holding area to contain liquid or solid material. Dike surface flow using soil, sand bags, foamed polyurethane, or foamed concrete. Absorb bulk liquid with fly ash, cement powder, or commercial sorbents. Water spill: Use natural deep water pockets, excavated lagoons, or sand bag barriers to trap material at bottom. Remove trapped material with suction hoses. (AAR, 1999)

Firefighting: Cool all affected containers with flooding quantities of water. Apply water from as far a distance as possible. Extinguish fire using agent suitable for type of surrounding fire. (Material itself does not burn or burns with difficulty.) Keep run-off water out of sewers and water sources. (AAR, 1999)

Reactivity: STABILITY: This chemical is sensitive to heat. It is also sensitive to exposure to moisture. It is subject to slow hydrolysis which is accelerated by light. Solutions of this chemical in water, DMSO, 95% ethanol or acetone should be stable for 24 hours under normal lab conditions.REACTIVITY: This chemical reacts vigorously with active metals such as lithium, sodium and potassium, and with strong bases such as potassium tert-butoxide. It is incompatible with strong oxidizers, strong caustics and chemically active metals such as aluminum or magnesium powders. The liquid will attack some forms of plastic, rubber and coatings. This compound reacts with sodium-potassium alloy, (potassium hydrogen + N-methyl-N-nitrosurea), nitrogen tetroxide and liquid oxygen. It also reacts with titanium. On contact with water it corrodes iron, some stainless steels, copper and nickel. It is incompatible with alkali metals. It is incompatible with amines, zinc and alloys of aluminum, magnesium and zinc. This compound is liable to explode when mixed with dinitrogen pentoxide or nitric acid. Mixtures of this compound in air with methanol vapor are flammable. (NTP, 1992)

First Aid: EYES: First check the victim for contact lenses and remove if present. Flush victim's eyes with water or normal saline solution for 20 to 30 minutes while simultaneously calling a hospital or poison control center. Do not put any ointments, oils, or medication in the victim's eyes without specific instructions from a physician. IMMEDIATELY transport the victim after flushing eyes to a hospital even if no symptoms (such as redness or irritation) develop. SKIN: IMMEDIATELY flood affected skin with water while removing and isolating all contaminated clothing. Gently wash all affected skin areas thoroughly with soap and water. IMMEDIATELY call a hospital or poison control center even if no symptoms (such as redness or irritation) develop. IMMEDIATELY transport the victim to a hospital for treatment after washing the affected areas. INHALATION: IMMEDIATELY leave the contaminated area; take deep breaths of fresh air. IMMEDIATELY call a physician and be prepared to transport the victim to a hospital even if no symptoms (such as wheezing, coughing, shortness of Breathing, or burning in the mouth, throat, or chest) develop. Provide proper respiratory protection to rescuers entering an unknown atmosphere. Whenever possible, Self-Contained Breathing Apparatus (SCBA) should be used; if not available, use a level of protection greater than or equal to that advised under Protective Clothing. INGESTION: DO NOT INDUCE VOMITING. Volatile chemicals have a high risk of being aspirated into the victim's lungs during vomiting which increases the medical problems. If the victim is conscious and not convulsing, give 1 or 2 glasses of water to dilute the chemical and IMMEDIATELY call a hospital or poison control center. IMMEDIATELY transport the victim to a hospital. If the victim is convulsing or unconscious, do not give anything by mouth, ensure that the victim's airway is open and lay the victim on his/her side with the Headache lower than the body. DO NOT INDUCE VOMITING. IMMEDIATELY transport the victim to a hospital. OTHER: Since this chemical is a known or suspected carcinogen you should contact a physician for advice regarding the possible long term health effects and potential recommendation for medical monitoring. Recommendations from the physician will depend upon the specific compound, its chemical, physical and toxicity properties, the exposure level, length of exposure, and the route of exposure. (NTP, 1992)

OSHA/EPA Occupational Chemical Database

Chemical Identification

Chemical Name: METHYL ISOBUTYL KETONE

CAS #: 108-10-1 **UN No:** 1245 **Formula:** C6H12O

Synonyms: Isobutyl methyl ketone; Methyl isobutyl ketone; 4-Methyl 2-pentanone; MIBK

Physical Properties

Physical Description: Colorless liquid with a pleasant odor.

BP: 242ºF	**MW:** 100.2	**LEL:** (200ºF): 1.2%	**NFPA Fire Rating:** 3
FRZ/MLT: FRZ: -120ºF	**VP:** 16 mmHg	**UEL:** (200ºF) 8.0%	**NFPA Health Rating:** 2
FP: 64ºF	**VD:** NA		**NFPA Reactivity Rating:** 0
Sp. GR: 0.80	**IP:** 9.30 eV		**NFPA Sp. Inst.:** NA

Exposure Limits

OSHA	NIOSH	Related Information
PEL-TWA ppm: 100	**REL-TWA ppm:** 50	**AIHA Emergency Response Planning Guidelines - ERPG-1/ERPG-2/ERPG-3:** NA
PEL-TWA mg/m3: 410	**REL-TWA mg/m3:** 205	
PEL-STEL ppm: NA	**REL-STEL ppm:** 75	
PEL-STEL mg/m3: NA	**REL-STEL mg/m3:** 300	
PEL-C ppm: NA	**REL-C ppm:** NA	
PEL-C mg/m3: NA	**REL-C mg/m3:** NA	**Carcinogen Classifications:** NA
Skin Notation: No	**Skin Notation:** No	
Notes: NA	**Notes:** NA	
	IDLH ppm: 500	
	IDLH mg/m3: NA	
	IDLH Notes: NA	

NIOSH Pocket Guide to Chemical Hazards (Current through June 2006)

Hexone			CAS: 108-10-1
Formula: CH3COCH2CH(CH3)2			RTECS: SA9275000
Synonyms & Trade Names: Isobutyl methyl ketone, Methyl isobutyl ketone, 4-Methyl 2-pentanone, MIBK			DOT ID & Guide: 1245 127
Exposure Limits			
NIOSH REL: TWA 50 ppm (205 mg/m3) ST 75 ppm (300 mg/m3)		OSHA PEL : TWA 100 ppm (410 mg/m3)	
IDLH: 500 ppm		Conversion: 1 ppm = 4.10 mg/m3	
Physical Description			
Colorless liquid with a pleasant odor.			
MW: 100.2	BP: 242F	FRZ: -120F	Sol: 2%
VP: 16 mmHg	IP: 9.30 eV	RGasD: NA	Sp.Gr: 0.80
Fl.P: 64F	UEL(200F): 8.0%	LEL(200F): 1.2%	MEC: NA
Class IB Flammable Liquid (See flammable and combustible liquid classes)			
Incompatibilities & Reactivities			
Strong oxidizers, potassium tert-butoxide			
Measurement Methods			
NIOSH 1300, 2555; OSHA 1004			
Personal Protection & Sanitation		**First Aid**	
Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam		Eye: Irr immed Skin: Water flush prompt Breath: Resp support	

Remove: When wet (flamm) Change: N.R.	Swallow: Medical attention immed (See procedures)

NIOSH Respirator Recommendations

NIOSH/OSHA 500 ppm: CCROV*/GMFOV/PAPRTOV*/SA*/SCBAF : SCBAF:PD,PP/SAF:PD,PP:ASCBA Escape: GMFOV/SCBAE
(See symbols and codes)

Exposure Routes

Inh Ing Con

Symptoms

Irrit eyes, skin, muc memb; head, narco, coma; derm; in animals: liver, kidney damage
(See abbreviations)

Target Organs

Eyes, skin, resp sys, CNS, liver, kidneys
(See abbreviations)

DOT Emergency Response Guidebook (ERG 2004)

Guide Number: 127

127 Flammable Liquids (Polar/Water-Miscible)
POTENTIAL HAZARDS
FIRE OR EXPLOSION
* HIGHLY FLAMMABLE: Will be easily ignited by heat, sparks or flames.
* Vapors may form explosive mixtures with air.
* Vapors may travel to source of ignition and flash back.
* Most vapors are heavier than air. They will spread along ground and collect in low or confined areas (sewers, basements, tanks).
* Vapor explosion hazard indoors, outdoors or in sewers.
* Those substances designated with a P may polymerize explosively when heated or involved in a fire.
* Runoff to sewer may create fire or explosion hazard.
* Containers may explode when heated.
* Many liquids are lighter than water.

HEALTH
* Inhalation or contact with material may irritate or burn skin and eyes.
* Fire may produce irritating, corrosive and/or toxic gases.
* Vapors may cause dizziness or suffocation.
* Runoff from fire control may cause pollution.

PUBLIC SAFETY
* CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, refer to appropriate telephone number listed on the inside back cover.
* Isolate spill or leak area immediately for at least 25 to 50 meters (80 to 160 feet) in all directions.
* Keep unauthorized personnel away.
* Stay upwind.
* Keep out of low areas.
* Ventilate closed spaces before entering.

PROTECTIVE CLOTHING
* Wear positive pressure self-contained breathing apparatus (SCBA).
* Structural firefighters' protective clothing will only provide limited protection.

EVACUATION
Large Spill
* Consider initial downwind evacuation for at least 300 meters (1000 feet).

Fire
* If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions.

EMERGENCY RESPONSE
FIRE
CAUTION: All these products have a very low flash point: Use of water spray when fighting fire may be inefficient.

Small Fires
* Dry chemical, CO2, water spray or alcohol-resistant foam.

Large Fires
* Water spray, fog or alcohol-resistant foam.
* Use water spray or fog; do not use straight streams.
* Move containers from fire area if you can do it without risk.

Fire involving Tanks or Car/Trailer Loads
* Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
* Cool containers with flooding quantities of water until well after fire is out.
* Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.
* ALWAYS stay away from tanks engulfed in fire.
* For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn.

SPILL OR LEAK

* ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area).
* All equipment used when handling the product must be grounded.
* Do not touch or walk through spilled material.
* Stop leak if you can do it without risk.
* Prevent entry into waterways, sewers, basements or confined areas.
* A vapor suppressing foam may be used to reduce vapors.
* Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers.
* Use clean non-sparking tools to collect absorbed material.

Large Spills

* Dike far ahead of liquid spill for later disposal.
* Water spray may reduce vapor; but may not prevent ignition in closed spaces.

FIRST AID

* Move victim to fresh air.
* Call 911 or emergency medical service.
* Apply artificial respiration if victim is not breathing.
* Administer oxygen if breathing is difficult.
* Remove and isolate contaminated clothing and shoes.
* In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
* Wash skin with soap and water.
* Keep victim warm and quiet.
* Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves.

Additional Emergency Response Information (CAMEO Data)

Non-fire Spill Response: Keep sparks, flames, and other sources of ignition away. Keep material out of water sources and sewers. Build dikes to contain flow as necessary. Attempt to stop leak if without undue personnel hazard. Use water spray to disperse vapors and dilute standing pools of liquid. (AAR, 1999)

Firefighting: Do not extinguish fire unless flow can be stopped. Use water in flooding quantities as fog. Solid streams of water may be ineffective. Cool all affected containers with flooding quantities of water. Apply water from as far a distance as possible. Use "alcohol" foam, dry chemical or carbon dioxide. (AAR, 1999)

Reactivity: STABILITY: This chemical is sensitive to air (may form explosive peroxides). It is also sensitive to heat. Solutions of this chemical in water, DMSO, 95% ethanol or acetone should be stable for 24 hours under normal lab conditions.REACTIVITY: This chemical is incompatible with caustic soda and other strong alkalies, hydrochloric acid, sulfuric acid and other strong inorganic acids, amines and oxidizing agents such as hydrogen peroxide, nitric acid, perchloric acid and chromium trioxide. It reacts violently with potassium tert-butoxide. It reacts vigorously with reducing materials. (NTP, 1992)

First Aid: EYES: First check the victim for contact lenses and remove if present. Flush victim's eyes with water or normal saline solution for 20 to 30 minutes while simultaneously calling a hospital or poison control center. Do not put any ointments, oils, or medication in the victim's eyes without specific instructions from a physician. IMMEDIATELY transport the victim after flushing eyes to a hospital even if no symptoms (such as redness or irritation) develop. SKIN: IMMEDIATELY flood affected skin with water while removing and isolating all contaminated clothing. Gently wash all affected skin areas thoroughly with soap and water. If symptoms such as redness or irritation develop, IMMEDIATELY call a physician and be prepared to transport the victim to a hospital for treatment. INHALATION: IMMEDIATELY leave the contaminated area; take deep breaths of fresh air. If symptoms (such as wheezing, coughing, shortness of Breathing, or burning in the mouth, throat, or chest) develop, call a physician and be prepared to transport the victim to a hospital. Provide proper respiratory protection to rescuers entering an unknown atmosphere. Whenever possible, Self-Contained Breathing Apparatus (SCBA) should be used; if not available, use a level of protection greater than or equal to that advised under Protective Clothing. INGESTION: DO NOT INDUCE VOMITING. If the victim is conscious and not convulsing, give 1 or 2 glasses of water to dilute the chemical and IMMEDIATELY call a hospital or poison control center. Be prepared to transport the victim to a hospital if advised by a physician. If the victim is convulsing or unconscious, do not give anything by mouth, ensure that the victim's airway is open and lay the victim on his/her side with the Headache lower than the body. DO NOT INDUCE VOMITING. IMMEDIATELY transport the victim to a hospital. (NTP, 1992)

OSHA/EPA Occupational Chemical Database

Chemical Identification

Chemical Name: METHANOL

CAS #: 67-56-1 **UN No:** 1230 **Formula:** CH4O

Synonyms: Carbinol; Columbian spirits; Methanol; Pyroligneous spirit; Wood alcohol; Wood naphtha; Wood spirit

Physical Properties

Physical Description: Colorless liquid with a characteristic pungent odor.

BP: 147ºF	**MW:** 32.1	**LEL:** 6.0%	**NFPA Fire Rating:** 3
FRZ/MLT: FRZ: -144ºF	**VP:** 96 mmHg	**UEL:** 36%	**NFPA Health Rating:** 1
FP: 52ºF	**VD:** NA		**NFPA Reactivity Rating:** 0
Sp. GR: 0.79	**IP:** 10.84 eV		**NFPA Sp. Inst.:** NA

Exposure Limits

OSHA	NIOSH	Related Information
PEL-TWA ppm: 200	**REL-TWA ppm:** 200	**AIHA Emergency Response Planning Guidelines - ERPG-1/ERPG-2/ERPG-3:** 200 ppm/1000 ppm/5000 ppm
PEL-TWA mg/m3: 260	**REL-TWA mg/m3:** 260	
PEL-STEL ppm: NA	**REL-STEL ppm:** 250	
PEL-STEL mg/m3: NA	**REL-STEL mg/m3:** 325	
PEL-C ppm: NA	**REL-C ppm:** NA	
PEL-C mg/m3: NA	**REL-C mg/m3:** NA	**Carcinogen Classifications:** NA
Skin Notation: No	**Skin Notation:** Yes	
Notes: NA	**Notes:** NA	
	IDLH ppm: 6000	
	IDLH mg/m3: NA	
	IDLH Notes: NA	

NIOSH Pocket Guide to Chemical Hazards (Current through June 2006)

Methyl alcohol			CAS: 67-56-1
Formula: CH3OH			RTECS: PC1400000
Synonyms & Trade Names: Carbinol, Columbian spirits, Methanol, Pyroligneous spirit, Wood alcohol, Wood naphtha, Wood spirit			DOT ID & Guide: 1230 131
Exposure Limits			
NIOSH REL: TWA 200 ppm (260 mg/m3) ST 250 ppm (325 mg/m3) [skin]		OSHA PEL : TWA 200 ppm (260 mg/m3)	
IDLH: 6000 ppm		Conversion: 1 ppm = 1.31 mg/m3	
Physical Description			
Colorless liquid with a characteristic pungent odor.			
MW: 32.1	BP: 147F	FRZ: -144F	Sol: Miscible
VP: 96 mmHg	IP: 10.84 eV	RGasD: NA	Sp.Gr: 0.79
Fl.P: 52F	UEL: 36%	LEL: 6.0%	MEC: NA
Class IB Flammable Liquid (See flammable and combustible liquid classes)			
Incompatibilities & Reactivities			
Strong oxidizers			
Measurement Methods			
NIOSH 2000, 3800; OSHA 91			
Personal Protection & Sanitation		**First Aid**	
Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet (flamm) Change: N.R.		Eye: Irr immed Skin: Water flush prompt Breath: Resp support Swallow: Medical attention immed (See procedures)	

NIOSH Respirator Recommendations

NIOSH/OSHA 2000 ppm: SA 5000 ppm: SA:CF 6000 ppm: SAT:CF/SCBAF/SAF : SCBAF:PD,PP/SAF:PD,PP:ASCBA Escape: SCBAE
(See symbols and codes)

Exposure Routes

Inh Abs Ing Con

Symptoms

Irrit eyes, skin, upper resp sys; head, drow, dizz, verti, li-head, nau, vomit; vis dist, optic nerve damage (blindness); derm
(See abbreviations)

Target Organs

Eyes, skin, resp sys, CNS, GI tract
(See abbreviations)

DOT Emergency Response Guidebook (ERG 2004)

Guide Number: 131

131 Flammable Liquids - Toxic
POTENTIAL HAZARDS
HEALTH
* TOXIC; may be fatal if inhaled, ingested or absorbed through skin.
* Inhalation or contact with some of these materials will irritate or burn skin and eyes.
* Fire will produce irritating, corrosive and/or toxic gases.
* Vapors may cause dizziness or suffocation.
* Runoff from fire control or dilution water may cause pollution.

FIRE OR EXPLOSION
* HIGHLY FLAMMABLE: Will be easily ignited by heat, sparks or flames.
* Vapors may form explosive mixtures with air.
* Vapors may travel to source of ignition and flash back.
* Most vapors are heavier than air. They will spread along ground and collect in low or confined areas (sewers, basements, tanks).
* Vapor explosion and poison hazard indoors, outdoors or in sewers.
* Those substances designated with a P may polymerize explosively when heated or involved in a fire.
* Runoff to sewer may create fire or explosion hazard.
* Containers may explode when heated.
* Many liquids are lighter than water.

PUBLIC SAFETY
* CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, refer to appropriate telephone number listed on the inside back cover.
* Isolate spill or leak area immediately for at least 100 to 200 meters (330 to 660 feet) in all directions.
* Keep unauthorized personnel away.
* Stay upwind.
* Keep out of low areas.
* Ventilate closed spaces before entering.

PROTECTIVE CLOTHING
* Wear positive pressure self-contained breathing apparatus (SCBA).
* Wear chemical protective clothing which is specifically recommended by the manufacturer. It may provide little or no thermal protection.
* Structural firefighters' protective clothing provides limited protection in fire situations ONLY; it is not effective in spill situations.

EVACUATION
Spill
* See the Table of Initial Isolation and Protective Action Distances for highlighted substances. For non-highlighted substances, increase, in the downwind direction, as necessary, the isolation distance shown under **PUBLIC SAFETY**.

Fire
* If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions.

EMERGENCY RESPONSE
FIRE
CAUTION: All these products have a very low flash point: Use of water spray when fighting fire may be inefficient.
Small Fires
* Dry chemical, CO2, water spray or alcohol-resistant foam.

Large Fires
* Water spray, fog or alcohol-resistant foam.
* Move containers from fire area if you can do it without risk.
* Dike fire control water for later disposal; do not scatter the material.
* Use water spray or fog; do not use straight streams.

Fire involving Tanks or Car/Trailer Loads
* Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
* Cool containers with flooding quantities of water until well after

fire is out.
* Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.
* ALWAYS stay away from tanks engulfed in fire.
* For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn.

SPILL OR LEAK
* Fully encapsulating, vapor protective clothing should be worn for spills and leaks with no fire.
* ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area).
* All equipment used when handling the product must be grounded.
* Do not touch or walk through spilled material.
* Stop leak if you can do it without risk.
* Prevent entry into waterways, sewers, basements or confined areas.
* A vapor suppressing foam may be used to reduce vapors.

Small Spills
* Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal.
* Use clean non-sparking tools to collect absorbed material.

Large Spills
* Dike far ahead of liquid spill for later disposal.
* Water spray may reduce vapor; but may not prevent ignition in closed spaces.

FIRST AID
* Move victim to fresh air.
* Call 911 or emergency medical service.
* Apply artificial respiration if victim is not breathing.
* Do not use mouth-to-mouth method if victim ingested or inhaled the substance; induce artificial respiration with the aid of a pocket mask equipped with a one-way val

Additional Emergency Response Information (CAMEO Data)

Non-fire Spill Response: Keep sparks, flames, and other sources of ignition away. Keep material out of water sources and sewers. Build dikes to contain flow as necessary. Attempt to stop leak if without undue personnel hazard. Use water spray to disperse vapors and dilute standing pools of liquid. Apply water spray or mist to knock down vapors. Land spill: Dig a pit, pond, lagoon, holding area to contain liquid or solid material. Dike surface flow using soil, sand bags, foamed polyurethane, or foamed concrete. Water spill: Allow to aerate. Use natural barriers or oil spill control booms to limit spill travel. Remove trapped material with suction hoses. (AAR, 1999)

Firefighting: Do not extinguish fire unless flow can be stopped. Use water in flooding quantities as fog. Solid streams of water may be ineffective. Cool all affected containers with flooding quantities of water. Apply water from as far a distance as possible. Use "alcohol" foam, dry chemical or carbon dioxide. (AAR, 1999)

Reactivity: CHEMICAL PROFILE: Acetyl bromide reacts violently with alcohols or water (Merck 11th ed. 1989). Mixtures of alcohols with concentrated sulfuric acid and strong hydrogen peroxide can cause explosions. Example: an explosion will occur if dimethylbenzylcarbinol is added to 90% hydrogen peroxide then acidified with concentrated sulfuric acid. Mixtures of ethyl alcohol with concentrated hydrogen peroxide form powerful explosives. Mixtures of hydrogen peroxide and 1-phenyl-2-methyl propyl alcohol tend to explode if acidified with 70% sulfuric acid (Chem. Eng. News 45(43):73. 1967; J, Org. Chem. 28:1893. 1963). Alkyl hypochlorites are violently explosive. They are readily obtained by reacting hypochlorous acid and alcohols either in aqueous solution or mixed aqueous-carbon tetrachloride solutions. Chlorine plus alcohols would similarly yield alkyl hypochlorites. They decompose in the cold and explode on exposure to sunlight or heat. Tertiary hypochlorites are less unstable than secondary or primary hypochlorites (NFPA 491 M. 1991). Base-catalysed reactions of isocyanates with alcohols should be carried out in inert solvents. Such reactions in the absence of solvents often occur with explosive violence, (Wischmeyer 1969). A violent exothermic reaction occured when methyl alcohol and bromine were mixed in a mixing cylinder (MCA Case History 1863. 1972). A flask of anhydrous lead perchlorate dissolved in methyl alcohol exploded when it was disturbed (J. Am. Chem. Soc. 52:2391. 1930). (REACTIVITY, 1999)

First Aid: EYES: First check the victim for contact lenses and remove if present. Flush victim's eyes with water or normal saline solution for 20 to 30 minutes while simultaneously calling a hospital or poison control center. Do not put any ointments, oils, or medication in the victim's eyes without specific instructions from a physician. IMMEDIATELY transport the victim after flushing eyes to a hospital even if no symptoms (such as redness or irritation) develop. SKIN: IMMEDIATELY flood affected skin with water while removing and isolating all contaminated clothing. Gently wash all affected skin areas thoroughly with soap and water. If symptoms such as redness or irritation develop, IMMEDIATELY call a physician and be prepared to transport the victim to a hospital for treatment. INHALATION: IMMEDIATELY leave the contaminated area; take deep breaths of fresh air. If symptoms (such as wheezing, coughing, shortness of Breathing, or burning in the mouth, throat, or chest) develop, call a physician and be prepared to transport the victim to a hospital. Provide proper respiratory protection to rescuers entering an unknown atmosphere. Whenever possible, Self-Contained Breathing Apparatus (SCBA) should be used; if not available, use a level of protection greater than or equal to that advised under Protective Clothing. INGESTION: DO NOT INDUCE VOMITING. Volatile chemicals have a high risk of being aspirated into the victim's lungs during vomiting which increases the medical problems. If the victim is conscious and not convulsing, give 1 or 2 glasses of water to dilute the chemical and IMMEDIATELY call a hospital or poison control center. IMMEDIATELY transport the victim to a hospital. If the victim is convulsing or unconscious, do not give anything by mouth, ensure that the victim's airway is open and lay the victim on his/her side with the Headache lower than the body. DO NOT INDUCE VOMITING. IMMEDIATELY transport the victim to a hospital. (NTP, 1992)

OSHA/EPA Occupational Chemical Database

Chemical Identification

Chemical Name: MERCURY, ELEMENTAL AND INORGANIC COMPOUNDS, as Hg

CAS #: 7439-97-6 **UN No:** 2809 **Formula:** Hg

Synonyms: Mercury metal: Colloidal mercury; Metallic mercury; Quicksilver Synonyms of "other" Hg compounds vary depending upon the specific compound.

Physical Properties

Physical Description: [Note: "Other" Hg compounds include all inorganic & aryl Hg compounds except

BP: 674ºF	**MW:** 200.6	**LEL:** NA	**NFPA Fire Rating:** NA
FRZ/MLT: FRZ: -38ºF	**VP:** 0.0012 mmHg	**UEL:** NA	**NFPA Health Rating:** NA
FP: NA	**VD:** NA		**NFPA Reactivity Rating:** NA
Sp. GR: 13.6 (metal)	**IP:** NA		**NFPA Sp. Inst.:** NA

Exposure Limits

OSHA	NIOSH	Related Information
PEL-TWA ppm: NA	**REL-TWA ppm:** NA	**AIHA Emergency Response Planning Guidelines - ERPG-1/ERPG-2/ERPG-3:** NA/0.25 ppm/0.5 ppm (VAPOR ONLY)
PEL-TWA mg/m3: NA	**REL-TWA mg/m3:** 0.05	
PEL-STEL ppm: NA	**REL-STEL ppm:** NA	
PEL-STEL mg/m3: NA	**REL-STEL mg/m3:** NA	
PEL-C ppm: NA	**REL-C ppm:** NA	
PEL-C mg/m3: 0.1	**REL-C mg/m3:** 0.1	**Carcinogen Classifications:** IARC-3, TLV-A4
Skin Notation: No	**Skin Notation:** Yes	
Notes: NA	**Notes:** TWA IS FOR Hg VAPOR	
	IDLH ppm: NA	
	IDLH mg/m3: 10	
	IDLH Notes: NA	

NIOSH Pocket Guide to Chemical Hazards (Current through June 2006)

Mercury compounds [except (organo) alkyls] (as Hg)	CAS: 7439-97-6
Formula: Hg (metal)	RTECS: OV4550000 (metal)
Synonyms & Trade Names: Mercury metal: Colloidal mercury, Metallic mercury, Quicksilver Synonyms of other"Hgcompoundsvarydependinguponthespecificcompound."	DOT ID & Guide: 2809 172

Exposure Limits

NIOSH REL: Hg Vapor: TWA 0.05 mg/m3 [skin] Other: C 0.1 mg/m3 [skin]	OSHA PEL : C 0.1 mg/m3
IDLH: 10 mg/m3 (as Hg)	Conversion: NA

Physical Description

Metal: Silver-white, heavy, odorless liquid. [Note: Other"Hgcompoundsincludeallinorganic&arylHgcompoundsexcept(organo)alkyls.]"

MW: 200.6	BP: 674F	FRZ: -38F	Sol: Insoluble
VP: 0.0012 mmHg	IP: ?	RGasD: NA	Sp.Gr: 13.6 (metal)
Fl.P: NA	UEL: NA	LEL: NA	MEC: NA

Metal: Noncombustible Liquid (See flammable and combustible liquid classes)

Incompatibilities & Reactivities

Acetylene, ammonia, chlorine dioxide, azides, calcium (amalgam formation), sodium carbide, lithium, rubidium, copper

Measurement Methods

NIOSH 6009; OSHA ID140

Personal Protection & Sanitation	First Aid
Skin: Prevent skin contact Eyes: N.R. Wash skin: When contam Remove: When wet or contam Change: Daily	Eye: Irr immed Skin: Soap wash prompt Breath: Resp support Swallow: Medical attention immed (See procedures)

NIOSH Respirator Recommendations

See Appendix E for Respirator Recommendations for Mercury compounds [except (organo) alkyls]. Mercury vapor: NIOSH/OSHA 0.5 mg/m3: CCRS /SA 1.25 mg/m3: SA:CF/PAPRS (canister) 2.5 mg/m3: CCRFS /GMFS /SAT:CF/PAPRTS(canister)/SCBAF/SAF 28 mg/m3: SA:PD,PP :
(See symbols and codes)

Exposure Routes

Inh Abs Ing Con

Symptoms

Irrit eyes, skin; cough, chest pain, dysp, bron pneuitis; tremor, insom, irrity, indecision, head, ftg, weak; stomatitis, salv; GI dist, anor, low-wgt; prot
(See abbreviations)

Target Organs

Eyes, skin, resp sys, CNS, kidneys
(See abbreviations)

DOT Emergency Response Guidebook (ERG 2004)

Guide Number: 172

172 Gallium and Mercury
POTENTIAL HAZARDS
HEALTH
* Inhalation of vapors or contact with substance will result in contamination and potential harmful effects.
* Fire will produce irritating, corrosive and/or toxic gases.

FIRE OR EXPLOSION
* Non-combustible, substance itself does not burn but may react upon heating to produce corrosive and/or toxic fumes.
* Runoff may pollute waterways.

PUBLIC SAFETY
* CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, refer to appropriate telephone number listed on the inside back cover.
* Isolate spill or leak area immediately for at least 10 to 25 meters (30 to 80 feet) in all directions.
* Stay upwind.
* Keep unauthorized personnel away.

PROTECTIVE CLOTHING
* Wear positive pressure self-contained breathing apparatus (SCBA).
* Structural firefighters' protective clothing will only provide limited protection.

EVACUATION
Large Spill
* Consider initial downwind evacuation for at least 100 meters (330 feet).

Fire
* When any large container is involved in a fire, consider initial evacuation for 500 meters (1/3 mile) in all directions.

EMERGENCY RESPONSE
FIRE
* Use extinguishing agent suitable for type of surrounding fire.
* Do not direct water at the heated metal.

SPILL OR LEAK
* Do not touch or walk through spilled material.
* Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.
* Stop leak if you can do it without risk.
* Prevent entry into waterways, sewers, basements or confined areas.
* Do not use steel or aluminum tools or equipment.
* Cover with earth, sand, or other non-combustible material followed with plastic sheet to minimize spreading or contact with rain.
* For mercury, use a mercury spill kit.
* Mercury spill areas may be subsequently treated with calcium sulphide/calcium sulfide or with sodium thiosulphate/sodium thiosulfate wash to neutralize any residual mercury.

FIRST AID
* Move victim to fresh air.
* Call 911 or emergency medical service.
* Apply artificial respiration if victim is not breathing.
* Administer oxygen if breathing is difficult.
* Remove and isolate contaminated clothing and shoes.
* In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
* Keep victim warm and quiet.
* Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves.

Additional Emergency Response Information (CAMEO Data)

Non-fire Spill Response: Keep material out of water sources and sewers. Build dikes to contain flow as necessary. Attempt to stop leak if without undue personnel hazard. (AAR, 1999)

Firefighting: Cool all affected containers with flooding quantities of water. Extinguish fire using agent suitable for type of surrounding fire. (Material itself does not burn or burns with difficulty.) Use water in flooding quantities as fog. Keep run-off water out of sewers and water sources. (AAR, 1999)

Reactivity: CHEMICAL PROFILE: Insoluble, explosive acelylide is formed by mixing acetylene and mercury. Ammonia and mercury can form explosive compounds. A residue resulting from such a reaction exploded when an attempt was made to clean it off a steel rod (Chem. Eng. News 25:2138. 1947). Chlorine dioxide and mercury explode when mixed (Mellor 2, Supp. 1:381. 1956). Methyl azide in the presence of mercury was shown to be potentially explosive (Can. J. Chem. 41:1048. 1963). Ground mixtures of sodium carbide and mercury, aluminum, lead, or iron can react vigorously (Mellor 5:848. 1946-47). (REACTIVITY, 1999)

First Aid: Eye: If this chemical contacts the eyes, immediately wash the eyes with large amounts of water, occasionally lifting the lower and upper lids. Get medical attention immediately. Contact lenses should not be worn when working with this chemical. Skin: If this chemical contacts the skin, promptly wash the contaminated skin with soap and water. If this chemical penetrates the clothing promptly remove the clothing and wash the skin with soap and water. Get medical attention promptly. Breathing: If a person breathes large amounts of this chemical, move the exposed person to fresh air at once. If breathing has stopped, perform mouth-to-mouth resuscitation. Keep the affected person warm and at rest. Get medical attention as soon as possible. Swallow: If this chemical has been swallowed, get medical attention immediately. (NIOSH, 1997)

OSHA/EPA Occupational Chemical Database

Chemical Identification

Chemical Name: MANGANESE (COMPOUNDS AND DUST), as Mn

CAS #: 7439-96-5 **UN No:** **Formula:** Mn

Synonyms: Manganese metal: Colloidal manganese; Manganese-55 Synonyms of other compounds vary depending upon the specific manganese compound.

Physical Properties

Physical Description: A lustrous, brittle, silvery solid.

BP: 3564ºF	**MW:** 54.9	**LEL:** NA	**NFPA Fire Rating:** NA
FRZ/MLT: MLT: 2271ºF	**VP:** 0 mmHg (approx)	**UEL:** NA	**NFPA Health Rating:** NA
FP: NA	**VD:** NA		**NFPA Reactivity Rating:** NA
Sp. GR: 7.20 (metal)	**IP:** NA		**NFPA Sp. Inst.:** NA

Exposure Limits

OSHA	NIOSH	Related Information
PEL-TWA ppm: NA	**REL-TWA ppm:** NA	**AIHA Emergency Response Planning Guidelines - ERPG-1/ERPG-2/ERPG-3:** NA
PEL-TWA mg/m3: NA	**REL-TWA mg/m3:** 1	
PEL-STEL ppm: NA	**REL-STEL ppm:** NA	
PEL-STEL mg/m3: NA	**REL-STEL mg/m3:** 3	
PEL-C ppm: NA	**REL-C ppm:** NA	
PEL-C mg/m3: 5	**REL-C mg/m3:** NA	**Carcinogen Classifications:** NA
Skin Notation: No	**Skin Notation:** No	
Notes: NA	**Notes:** NA	
	IDLH ppm: NA	
	IDLH mg/m3: 500	
	IDLH Notes: NA	

NIOSH Pocket Guide to Chemical Hazards (Current through June 2006)

Manganese compounds and fume (as Mn)	CAS: 7439-96-5
Formula: Mn (metal)	RTECS: OO9275000 (metal)
Synonyms & Trade Names: Manganese metal: Colloidal manganese, Manganese-55 Synonyms of other compounds vary depending upon the specific manganese compound.	DOT ID & Guide: NA

Exposure Limits

NIOSH REL*: TWA 1 mg/m3 ST 3 mg/m3 [*Note: Also see specific listings for Manganese cyclopentadienyl tricarbonyl, Methyl cyclopentadienyl manganese tricarbonyl, and Manganese tetroxide.]	OSHA PEL*: C 5 mg/m3 [*Note: Also see specific listings for Manganese cyclopentadienyl tricarbonyl and Methyl cyclopentadienyl manganese tricarbonyl.]
IDLH: 500 mg/m3 (as Mn)	Conversion: NA

Physical Description

A lustrous, brittle, silvery solid.

MW: 54.9	BP: 3564F	MLT: 2271F	Sol: Insoluble
VP: 0 mmHg (approx)	IP: NA	RGasD: NA	Sp.Gr: 7.20 (metal)
Fl.P: NA	UEL: NA	LEL: NA	MEC: NA

Metal: Combustible Solid (See flammable and combustible liquid classes)

Incompatibilities & Reactivities

Oxidizers [Note: Will react with water or steam to produce hydrogen.]

Measurement Methods

NIOSH 7300, 7301, 7303, 9102; OSHA ID121, ID125G

Personal Protection & Sanitation	First Aid
Skin: N.R. Eyes: N.R. Wash skin: N.R.	Breath: Resp support Swallow: Medical attention immed

Remove: N.R. Change: N.R.	(See procedures)

NIOSH Respirator Recommendations

NIOSH 10 mg/m3: DMXSQ^/SA 25 mg/m3: SA:CF/PAPRDM^ 50 mg/m3: HiEF/SAT:CF/PAPRTHiE/SCBAF/SAF 500 mg/m3: SA:PD,PP : SCBAF:PD,PP/SAF:PD,PP:ASCBA Escape: HiEF/SCBAE
(See symbols and codes)

Exposure Routes

Inh Ing

Symptoms

Parkinson's; asthenia, insom, mental conf; metal fume fever: dry throat, cough, chest tight, dysp, rales, flu-like fever; low-back pain; vomit; mal; ftg; kidney damage
(See abbreviations)

Target Organs

Resp sys, CNS, blood, kidneys
(See abbreviations)

DOT Emergency Response Guidebook (ERG 2004)

Guide: NA

Additional Emergency Response Information (CAMEO Data)

Non-fire Spill Response: NA

Firefighting: NA

Reactivity: CHEMICAL PROFILE: During a fire in an industrial bag filter, a mixture of aluminum and manganese dusts was released and an explosion resulted (Occ. Haz. 28:185-7. 1946-47). Powdered manganese ignites in chlorine and burns brilliantly; with fluorine the reaction takes place with incandescence (Mellor 12:185, 344. 1946-47). Concentrated nitric acid reacts with manganese with incandescence and a feeble explosion (Mellor 12:188. 1946-47). Manganese or potassium ignites in nitrogen dioxide (Ann. Chim. et Phys. (2) 2:317). Manganese burns with a brilliant flame when heated in sulfur dioxide vapor (Mellor 12:187. 1946-47). (REACTIVITY, 1999)

First Aid: Breathing: If a person breathes large amounts of this chemical, move the exposed person to fresh air at once. If breathing has stopped, perform mouth-to-mouth resuscitation. Keep the affected person warm and at rest. Get medical attention as soon as possible. Swallow: If this chemical has been swallowed, get medical attention immediately. (NIOSH, 1997)

OSHA/EPA Occupational Chemical Database

Chemical Identification

Chemical Name: LEAD (INORGANIC, DUSTS & FUMES), as Pb
CAS #: 7439-92-1 **UN No:** **Formula:** Pb
Synonyms: Lead metal; Plumbum

Physical Properties

Physical Description: A heavy, ductile, soft, gray solid.

BP: 3164ºF	**MW:** 207.2	**LEL:** NA	**NFPA Fire Rating:** NA
FRZ/MLT: MLT: 621ºF	**VP:** 0 mmHg (approx)	**UEL:** NA	**NFPA Health Rating:** NA
FP: NA	**VD:** NA		**NFPA Reactivity Rating:** NA
Sp. GR: 11.34	**IP:** NA		**NFPA Sp. Inst.:** NA

Exposure Limits

OSHA	NIOSH	Related Information
PEL-TWA ppm: NA	**REL-TWA ppm:** NA	**AIHA Emergency Response Planning Guidelines - ERPG-1/ERPG-2/ERPG-3:** NA
PEL-TWA mg/m3: 0.05	**REL-TWA mg/m3:** 0.05	
PEL-STEL ppm: NA	**REL-STEL ppm:** NA	
PEL-STEL mg/m3: NA	**REL-STEL mg/m3:** NA	
PEL-C ppm: NA	**REL-C ppm:** NA	
PEL-C mg/m3: NA	**REL-C mg/m3:** NA	**Carcinogen Classifications:** IARC-2B, TLV-A3
Skin Notation: No	**Skin Notation:** No	
Notes: SEE 29 CFR 1910.1025	**Notes:** AIR CONCENTRATIONS SHOULD BE MAINTAINED SO THAT WORKER BLOOD LEAD REMAINS BELOW 0.06 mg Pb/100 g WHOLE BLOOD	
	IDLH ppm: NA	
	IDLH mg/m3: 100	
	IDLH Notes: NA	

NIOSH Pocket Guide to Chemical Hazards (Current through June 2006)

Lead			CAS: 7439-92-1
Formula: Pb			RTECS: OF7525000
Synonyms & Trade Names: Lead metal, Plumbum			DOT ID & Guide: NA
Exposure Limits			
NIOSH REL*: TWA 0.050 mg/m3 See Appendix C [*Note: The REL also applies to other lead compounds (as Pb) -- see Appendix C.]		OSHA PEL*: [1910.1025] TWA 0.050 mg/m3 See Appendix C [*Note: The PEL also applies to other lead compounds (as Pb) -- see Appendix C.]	
IDLH: 100 mg/m3 (as Pb)		Conversion: NA	
Physical Description			
A heavy, ductile, soft, gray solid.			
MW: 207.2	BP: 3164F	MLT: 621F	Sol: Insoluble
VP: 0 mmHg (approx)	IP: NA	RGasD: NA	Sp.Gr: 11.34
Fl.P: NA	UEL: NA	LEL: NA	MEC: NA
Noncombustible Solid in bulk form. (See flammable and combustible liquid classes)			
Incompatibilities & Reactivities			
Strong oxidizers, hydrogen peroxide, acids			
Measurement Methods			
NIOSH 7082, 7105, 7300, 7301, 7303, 7700, 7701, 7702, 9100, 9102, 9105; OSHA ID121, ID125G, ID206			
Personal Protection & Sanitation		**First Aid**	
Skin: Prevent skin contact Eyes: Prevent eye contact		Eye: Irr immed Skin: Soap flush prompt	

Wash skin: Daily Remove: When wet or contam Change: Daily	Breath: Resp support Swallow: Medical attention immed (See procedures)

NIOSH Respirator Recommendations

OSHA 0.5 mg/m3: HiE/SA 1.25 mg/m3: SA:CF/PAPRHiE 2.5 mg/m3: HiEF/SAT:CF/PAPRTHiE/SCBAF/SAF 50 mg/m3: SA:PD,PP 100 mg/m3: SAF:PD,PP : SCBAF:PD,PP/SAF:PD,PP:ASCBA Escape: HiEF/SCBAE
(See symbols and codes)

Exposure Routes

Inh Ing Con

Symptoms

Weak, lass, insom; facial pallor; anor, low-wgt, malnut; constip, abdom pain, colic; anemia; gingival lead line; tremor; para wrist, ankles; encephalopathy; kidney disease; irrit eyes; hypotension
(See abbreviations)

Target Organs

NA
(See abbreviations)

DOT Emergency Response Guidebook (ERG 2004)

Guide: NA

Additional Emergency Response Information (CAMEO Data)

Non-fire Spill Response: STORAGE PRECAUTIONS: You should store this chemical under refrigerated temperatures, and keep it away from oxidizing materials. (NTP, 1992)

Firefighting: Fires involving this material can be controlled with a dry chemical, carbon dioxide, foam, or Halon extinguisher. (NTP, 1992)

Reactivity: CHEMICAL PROFILE: In the presence of carbon, the combination of chlorine trifluoride with aluminum, copper, lead, magnesium, silver, tin, or zinc results in a violent reaction (Mellor 2, Supp. 1: 1956). A solution of sodium azide in copper pipe with lead joints formed copper and lead azide, both are detonating compounds (Klotz 1973). (REACTIVITY, 1999)

First Aid: EYES: First check the victim for contact lenses and remove if present. Flush victim's eyes with water or normal saline solution for 20 to 30 minutes while simultaneously calling a hospital or poison control center. Do not put any ointments, oils, or medication in the victim's eyes without specific instructions from a physician. IMMEDIATELY transport the victim after flushing eyes to a hospital even if no symptoms (such as redness or irritation) develop. SKIN: IMMEDIATELY flood affected skin with water while removing and isolating all contaminated clothing. Gently wash all affected skin areas thoroughly with soap and water. If symptoms such as redness or irritation develop, IMMEDIATELY call a physician and be prepared to transport the victim to a hospital for treatment. INHALATION: IMMEDIATELY leave the contaminated area; take deep breaths of fresh air. IMMEDIATELY call a physician and be prepared to transport the victim to a hospital even if no symptoms (such as wheezing, coughing, shortness of Breathing, or burning in the mouth, throat, or chest) develop. Provide proper respiratory protection to rescuers entering an unknown atmosphere. Whenever possible, Self-Contained Breathing Apparatus (SCBA) should be used; if not available, use a level of protection greater than or equal to that advised under Protective Clothing. INGESTION: Some heavy metals are VERY TOXIC POISONS, especially if their salts are very soluble in water (e.g., lead, chromium, mercury, bismuth, osmium, and arsenic). IMMEDIATELY call a hospital or poison control center and locate activated charcoal, egg whites, or milk in case the medical advisor recommends administering one of them. Also locate Ipecac syrup or a glass of salt water in case the medical advisor recommends inducing vomiting. Usually, this is NOT RECOMMENDED outside of a physician's care. If advice from a physician is not readily available and the victim is conscious and not convulsing, give the victim a glass of activated charcoal slurry in water or, if this is not available, a glass of milk, or beaten egg whites and IMMEDIATELY transport victim to a hospital. If the victim is convulsing or unconscious, do not give anything by mouth, assure that the victim's airway is open and lay the victim on his/her side with the Headache lower than the body. DO NOT INDUCE VOMITING. IMMEDIATELY transport the victim to a hospital. OTHER: Since this chemical is a known or suspected carcinogen you should contact a physician for advice regarding the possible long term health effects and potential recommendation for medical monitoring. Recommendations from the physician will depend upon the specific compound, its chemical, physical and toxicity properties, the exposure level, length of exposure, and the route of exposure. (NTP, 1992)

OSHA/EPA Occupational Chemical Database

Chemical Identification

Chemical Name: IRON OXIDE, DUST & FUME, as Fe
CAS #: 1309-37-1 **UN No:** 1376 **Formula:** Fe2O3
Synonyms: Ferric oxide; Iron(III) oxide

Physical Properties

Physical Description: Reddish-brown solid. [Note: Exposure to fume may occur during the arc-welding of iron.]

BP: NA	**MW:** 159.7	**LEL:** NA	**NFPA Fire Rating:** NA
FRZ/MLT: MLT: 2664ºF	**VP:** 0 mmHg (approx)	**UEL:** NA	**NFPA Health Rating:** NA
FP: NA	**VD:** NA		**NFPA Reactivity Rating:** NA
Sp. GR: 5.24	**IP:** NA		**NFPA Sp. Inst.:** NA

Exposure Limits

OSHA	NIOSH	Related Information
PEL-TWA ppm: NA	**REL-TWA ppm:** NA	**AIHA Emergency Response Planning Guidelines - ERPG-1/ERPG-2/ERPG-3:** NA
PEL-TWA mg/m3: 10	**REL-TWA mg/m3:** 5	
PEL-STEL ppm: NA	**REL-STEL ppm:** NA	
PEL-STEL mg/m3: NA	**REL-STEL mg/m3:** NA	
PEL-C ppm: NA	**REL-C ppm:** NA	
PEL-C mg/m3: NA	**REL-C mg/m3:** NA	**Carcinogen Classifications:** TLV-A4, IARC-3
Skin Notation: No	**Skin Notation:** No	
Notes: FUME	**Notes:** NA	
	IDLH ppm: NA	
	IDLH mg/m3: 2500	
	IDLH Notes: NA	

NIOSH Pocket Guide to Chemical Hazards (Current through June 2006)

Rouge			CAS: 1309-37-1
Formula: Fe2O3			RTECS: NO7400000
Synonyms & Trade Names: Iron(III)oxide, Iron oxide red, Red iron oxide, Red oxide			DOT ID & Guide: NA
Exposure Limits			
NIOSH REL: See Appendix D		OSHA PEL : TWA 15 mg/m3 (total) TWA 5 mg/m3 (resp)	
IDLH: N.D.		Conversion: NA	
Physical Description			
A fine, red powder of ferric oxide. [Note: Usually used in cake form or impregnated in paper or cloth.]			
MW: 159.7	BP: ?	MLT: 2849F	Sol: Insoluble
VP: 0 mmHg (approx)	IP: NA	RGasD: NA	Sp.Gr: 5.24
Fl.P: NA	UEL: NA	LEL: NA	MEC: NA
Noncombustible Solid (See flammable and combustible liquid classes)			
Incompatibilities & Reactivities			
Calcium hypochlorite, carbon monoxide, hydrogen peroxide			
Measurement Methods			
NIOSH 0500, 0600			
Personal Protection & Sanitation		**First Aid**	
Skin: N.R. Eyes: N.R. Wash skin: N.R. Remove: N.R. Change: N.R.		Eye: Irr immed Breath: Fresh air (See procedures)	
NIOSH Respirator Recommendations			
TBAL			

(See symbols and codes)

Exposure Routes

Inh Con

Symptoms

Irrit eyes, skin, resp sys
(See abbreviations)

Target Organs

Eyes, skin, resp sys
(See abbreviations)

DOT Emergency Response Guidebook (ERG 2004)

Guide Number: 135

135 Substances - Spontaneously Combustible
POTENTIAL HAZARDS
FIRE OR EXPLOSION
* Flammable/combustible material.
* May ignite on contact with moist air or moisture.
* May burn rapidly with flare-burning effect.
* Some react vigorously or explosively on contact with water.
* Some may decompose explosively when heated or involved in a fire.
* May re-ignite after fire is extinguished.
* Runoff may create fire or explosion hazard.

HEALTH
* Fire will produce irritating, corrosive and/or toxic gases.
* Inhalation of decomposition products may cause severe injury or death.
* Contact with substance may cause severe burns to skin and eyes.
* Runoff from fire control may cause pollution.

PUBLIC SAFETY
* CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, refer to appropriate telephone number listed on the inside back cover.
* Isolate spill or leak area immediately for at least 100 to 150 meters (330 to 490 feet) in all directions.
* Stay upwind.
* Keep unauthorized personnel away.
* Keep out of low areas.

PROTECTIVE CLOTHING
* Wear positive pressure self-contained breathing apparatus (SCBA).
* Wear chemical protective clothing which is specifically recommended by the manufacturer. It may provide little or no thermal protection.
* Structural firefighters' protective clothing will only provide limited protection.

EVACUATION
Spill
* See the Table of Initial Isolation and Protective Action Distances for highlighted substances. For non-highlighted substances, increase, in the downwind direction, as necessary, the isolation distance shown under **PUBLIC SAFETY**.

Fire
* If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions.

EMERGENCY RESPONSE
FIRE
* DO NOT USE WATER, CO2 OR FOAM ON MATERIAL ITSELF.
* Some of these materials may react violently with water.

EXCEPTION: For Dithionite (Hydrosulfite/Hydrosulphite) UN1384, UN1923 and UN1929, USE FLOODING AMOUNTS OF WATER for SMALL AND LARGE fires to stop the reaction. Smothering will not work for these materials. They do not need air to burn.

Small Fires
* Dry chemical, soda ash, lime or DRY sand, EXCEPT for UN1384, UN1923 and UN1929.

Large Fires
* DRY sand, dry chemical, soda ash or lime, EXCEPT for UN1384, UN1923 and UN1929, or withdraw from area and let fire burn.
* Move containers from fire area if you can do it without risk.

Fire involving Tanks or Car/Trailer Loads
* Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
* Do not get water inside containers or in contact with substance.
* Cool containers with flooding quantities of water until well after fire is out.
* Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.
* ALWAYS stay away from tanks engulfed in fire.

SPILL OR LEAK
* Fully encapsulating, vapor protective clothing should be worn for

spills and leaks with no fire.
* ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area).
* Do not touch or walk through spilled material.
* Stop leak if you can do it without risk.

Small Spills

EXCEPTION: For Dithionite (Hydrosulfite/Hydrosulphite) spills, UN1384, UN1923 and UN1929, dissolve with 5 parts water and collect for proper disposal.
* Cover with DRY earth, DRY sand, or other non-combustible material followed with plastic sheet to minimize spreading or contact with rain.
* Use clean non-sparking tools to collect material and place it into loosley covered plastic containers for later disposal.
* Prevent entry into waterways, sewers, basements or confined areas.

FIRST AID
* Move victim to fresh air.
* Call 911 or emergency medical service.
* Apply artificial respiration if victim is not breathing.
* Administer oxygen if breathing is difficult.
* Remove and isolate contaminated clothing and shoes.
* In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
* Keep victim warm and quiet.
* Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves.

Additional Emergency Response Information (CAMEO Data)

Non-fire Spill Response: Keep sparks, flames, and other sources of ignition away. (AAR, 1999)

Firefighting: Flood with water. (AAR, 1999)

Reactivity: AIR AND WATER REACTIONS: Iron(II) oxide - the finely divided oxide prepared by reduction may be pyrophoric in air at ambient temperature, Bailar, 1973, vol.3, 1008-1009.CHEMICAL PROFILE: Many serious accidents have occurred that caused explosions in the container. Oxygen is generated by the reaction of calcium hypochlorite and iron oxide or manganese oxide, Ind. Eng. Chem. 16:577(1924). Alkali metal hydroxides, acids, anhydrous chlorides of iron, tin, and aluminum, pure oxides of iron and aluminum, and metallic potassium are some of the catalysts that may cause ethylene oxide to rearrange and polymerize, liberating heat, J. Soc. Chem. Ind. 68:179(1949). Explosions occur , although infrequently, from the combination of ethylene oxide and alcohols or mercaptans, Chem. Eng. News 20:1318(1942). While boiling a piece of polester fiber in hydrazine in a glass beaker, the technician used a somewhat rusty pair of metal tweezers. When the tweezers were put into the solution it ignited, MCA Case History 1893(1973). A pyrophoric iron sulfide was made from hydrated iron oxide and hydrogen sulfide under gasoline, Ellern, p33(1968). (REACTIVITY, 1999)

First Aid: Move victim to fresh air. Call emergency medical care. Apply artificial respiration if victim is not breathing. Administer oxygen if breathing is difficult. Remove and isolate contaminated clothing and shoes. In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes. Keep victim warm and quiet. Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves. (DOT, 1996)

OSHA/EPA Occupational Chemical Database

Chemical Identification

Chemical Name: ETHYL BENZENE
CAS #: 100-41-4 **UN No:** 1175 **Formula:** C8H10
Synonyms: Ethylbenzol; Phenylethane

Physical Properties

Physical Description: Colorless liquid with an aromatic odor.

BP: 277ºF	**MW:** 106.2	**LEL:** 0.8%	**NFPA Fire Rating:** 3
FRZ/MLT: FRZ: -139ºF	**VP:** 7 mmHg	**UEL:** 6.7%	**NFPA Health Rating:** 2
FP: 55ºF	**VD:** NA		**NFPA Reactivity Rating:** 0
Sp. GR: 0.87	**IP:** 8.76 eV		**NFPA Sp. Inst.:** NA

Exposure Limits

OSHA	NIOSH	Related Information
PEL-TWA ppm: 100	**REL-TWA ppm:** 100	**AIHA Emergency Response Planning Guidelines - ERPG-1/ERPG-2/ERPG-3:** NA
PEL-TWA mg/m3: 435	**REL-TWA mg/m3:** 435	
PEL-STEL ppm: NA	**REL-STEL ppm:** 125	
PEL-STEL mg/m3: NA	**REL-STEL mg/m3:** 545	
PEL-C ppm: NA	**REL-C ppm:** NA	
PEL-C mg/m3: NA	**REL-C mg/m3:** NA	**Carcinogen Classifications:** IARC-2B, TLV-A3
Skin Notation: No	**Skin Notation:** No	
Notes: NA	**Notes:** NA	
	IDLH ppm: 800	
	IDLH mg/m3: NA	
	IDLH Notes: 10% of LEL	

NIOSH Pocket Guide to Chemical Hazards (Current through June 2006)

Ethyl benzene			CAS: 100-41-4
Formula: CH3CH2C6H5			RTECS: DA0700000
Synonyms & Trade Names: Ethylbenzol, Phenylethane			DOT ID & Guide: 1175 130
Exposure Limits			
NIOSH REL: TWA 100 ppm (435 mg/m3) ST 125 ppm (545 mg/m3)		OSHA PEL : TWA 100 ppm (435 mg/m3)	
IDLH: 800 ppm [10%LEL]		Conversion: 1 ppm = 4.34 mg/m3	
Physical Description			
Colorless liquid with an aromatic odor.			
MW: 106.2	BP: 277F	FRZ: -139F	Sol: 0.01%
VP: 7 mmHg	IP: 8.76 eV	RGasD: NA	Sp.Gr: 0.87
Fl.P: 55F	UEL: 6.7%	LEL: 0.8%	MEC: NA
Class IB Flammable Liquid (See flammable and combustible liquid classes)			
Incompatibilities & Reactivities			
Strong oxidizers			
Measurement Methods			
NIOSH 1501; OSHA 7, 1002			

Personal Protection & Sanitation	First Aid
Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet (flamm) Change: N.R.	Eye: Irr immed Skin: Water flush prompt Breath: Resp support Swallow: Medical attention immed (See procedures)

NIOSH Respirator Recommendations

NIOSH/OSHA 800 ppm: CCROV*/GMFOV/PAPROV*/SA*/SCBAF : SCBAF:PD,PP/SAF:PD,PP:ASCBA Escape: GMFOV/SCBAE
(See symbols and codes)

Exposure Routes

Inh Ing Con

Symptoms

Irrit eyes, skin, muc memb; head; derm; narco, coma
(See abbreviations)

Target Organs

Eyes, skin, resp sys, CNS
(See abbreviations)

DOT Emergency Response Guidebook (ERG 2004)

Guide Number: 129

129 Flammable Liquids (Polar/Water-Miscible/Noxious)
POTENTIAL HAZARDS
FIRE OR EXPLOSION
* HIGHLY FLAMMABLE: Will be easily ignited by heat, sparks or flames.
* Vapors may form explosive mixtures with air.
* Vapors may travel to source of ignition and flash back.
* Most vapors are heavier than air. They will spread along ground and collect in low or confined areas (sewers, basements, tanks).
* Vapor explosion hazard indoors, outdoors or in sewers.
* Those substances designated with a P may polymerize explosively when heated or involved in a fire.
* Runoff to sewer may create fire or explosion hazard.
* Containers may explode when heated.
* Many liquids are lighter than water.

HEALTH
* May cause toxic effects if inhaled or absorbed through skin.
* Inhalation or contact with material may irritate or burn skin and eyes.
* Fire will produce irritating, corrosive and/or toxic gases.
* Vapors may cause dizziness or suffocation.
* Runoff from fire control or dilution water may cause pollution.

PUBLIC SAFETY
* CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, refer to appropriate telephone number listed on the inside back cover.
* Isolate spill or leak area immediately for at least 50 to 100 meters (160 to 330 feet) in all directions.
* Keep unauthorized personnel away.
* Stay upwind.
* Keep out of low areas.
* Ventilate closed spaces before entering.

PROTECTIVE CLOTHING
* Wear positive pressure self-contained breathing apparatus (SCBA).
* Structural firefighters' protective clothing will only provide limited protection.

EVACUATION
Large Spill
* Consider initial downwind evacuation for at least 300 meters (1000 feet).

Fire
* If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions.

EMERGENCY RESPONSE
FIRE
CAUTION: All these products have a very low flash point: Use of water spray when fighting fire may be inefficient.

Small Fires
* Dry chemical, CO_2, water spray or alcohol-resistant foam.
* Do not use dry chemical extinguishers to control fires involving nitromethane or nitroethane.

Large Fires
* Water spray, fog or alcohol-resistant foam.
* Do not use straight streams.
* Move containers from fire area if you can do it without risk.

Fire involving Tanks or Car/Trailer Loads
* Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
* Cool containers with flooding quantities of water until well after fire is out.
* Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.
* ALWAYS stay away from tanks engulfed in fire.
* For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn.

SPILL OR LEAK

* ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area).
* All equipment used when handling the product must be grounded.
* Do not touch or walk through spilled material.
* Stop leak if you can do it without risk.
* Prevent entry into waterways, sewers, basements or confined areas.
* A vapor suppressing foam may be used to reduce vapors.
* Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers.
* Use clean non-sparking tools to collect absorbed material.

Large Spills

* Dike far ahead of liquid spill for later disposal.
* Water spray may reduce vapor; but may not prevent ignition in closed spaces.

FIRST AID

* Move victim to fresh air.
* Call 911 or emergency medical service.
* Apply artificial respiration if victim is not breathing.
* Administer oxygen if breathing is difficult.
* Remove and isolate contaminated clothing and shoes.
* In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
* Wash skin with soap and water.
* Keep victim warm and quiet.
* Effects of exposure (inhalation, ingestion or skin contact) to substance may be delayed.
* Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves.

Additional Emergency Response Information (CAMEO Data)

Non-fire Spill Response: Keep sparks, flames, and other sources of ignition away. Keep material out of water sources and sewers. Build dikes to contain flow as necessary. Attempt to stop leak if without undue personnel hazard. Use water spray to knock-down vapors. Land spill: Dig a pit, pond, lagoon, holding area to contain liquid or solid material. Dike surface flow using soil, sand bags, foamed polyurethane, or foamed concrete. Absorb bulk liquid with fly ash, cement powder, or commercial sorbents. Apply "universal" gelling agent to immobilize spill. Apply approriate foam to diminish vapor and fire hazard. Water spill: Use natural barriers or oil spill control booms to limit spill travel. Use surface active agent (e.g. detergent, soaps, alcohols), if approved by epa. Inject "universal" gelling agent to solidify encircled spill and increase effectiveness of booms. If dissolved, in region of 10 ppm or greater concentration, apply activated carbon at ten times the spilled amount. Remove trapped material with suction hoses. Use mechanical dredges or lifts to remove immobilized masses of pollutants and precipitates. (AAR, 1999)

Firefighting: Do not extinguish fire unless flow can be stopped. Use water in flooding quantities as fog. Solid streams of water may spread fire. Cool all affected containers with flooding quantities of water. Apply water from as far a distance as possible. Use foam, dry chemical, or carbon dioxide. (AAR, 1999)

Reactivity: STABILITY: This chemical is stable under normal laboratory conditions. Solutions of this chemical should be stable for 24 hours under normal lab conditions.REACTIVITY: This compound can react vigorously with strong oxidizing materials. (NTP, 1992)

First Aid: EYES: First check the victim for contact lenses and remove if present. Flush victim's eyes with water or normal saline solution for 20 to 30 minutes while simultaneously calling a hospital or poison control center. Do not put any ointments, oils, or medication in the victim's eyes without specific instructions from a physician. IMMEDIATELY transport the victim after flushing eyes to a hospital even if no symptoms (such as redness or irritation) develop. SKIN: IMMEDIATELY flood affected skin with water while removing and isolating all contaminated clothing. Gently wash all affected skin areas thoroughly with soap and water. If symptoms such as redness or irritation develop, IMMEDIATELY call a physician and be prepared to transport the victim to a hospital for treatment. INHALATION: IMMEDIATELY leave the contaminated area; take deep breaths of fresh air. If symptoms (such as wheezing, coughing, shortness of Breathing, or burning in the mouth, throat, or chest) develop, call a physician and be prepared to transport the victim to a hospital. Provide proper respiratory protection to rescuers entering an unknown atmosphere. Whenever possible, Self-Contained Breathing Apparatus (SCBA) should be used; if not available, use a level of protection greater than or equal to that advised under Protective Clothing. INGESTION: DO NOT INDUCE VOMITING. If the victim is conscious and not convulsing, give 1 or 2 glasses of water to dilute the chemical and IMMEDIATELY call a hospital or poison control center. Be prepared to transport the victim to a hospital if advised by a physician. If the victim is convulsing or unconscious, do not give anything by mouth, ensure that the victim's airway is open and lay the victim on his/her side with the Headache lower than the body. DO NOT INDUCE VOMITING. IMMEDIATELY transport the victim to a hospital. (NTP, 1992)

OSHA/EPA Occupational Chemical Database

Chemical Identification

Chemical Name: ETHANOL
CAS #: 64-17-5 **UN No:** 1987 **Formula:** C2H6O
Synonyms: Alcohol; Cologne spirit; Ethanol; EtOH; Grain alcohol

Physical Properties

Physical Description: Clear, colorless liquid with a weak, ethereal, vinous odor.

BP: 173ºF	**MW:** 46.1	**LEL:** 3.3%	**NFPA Fire Rating:** NA
FRZ/MLT: FRZ: -173ºF	**VP:** 44 mmHg	**UEL:** 19%	**NFPA Health Rating:** NA
FP: 55ºF	**VD:** NA		**NFPA Reactivity Rating:** NA
Sp. GR: 0.79	**IP:** 10.47 eV		**NFPA Sp. Inst.:** NA

Exposure Limits

OSHA	NIOSH	Related Information
PEL-TWA ppm: 1000	**REL-TWA ppm:** 1000	**AIHA Emergency Response Planning Guidelines - ERPG-1/ERPG-2/ERPG-3:** NA
PEL-TWA mg/m3: 1900	**REL-TWA mg/m3:** 1900	
PEL-STEL ppm: NA	**REL-STEL ppm:** NA	
PEL-STEL mg/m3: NA	**REL-STEL mg/m3:** NA	
PEL-C ppm: NA	**REL-C ppm:** NA	
PEL-C mg/m3: NA	**REL-C mg/m3:** NA	**Carcinogen Classifications:** TLV-A4
Skin Notation: No	**Skin Notation:** No	
Notes: NA	**Notes:** NA	
	IDLH ppm: 3300	
	IDLH mg/m3: NA	
	IDLH Notes: 10% of LEL	

NIOSH Pocket Guide to Chemical Hazards (Current through June 2006)

Ethyl alcohol			CAS: 64-17-5
Formula: CH3CH2OH			RTECS: KQ6300000
Synonyms & Trade Names: Alcohol, Cologne spirit, Ethanol, EtOH, Grain alcohol			DOT ID & Guide: 1170 127
Exposure Limits			
NIOSH REL: TWA 1000 ppm (1900 mg/m3)		OSHA PEL: TWA 1000 ppm (1900 mg/m3)	
IDLH: 3300 ppm [10%LEL]		Conversion: 1 ppm = 1.89 mg/m3	
Physical Description			
Clear, colorless liquid with a weak, ethereal, vinous odor.			
MW: 46.1	BP: 173F	FRZ: -173F	Sol: Miscible
VP: 44 mmHg	IP: 10.47 eV	RGasD: NA	Sp.Gr: 0.79
Fl.P: 55F	UEL: 19%	LEL: 3.3%	MEC: NA
Class IB Flammable Liquid (See flammable and combustible liquid classes)			
Incompatibilities & Reactivities			
Strong oxidizers, potassium dioxide, bromine pentafluoride, acetyl bromide, acetyl chloride, platinum, sodium			
Measurement Methods			
NIOSH 1400; OSHA 100			
Personal Protection & Sanitation		**First Aid**	
Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet (flamm) Change: N.R.		Eye: Irr immed Skin: Water flush prompt Breath: Fresh air Swallow: Medical attention immed (See procedures)	
NIOSH Respirator Recommendations			
NIOSH/OSHA 3300 ppm: SA/SCBAF : SCBAF:PD,PP/SAF:PD,PP:ASCBA Escape: SCBAE			

(See symbols and codes)

Exposure Routes

Inh Ing Con

Symptoms

Irrit eyes, skin, nose; head, drow, ftg, narco; cough; liver damage; anemia; repro, terato effects
(See abbreviations)

Target Organs

Eyes, skin, resp sys, CNS, liver, blood, repro sys
(See abbreviations)

DOT Emergency Response Guidebook (ERG 2004)

Guide Number: 127

127 Flammable Liquids (Polar/Water-Miscible)
POTENTIAL HAZARDS
FIRE OR EXPLOSION
* HIGHLY FLAMMABLE: Will be easily ignited by heat, sparks or flames.
* Vapors may form explosive mixtures with air.
* Vapors may travel to source of ignition and flash back.
* Most vapors are heavier than air. They will spread along ground and collect in low or confined areas (sewers, basements, tanks).
* Vapor explosion hazard indoors, outdoors or in sewers.
* Those substances designated with a P may polymerize explosively when heated or involved in a fire.
* Runoff to sewer may create fire or explosion hazard.
* Containers may explode when heated.
* Many liquids are lighter than water.

HEALTH
* Inhalation or contact with material may irritate or burn skin and eyes.
* Fire may produce irritating, corrosive and/or toxic gases.
* Vapors may cause dizziness or suffocation.
* Runoff from fire control may cause pollution.

PUBLIC SAFETY
* CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, refer to appropriate telephone number listed on the inside back cover.
* Isolate spill or leak area immediately for at least 25 to 50 meters (80 to 160 feet) in all directions.
* Keep unauthorized personnel away.
* Stay upwind.
* Keep out of low areas.
* Ventilate closed spaces before entering.

PROTECTIVE CLOTHING
* Wear positive pressure self-contained breathing apparatus (SCBA).
* Structural firefighters' protective clothing will only provide limited protection.

EVACUATION
Large Spill
* Consider initial downwind evacuation for at least 300 meters (1000 feet).

Fire
* If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions.

EMERGENCY RESPONSE
FIRE
CAUTION: All these products have a very low flash point: Use of water spray when fighting fire may be inefficient.

Small Fires
* Dry chemical, CO_2, water spray or alcohol-resistant foam.

Large Fires
* Water spray, fog or alcohol-resistant foam.
* Use water spray or fog; do not use straight streams.
* Move containers from fire area if you can do it without risk.

Fire involving Tanks or Car/Trailer Loads
* Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
* Cool containers with flooding quantities of water until well after fire is out.
* Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.
* ALWAYS stay away from tanks engulfed in fire.
* For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn.

SPILL OR LEAK
* ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area).
* All equipment used when handling the product must be grounded.
* Do not touch or walk through spilled material.

* Stop leak if you can do it without risk.
* Prevent entry into waterways, sewers, basements or confined areas.
* A vapor suppressing foam may be used to reduce vapors.
* Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers.
* Use clean non-sparking tools to collect absorbed material.

Large Spills

* Dike far ahead of liquid spill for later disposal.
* Water spray may reduce vapor; but may not prevent ignition in closed spaces.

FIRST AID

* Move victim to fresh air.
* Call 911 or emergency medical service.
* Apply artificial respiration if victim is not breathing.
* Administer oxygen if breathing is difficult.
* Remove and isolate contaminated clothing and shoes.
* In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
* Wash skin with soap and water.
* Keep victim warm and quiet.
* Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves.

Additional Emergency Response Information (CAMEO Data)

Non-fire Spill Response: Keep sparks, flames, and other sources of ignition away. Keep material out of water sources and sewers. Build dikes to contain flow as necessary. Attempt to stop leak if without undue personnel hazard. Use water spray to disperse vapors and dilute standing pools of liquid. Apply water spray or mist to knock down vapors. Vapor knockdown water is corrosive or toxic and should be diked for containment. Land spill: Dike surface flow using soil, sand bags, foamed polyurethane, or foamed concrete. Absorb bulk liquid with fly ash, cement powder, or commercial sorbents. Apply "universal" gelling agent to immobilize spill. Apply approriate foam to diminish vapor and fire hazard. Water spill: Remove trapped material with suction hoses. If dissolved, in region of 10 ppm or greater concentration, apply activated carbon at ten times the spilled amount. Use mechanical dredges or lifts to remove immobilized masses of pollutants and precipitates. (AAR, 1999)

Firefighting: Do not extinguish fire unless flow can be stopped. Use water in flooding quantities as fog. Solid streams of water may be ineffective. Cool all affected containers with flooding quantities of water. Apply water from as far a distance as possible. Use foam, dry chemical, or carbon dioxide. (AAR, 1999)

Reactivity: CHEMICAL PROFILE: Acetyl chloride react violently with ethyl alcohol or water (Rose 1961). Acetyl bromide reacts violently with alcohols or water (Merck 11th ed. 1989). Mixtures of alcohols with concentrated sulfuric acid and strong hydrogen peroxide can cause explosions. Example: An explosion will occur if dimethylbenzylcarbinol is added to 90% hydrogen peroxide then acidified with concentrated sulfuric acid. Mixtures of ethyl alcohol with concentrated hydrogen peroxide form powerful explosives. Mixtures of hydrogen peroxide and 1-phenyl-2-methyl propyl alcohol tend to explode if acidified with 70% sulfuric acid (Chem. Eng. News 45(43):73. 1967; J, Org. Chem. 28:1893. 1963). Alkyl hypochlorites are violently explosive. They are readily obtained by reacting hypochlorous acid and alcohols either in aqueous solution or mixed aqueous-carbon tetrachloride solutions. Chlorine plus alcohols would similarly yield alkyl hypochlorites. They decompose in the cold and explode on exposure to sunlight or heat. Tertiary hypochlorites are less unstable than secondary or primary hypochlorites (NFPA 491 M. 1991). Base-catalysed reactions of isocyanates with alcohols should be carried out in inert solvents. Such reactions in the absence of solvents often occur with explosive violence (Wischmeyer 1969). (REACTIVITY, 1999)

First Aid: Move victim to fresh air; call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 15 minutes. Remove and isolate contaminated clothing and shoes at the site. (AAR, 1999)

OSHA/EPA Occupational Chemical Database

Chemical Identification

Chemical Name: COPPER, DUSTS AND MISTS, as Cu
CAS #: 7440-50-8 **UN No:** **Formula:** Cu
Synonyms: Copper metal dusts; Copper metal fumes

Physical Properties

Physical Description: Reddish, lustrous, malleable, odorless solid.

BP: 4703ºF	**MW:** 63.5	**LEL:** NA	**NFPA Fire Rating:** NA
FRZ/MLT: MLT: 1981ºF	**VP:** 0 mmHg (approx)	**UEL:** NA	**NFPA Health Rating:** NA
FP: NA	**VD:** NA		**NFPA Reactivity Rating:** NA
Sp. GR: 8.94	**IP:** NA		**NFPA Sp. Inst.:** NA

Exposure Limits

OSHA	NIOSH	Related Information
PEL-TWA ppm: NA	**REL-TWA ppm:** NA	**AIHA Emergency Response Planning Guidelines - ERPG-1/ERPG-2/ERPG-3:** NA
PEL-TWA mg/m3: 1	**REL-TWA mg/m3:** 1	
PEL-STEL ppm: NA	**REL-STEL ppm:** NA	
PEL-STEL mg/m3: NA	**REL-STEL mg/m3:** NA	
PEL-C ppm: NA	**REL-C ppm:** NA	
PEL-C mg/m3: NA	**REL-C mg/m3:** NA	**Carcinogen Classifications:** NA
Skin Notation: No	**Skin Notation:** No	
Notes: NA	**Notes:** NA	
	IDLH ppm: NA	
	IDLH mg/m3: 100	
	IDLH Notes: NA	

NIOSH Pocket Guide to Chemical Hazards (Current through June 2006)

Copper (dusts and mists, as Cu)			CAS: 7440-50-8
Formula: Cu			RTECS: GL5325000
Synonyms & Trade Names: Copper metal dusts, Copper metal fumes			DOT ID & Guide: NA
Exposure Limits			
NIOSH REL*: TWA 1 mg/m3 [*Note: The REL also applies to other copper compounds (as Cu) except Copper fume.]		OSHA PEL*: TWA 1 mg/m3 [*Note: The PEL also applies to other copper compounds (as Cu) except copper fume.]	
IDLH: 100 mg/m3 (as Cu)		Conversion: NA	
Physical Description			
Reddish, lustrous, malleable, odorless solid.			
MW: 63.5	BP: 4703F	MLT: 1981F	Sol: Insoluble
VP: 0 mmHg (approx)	IP: NA	RGasD: NA	Sp.Gr: 8.94
Fl.P: NA	UEL: NA	LEL: NA	MEC: NA
Noncombustible Solid in bulk form, but powdered form may ignite. (See flammable and combustible liquid classes)			
Incompatibilities & Reactivities			
Oxidizers, alkalis, sodium azide, acetylene			
Measurement Methods			
NIOSH 7029, 7300, 7301, 7303, 9102; OSHA ID121, ID125G			
Personal Protection & Sanitation		**First Aid**	
Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet or contam Change: Daily		Eye: Irr immed Skin: Soap wash prompt Breath: Resp support Swallow: Medical attention immed (See procedures)	
NIOSH Respirator Recommendations			

NIOSH/OSHA 5 mg/m3: DM* 10 mg/m3: DMXSQ*^/SA* 25 mg/m3: SA:CF*/PAPRDM* 50 mg/m3: HiEF/PAPRTHiE*/SCBAF/SAF 100 mg/m3: SAF:PD,PP : SCBAF:PD,PP/SAF:PD,PP:ASCBA Escape: HiEF/SCBAE
(See symbols and codes)

Exposure Routes

Inh Ing Con

Symptoms

Irrit eyes, nose, pharynx; nasal septum perf; metallic taste; derm; in animals: lung, liver, kidney damage; anemia
(See abbreviations)

Target Organs

Eyes, skin, resp sys, liver, kidneys (incr risk with Wilson's disease)
(See abbreviations)

DOT Emergency Response Guidebook (ERG 2004)

Guide: NA

Additional Emergency Response Information (CAMEO Data)

Non-fire Spill Response: NA

Firefighting: NA

Reactivity: CHEMICAL PROFILE: In the presence of carbon, the combination of chlorine trifluoride with aluminum, copper, lead, magnesium, silver, tin, or zinc results in a violent reaction, Mellor 2, Supp. 1:(1956). Sodium peroxide oxidizes antimony, arsenic, copper, potassium, tin, and zinc with incandescence, Mellor 2:490-93(1946-1947). Unstable acetylides form when acetylene is passed over copper that has been heated enough to form a tarnish of oxide coating. A combination of finely divided copper with finely divided bromates(also chlorates and iodates) of barium, calcium, magnesium, potassium, sodium, or zinc will explode with heat, percussion, and sometimes light friction, Mellor 2:310(1946-1947). A solution of sodium azide in copper pipe with lead joints formed copper and lead azide, both are detonating compounds, Klotz(1973). (REACTIVITY, 1999)

First Aid: Eye: If this chemical contacts the eyes, immediately wash the eyes with large amounts of water, occasionally lifting the lower and upper lids. Get medical attention immediately. Contact lenses should not be worn when working with this chemical. Skin: If this chemical contacts the skin, promptly wash the contaminated skin with soap and water. If this chemical penetrates the clothing promptly remove the clothing and wash the skin with soap and water. Get medical attention promptly. Breathing: If a person breathes large amounts of this chemical, move the exposed person to fresh air at once. If breathing has stopped, perform mouth-to-mouth resuscitation. Keep the affected person warm and at rest. Get medical attention as soon as possible. Swallow: If this chemical has been swallowed, get medical attention immediately. (NIOSH, 1997)

OSHA/EPA Occupational Chemical Database

Chemical Identification

Chemical Name: COAL TAR PITCH VOLATILES

CAS #: 65996-93-2 **UN No:** **Formula:**

Synonyms: Synonyms vary depending upon the specific compound (e.g., pyrene; phenanthrene; acridine; chrysene; anthracene & benzo (a)pyrene).

Physical Properties

Physical Description: Odorless, silver-gray to black solid.

BP: 5612ºF	**MW:** 58.9	**LEL:** NA	**NFPA Fire Rating:** NA
FRZ/MLT: FRZ: NA	**VP:** NA	**UEL:** 2719ºF	**NFPA Health Rating:** NA
FP: NA	**VD:** NA		**NFPA Reactivity Rating:** NA
Sp. GR: 8.92	**IP:** NA		**NFPA Sp. Inst.:** NA

Exposure Limits

OSHA	NIOSH	Related Information
PEL-TWA ppm: NA	**REL-TWA ppm:** NA	**AIHA Emergency Response Planning Guidelines - ERPG-1/ERPG-2/ERPG-3:** NA
PEL-TWA mg/m3: 0.2	**REL-TWA mg/m3:** 0.1	
PEL-STEL ppm: NA	**REL-STEL ppm:** NA	
PEL-STEL mg/m3: NA	**REL-STEL mg/m3:** NA	
PEL-C ppm: NA	**REL-C ppm:** NA	
PEL-C mg/m3: NA	**REL-C mg/m3:** NA	**Carcinogen Classifications:** IARC-1, NIOSH-Ca, NTP-K, TLV-A1
Skin Notation: No	**Skin Notation:** No	
Notes: as BENZENE SOLUBLE FRACTION (ANTHRACENE, BaP, PHENANTHRENE, ACRIDINE, CHRYSENE, PYRENE); SEE 1910.1002 (DEFINITION)	**Notes:** CARCINOGEN (Ca); as CYCLOHEXANE-EXTRACTABLE FRACTION	
	IDLH ppm: NA	
	IDLH mg/m3: 80	
	IDLH Notes: Ca	

NIOSH Pocket Guide to Chemical Hazards (Current through June 2006)

Coal tar pitch volatiles			CAS: 65996-93-2
Formula: NA			RTECS: GF8655000
Synonyms & Trade Names: Synonyms vary depending upon the specific compound (e.g., pyrene, phenanthrene, acridine, chrysene, anthracene & benzo(a)pyrene).			DOT ID & Guide: 2713 153
Exposure Limits			
NIOSH REL: Ca TWA 0.1 mg/m3 (cyclohexane-extractable fraction) See Appendix A See Appendix C		OSHA PEL: TWA 0.2 mg/m3 (benzene-soluble fraction) [1910.1002] See Appendix C	
IDLH: Ca [80 mg/m3]		Conversion: NA	
Physical Description			
Black or dark-brown amorphous residue.			
Properties vary depending upon the specific compound.	BP: NA	FRZ: NA	Sol: NA
VP: NA	IP: NA	RGasD: NA	SG: NA
FP: NA	UEL: NA	LEL: NA	MEC: NA
Combustible Solids (See flammable and combustible liquid classes)			
Incompatibilities & Reactivities			
Strong oxidizers			
Measurement Methods			
OSHA 58			
Personal Protection & Sanitation		**First Aid**	

Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: Daily Remove: N.R. Change: Daily	Eye: Irr immed Skin: Soap wash immed Breath: Resp support Swallow: Medical attention immed (See procedures)

NIOSH Respirator Recommendations

NIOSH : SCBAF:PD,PP/SAF:PD,PP:ASCBA Escape: GMFOVHiE/SCBAE
(See symbols and codes)

Exposure Routes

Inh Con

Symptoms

Derm, bron, [carc]
(See abbreviations)

Target Organs

Resp sys, skin, bladder, kidneys
(See abbreviations)

DOT Emergency Response Guidebook (ERG 2004)

Guide Number: 153

153 Substances - Toxic and/or Corrosive (Combustible)
POTENTIAL HAZARDS
HEALTH
* TOXIC; inhalation, ingestion, or skin contact with material may cause severe injury or death.
* Contact with molten substance may cause severe burns to skin and eyes.
* Avoid any skin contact.
* Effects of contact or inhalation may be delayed.
* Fire may produce irritating, corrosive and/or toxic gases.
* Runoff from fire control or dilution water may be corrosive and/or toxic and cause pollution.

FIRE OR EXPLOSION
* Combustible material: may burn but does not ignite readily.
* When heated, vapors may form explosive mixtures with air: indoors, outdoors, and sewers explosion hazards.
* Those substances designated with a P may polymerize explosively when heated or involved in a fire.
* Contact with metals may evolve flammable hydrogen gas.
* Containers may explode when heated.
* Runoff may pollute waterways.
* Substance may be transported in a molten form.

PUBLIC SAFETY
* CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, refer to appropriate telephone number listed on the inside back cover.
* Isolate spill or leak area immediately for at least 25 to 50 meters (80 to 160 feet) in all directions.
* Keep unauthorized personnel away.
* Stay upwind.
* Keep out of low areas.
* Ventilate enclosed areas.

PROTECTIVE CLOTHING
* Wear positive pressure self-contained breathing apparatus (SCBA).
* Wear chemical protective clothing which is specifically recommended by the manufacturer. It may provide little or no thermal protection.
* Structural firefighters' protective clothing provides limited protection in fire situations ONLY; it is not effective in spill situations.

EVACUATION
Spill
* See the Table of Initial Isolation and Protective Action Distances for highlighted substances. For non-highlighted substances, increase, in the downwind direction, as necessary, the isolation distance shown under **PUBLIC SAFETY**.

Fire
* If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions.

EMERGENCY RESPONSE
FIRE
Small Fires
* Dry chemical, CO2 or water spray.

Large Fires
* Dry chemical, CO2, alcohol-resistant foam or water spray.
* Move containers from fire area if you can do it without risk.
* Dike fire control water for later disposal; do not scatter the material.

Fire involving Tanks or Car/Trailer Loads

* Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
* Do not get water inside containers.
* Cool containers with flooding quantities of water until well after fire is out.
* Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.
* ALWAYS stay away from tanks engulfed in fire.

SPILL OR LEAK

* ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area).
* Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.
* Stop leak if you can do it without risk.
* Prevent entry into waterways, sewers, basements or confined areas.
* Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers.
* DO NOT GET WATER INSIDE CONTAINERS.

FIRST AID

* Move victim to fresh air.
* Call 911 or emergency medical service.
* Apply artificial respiration if victim is not breathing.
* Do not use mouth-to-mouth method if victim ingested or inhaled the substance; induce artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device.
* Administer oxygen if breathing is difficult.
* Remove and isolate contaminated clothing and shoes.
* In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
* For minor skin contact, avoid spreading material on unaffected skin.
* Keep victim warm and quiet.
* Effects of exposure (inhalation, ingestion or skin contact) to substance may be delayed.
* Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves.

Additional Emergency Response Information (CAMEO Data)

Non-fire Spill Response: NA

Firefighting: NA

Reactivity: NA

First Aid: NA

OSHA/EPA Occupational Chemical Database

Chemical Identification

Chemical Name: CHROMIUM METAL
CAS #: 7440-47-3 **UN No:** 1759 **Formula:** Cr
Synonyms: Chrome; Chromium

Physical Properties			
Physical Description: Blue-white to steel-gray, lustrous, brittle, hard, odorless solid.			
BP: 4788ºF	**MW:** 52.0	**LEL:** NA	**NFPA Fire Rating:** NA
FRZ/MLT: MLT: 3452ºF	**VP:** 0 mmHg (approx)	**UEL:** NA	**NFPA Health Rating:** NA
FP: NA	**VD:** NA		**NFPA Reactivity Rating:** NA
Sp. GR: 7.14	**IP:** NA		**NFPA Sp. Inst.:** NA

Exposure Limits		
OSHA	**NIOSH**	**Related Information**
PEL-TWA ppm: NA	**REL-TWA ppm:** NA	**AIHA Emergency Response Planning Guidelines - ERPG-1/ERPG-2/ERPG-3:** NA
PEL-TWA mg/m3: 1	**REL-TWA mg/m3:** 0.5	
PEL-STEL ppm: NA	**REL-STEL ppm:** NA	
PEL-STEL mg/m3: NA	**REL-STEL mg/m3:** NA	
PEL-C ppm: NA	**REL-C ppm:** NA	
PEL-C mg/m3: NA	**REL-C mg/m3:** NA	**Carcinogen Classifications:** IARC-3, TLV-A4
Skin Notation: No	**Skin Notation:** No	
Notes: NA	**Notes:** NA	
	IDLH ppm: NA	
	IDLH mg/m3: 250	
	IDLH Notes: NA	

NIOSH Pocket Guide to Chemical Hazards (Current through June 2006)			
Chromium metal			CAS: 7440-47-3
Formula: Cr			RTECS: GB4200000
Synonyms & Trade Names: Chrome, Chromium			DOT ID & Guide: NA
Exposure Limits			
NIOSH REL: TWA 0.5 mg/m3 See Appendix C		OSHA PEL*: TWA 1 mg/m3 See Appendix C [*Note: The PEL also applies to insoluble chromium salts.]	
IDLH: 250 mg/m3 (as Cr)		Conversion: NA	
Physical Description			
Blue-white to steel-gray, lustrous, brittle, hard, odorless solid.			
MW: 52.0	BP: 4788F	MLT: 3452F	Sol: Insoluble
VP: 0 mmHg (approx)	IP: NA	RGasD: NA	Sp.Gr: 7.14
Fl.P: NA	UEL: NA	LEL: NA	MEC: NA
Noncombustible Solid in bulk form, but finely divided dust burns rapidly if heated in a flame. (See flammable and combustible liquid classes)			
Incompatibilities & Reactivities			
Strong oxidizers (such as hydrogen peroxide), alkalis			
Measurement Methods			
NIOSH 7024, 7300, 7301, 7303, 9102; OSHA ID121, ID125G			
Personal Protection & Sanitation		**First Aid**	
Skin: N.R. Eyes: N.R. Wash skin: N.R. Remove: N.R. Change: N.R.		Eye: Irr immed Skin: Soap wash Breath: Resp support Swallow: Medical attention immed (See procedures)	

NIOSH Respirator Recommendations

NIOSH 2.5 mg/m3: DM* 5 mg/m3: DMXSQ*/SA* 12.5 mg/m3: SA:CF*/PAPRDM* 25 mg/m3: HiEF/PAPRTHiE*/SCBAF/SAF 250 mg/m3: SAF:PD,PP : SCBAF:PD,PP/SAF:PD,PP:ASCBA Escape: HiEF/SCBAE
(See symbols and codes)

Exposure Routes

Inh Ing Con

Symptoms

Irrit eyes, skin; lung fib (histologic)
(See abbreviations)

Target Organs

Eyes, skin, resp sys
(See abbreviations)

DOT Emergency Response Guidebook (ERG 2004)

Guide Number: 154

154 Substances - Toxic and/or Corrosive (Non-Combustible)
POTENTIAL HAZARDS
HEALTH
* TOXIC; inhalation, ingestion, or skin contact with material may cause severe injury or death.
* Contact with molten substance may cause severe burns to skin and eyes.
* Avoid any skin contact.
* Effects of contact or inhalation may be delayed.
* Fire may produce irritating, corrosive and/or toxic gases.
* Runoff from fire control or dilution water may be corrosive and/or toxic and cause pollution.

FIRE OR EXPLOSION
* Non-combustible, substance itself does not burn but may decompose upon heating to produce corrosive and/or toxic fumes.
* Some are oxidizers and may ignite combustibles (wood, paper, oil, clothing, etc.).
* Contact with metals may evolve flammable hydrogen gas.
* Containers may explode when heated.

PUBLIC SAFETY
* CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, refer to appropriate telephone number listed on the inside back cover.
* Isolate spill or leak area immediately for at least 25 to 50 meters (80 to 160 feet) in all directions.
* Keep unauthorized personnel away.
* Stay upwind.
* Keep out of low areas.
* Ventilate enclosed areas.

PROTECTIVE CLOTHING
* Wear positive pressure self-contained breathing apparatus (SCBA).
* Wear chemical protective clothing which is specifically recommended by the manufacturer. It may provide little or no thermal protection.
* Structural firefighters' protective clothing provides limited protection in fire situations ONLY; it is not effective in spill situations.

EVACUATION
Spill
* See the Table of Initial Isolation and Protective Action Distances for highlighted substances. For non-highlighted substances, increase, in the downwind direction, as necessary, the isolation distance shown under **PUBLIC SAFETY**.

Fire
* If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions.

EMERGENCY RESPONSE
FIRE
Small Fires
* Dry chemical, CO2 or water spray.

Large Fires
* Dry chemical, CO2, alcohol-resistant foam or water spray.
* Move containers from fire area if you can do it without risk.
* Dike fire control water for later disposal; do not scatter the material.

Fire involving Tanks or Car/Trailer Loads
* Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
* Do not get water inside containers.
* Cool containers with flooding quantities of water until well after fire is out.
* Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.
* ALWAYS stay away from tanks engulfed in fire.

SPILL OR LEAK

* ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area).
* Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.
* Stop leak if you can do it without risk.
* Prevent entry into waterways, sewers, basements or confined areas.
* Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers.
* DO NOT GET WATER INSIDE CONTAINERS.

FIRST AID

* Move victim to fresh air.
* Call 911 or emergency medical service.
* Apply artificial respiration if victim is not breathing.
* Do not use mouth-to-mouth method if victim ingested or inhaled the substance; induce artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device.
* Administer oxygen if breathing is difficult.
* Remove and isolate contaminated clothing and shoes.
* In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
* For minor skin contact, avoid spreading material on unaffected skin.
* Keep victim warm and quiet.
* Effects of exposure (inhalation, ingestion or skin contact) to substance may be delayed.
* Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves.

Additional Emergency Response Information (CAMEO Data)

Non-fire Spill Response: SMALL SPILLS AND LEAKAGE: If you spill this chemical, dampen the solid spill material with 5% ammonium hydroxide, then transfer the dampened material to a suitable container. Use absorbent paper dampened with 5% ammonium hydroxide to pick up any remaining material. Your contaminated clothing and the absorbent paper should be sealed in a vapor-tight plastic bag for eventual disposal. Wash all contaminated surfaces with 5% ammonium hydroxide followed by washing with a strong soap and water solution. Do not reenter the contaminated area until the Safety Officer (or other responsible person) has verified that the area has been properly cleaned.STORAGE PRECAUTIONS: You should store this material in a refrigerator. (NTP, 1992)

Firefighting: NA

Reactivity: REACTIVITY: Reacts violently with NH_4NO_3, N_2O_2, Li, NO, $KClO_3$, SO_2. (NTP, 1992)

First Aid: EYES: First check the victim for contact lenses and remove if present. Flush victim's eyes with water or normal saline solution for 20 to 30 minutes while simultaneously calling a hospital or poison control center. Do not put any ointments, oils, or medication in the victim's eyes without specific instructions from a physician. IMMEDIATELY transport the victim after flushing eyes to a hospital even if no symptoms (such as redness or irritation) develop. SKIN: IMMEDIATELY flood affected skin with water while removing and isolating all contaminated clothing. Gently wash all affected skin areas thoroughly with soap and water. If symptoms such as redness or irritation develop, IMMEDIATELY call a physician and be prepared to transport the victim to a hospital for treatment. INHALATION: IMMEDIATELY leave the contaminated area; take deep breaths of fresh air. IMMEDIATELY call a physician and be prepared to transport the victim to a hospital even if no symptoms (such as wheezing, coughing, shortness of breath, or burning in the mouth, throat, or chest) develop. Provide proper respiratory protection to rescuers entering an unknown atmosphere. Whenever possible, Self-Contained Breathing Apparatus (SCBA) should be used; if not available, use a level of protection greater than or equal to that advised under Protective Clothing. INGESTION: Some heavy metals are VERY TOXIC POISONS, especially if their salts are very soluble in water (e.g., lead, chromium, mercury, bismuth, osmium, and arsenic). IMMEDIATELY call a hospital or poison control center and locate activated charcoal, egg whites, or milk in case the medical advisor recommends administering one of them. Also locate Ipecac syrup or a glass of salt water in case the medical advisor recommends inducing vomiting. Usually, this is NOT RECOMMENDED outside of a physician's care. If advice from a physician is not readily available and the victim is conscious and not convulsing, give the victim a glass of activated charcoal slurry in water or, if this is not available, a glass of milk, or beaten egg whites and IMMEDIATELY transport victim to a hospital. If the victim is convulsing or unconscious, do not give anything by mouth, assure that the victim's airway is open and lay the victim on his/her side with the head lower than the body. DO NOT INDUCE VOMITING. IMMEDIATELY transport the victim to a hospital. OTHER: Since this chemical is a known or suspected carcinogen you should contact a physician for advice regarding the possible long term health effects and potential recommendation for medical monitoring. Recommendations from the physician will depend upon the specific compound, its chemical, physical and toxicity properties, the exposure level, length of exposure, and the route of exposure. (NTP, 1992)

OSHA/EPA Occupational Chemical Database

Chemical Identification

Chemical Name: ETHYL CHLORIDE

CAS #: 75-00-3 **UN No:** 1037 **Formula:** C2H5Cl

Synonyms: Chloroethane; Hydrochloric ether; Monochloroethane; Muriatic ether

Physical Properties

Physical Description: Colorless gas or liquid (below 54ºF) with a pungent, ether-like odor. [Note: Shipped as a liquefied compressed gas.]

BP: 54ºF	**MW:** 64.5	**LEL:** 3.8%	**NFPA Fire Rating:** 4
FRZ/MLT: FRZ: -218ºF	**VP:** 1000 mmHg	**UEL:** 15.4%	**NFPA Health Rating:** 2
FP: NA (Gas) -58ºF (Liquid)	**VD:** 2.23		**NFPA Reactivity Rating:** 0
Sp. GR: 0.92 (Liquid at 32ºF)	**IP:** 10.97 eV		**NFPA Sp. Inst.:** NA

Exposure Limits

OSHA	NIOSH	Related Information
PEL-TWA ppm: 1000	**REL-TWA ppm:** NA	**AIHA Emergency Response Planning Guidelines - ERPG-1/ERPG-2/ERPG-3:** NA
PEL-TWA mg/m3: 2600	**REL-TWA mg/m3:** NA	
PEL-STEL ppm: NA	**REL-STEL ppm:** NA	
PEL-STEL mg/m3: NA	**REL-STEL mg/m3:** NA	
PEL-C ppm: NA	**REL-C ppm:** NA	
PEL-C mg/m3: NA	**REL-C mg/m3:** NA	**Carcinogen Classifications:** IARC-3, TLV-A3
Skin Notation: No	**Skin Notation:** No	
Notes: NA	**Notes:** HANDLE WITH CAUTION	
	IDLH ppm: 3800	
	IDLH mg/m3: NA	
	IDLH Notes: 10% of LEL	

NIOSH Pocket Guide to Chemical Hazards (Current through June 2006)

Ethyl chloride			CAS: 75-00-3
Formula: CH3CH2Cl			RTECS: KH7525000
Synonyms & Trade Names: Chloroethane, Hydrochloric ether, Monochloroethane, Muriatic ether			DOT ID & Guide: 1037 115
Exposure Limits			
NIOSH REL: Handle with caution in the workplace. See Appendix C (Chloroethanes)		OSHA PEL: TWA 1000 ppm (2600 mg/m3)	
IDLH: 3800 ppm [10%LEL]		Conversion: 1 ppm = 2.64 mg/m3	
Physical Description			
Colorless gas or liquid (below 54F) with a pungent, ether-like odor. [Note: Shipped as a liquefied compressed gas.]			
MW: 64.5	BP: 54F	FRZ: -218F	Sol: 0.6%
VP: 1000 mmHg	IP: 10.97 eV	RGasD: 2.23	Sp.Gr: 0.92 (Liquid at 32F)
Fl.P: NA (Gas) -58F (Liquid)	UEL: 15.4%	LEL: 3.8%	MEC: NA
Flammable Gas (See flammable and combustible liquid classes)			
Incompatibilities & Reactivities			
Chemically-active metals such as sodium, potassium, calcium, powdered aluminum, zinc & magnesium; oxidizers; water or steam [Note: Reacts with water to form hydrochloric acid.]			
Measurement Methods			
NIOSH 2519			
Personal Protection & Sanitation		**First Aid**	
Skin: Prevent skin contact (liquid) Eyes: Prevent eye contact (liquid) Wash skin: N.R.		Eye: Irr immed (liquid) Skin: Water flush prompt (liquid) Breath: Resp support	

Remove: When wet (flamm) Change: N.R.	Swallow: Medical attention immed (liquid) (See procedures)

NIOSH Respirator Recommendations

OSHA 3800 ppm: SA*/SCBAF : SCBAF:PD,PP/SAF:PD,PP:ASCBA Escape: GMFOV/SCBAE
(See symbols and codes)

Exposure Routes

Inh Abs (liquid) Ing (liquid) Con

Symptoms

Inco, inebri; abdom cramps; card arrhy, card arrest; liver, kidney damage
(See abbreviations)

Target Organs

Liver, kidneys, resp sys, CVS, CNS
(See abbreviations)

DOT Emergency Response Guidebook (ERG 2004)

Guide Number: 115

115 Gases - Flammable (Including Refrigerated Liquids)
POTENTIAL HAZARDS
FIRE OR EXPLOSION
* EXTREMELY FLAMMABLE.
* Will be easily ignited by heat, sparks or flames.
* Will form explosive mixtures with air.
* Vapors from liquefied gas are initially heavier than air and spread along ground.
* Vapors may travel to source of ignition and flash back.
* Containers may explode when heated.
* Ruptured cylinders may rocket.

HEALTH
* Vapors may cause dizziness or asphyxiation without warning.
* Some may be irritating if inhaled at high concentrations.
* Contact with gas or liquefied gas may cause burns, severe injury and/or frostbite.
* Fire may produce irritating and/or toxic gases.

PUBLIC SAFETY
* CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, refer to appropriate telephone number listed on the inside back cover.
* Isolate spill or leak area immediately for at least 50 to 100 meters (160 to 330 feet) in all directions.
* Keep unauthorized personnel away.
* Stay upwind.
* Many gases are heavier than air and will spread along ground and collect in low or confined areas (sewers, basements, tanks).
* Keep out of low areas.

PROTECTIVE CLOTHING
* Wear positive pressure self-contained breathing apparatus (SCBA).
* Structural firefighters' protective clothing will only provide limited protection.
* Always wear thermal protective clothing when handling refrigerated/cryogenic liquids.

EVACUATION
Large Spill
* Consider initial downwind evacuation for at least 800 meters (1/2 mile).

Fire
* If tank, rail car or tank truck is involved in a fire, ISOLATE for 1600 meters (1 mile) in all directions; also, consider initial evacuation for 1600 meters (1 mile) in all directions.

EMERGENCY RESPONSE
FIRE
* DO NOT EXTINGUISH A LEAKING GAS **FIRE** UNLESS LEAK CAN BE STOPPED.

Small Fires
* Dry chemical or CO2.

Large Fires
* Water spray or fog.
* Move containers from fire area if you can do it without risk.

Fire involving Tanks
* Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
* Cool containers with flooding quantities of water until well after fire is out.
* Do not direct water at source of leak or safety devices; icing may occur.
* Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.
* ALWAYS stay away from tanks engulfed in fire.
* For massive fire, use unmanned hose holders or monitor nozzles; if this

is impossible, withdraw from area and let fire burn.

SPILL OR LEAK

* ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area).
* All equipment used when handling the product must be grounded.
* Do not touch or walk through spilled material.
* Stop leak if you can do it without risk.
* If possible, turn leaking containers so that gas escapes rather than liquid.
* Use water spray to reduce vapors or divert vapor cloud drift. Avoid allowing water runoff to contact spilled material.
* Do not direct water at spill or source of leak.
* Prevent spreading of vapors through sewers, ventilation systems and confined areas.
* Isolate area until gas has dispersed.

CAUTION: When in contact with refrigerated/cryogenic liquids, many materials become brittle and are likely to break without warning.

FIRST AID

* Move victim to fresh air.
* Call 911 or emergency medical service.
* Apply artificial respiration if victim is not breathing.
* Administer oxygen if breathing is difficult.
* Remove and isolate contaminated clothing and shoes.
* Clothing frozen to the skin should be thawed before being removed.
* In case of contact with liquefied gas, thaw frosted parts with lukewarm water
* Keep victim warm and quiet.
* Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves.

Additional Emergency Response Information (CAMEO Data)

Non-fire Spill Response: Keep sparks, flames, and other sources of ignition away. Keep material out of water sources and sewers. Build dikes to contain flow as necessary. Attempt to stop leak if without undue personnel hazard. Use water spray to knock-down vapors. (AAR, 1999)

Firefighting: Do not extinguish fire unless flow can be stopped. Use water in flooding quantities as fog. Solid streams of water may spread fire. Cool all affected containers with flooding quantities of water. Apply water from as far a distance as possible. Use foam, dry chemical, or carbon dioxide. (AAR, 1999)

Reactivity: STABILITY: This compound is heat sensitive.REACTIVITY: This compound will hydrolyze in the presence of alkalies and water. It reacts with water or steam to produce toxic and corrosive fumes. It can also react vigorously with oxidizing materials. The vapor forms highly flammable mixtures with air. A mixture of this compound with potassium is shock-sensitive. Contact with chemically active metals such as Na, K, Ca, powdered Al, Zn and Mg may result in violent reactions. (NTP, 1992)

First Aid: EYES: First check the victim for contact lenses and remove if present. Flush victim's eyes with water or normal saline solution for 20 to 30 minutes while simultaneously calling a hospital or poison control center. Do not put any ointments, oils, or medication in the victim's eyes without specific instructions from a physician. IMMEDIATELY transport the victim after flushing eyes to a hospital even if no symptoms (such as redness or irritation) develop. SKIN: CAUTION: Exposure of skin to compressed gases may result in freezing of the skin. Treatment for frostbite may be necessary. Remove the victim from the source of contamination. IMMEDIATELY wash affected areas gently with COLD water (and soap, if necessary) while removing and isolating all contaminated clothing. Dry carefully with clean, soft towels. Call a hospital or poison control center IMMEDIATELY even if no symptoms (such as inflammation or irritation) develop. Be prepared to transport the victim to a hospital for treatment after washing the affected area if advised to do so by a physician. INHALATION: IMMEDIATELY leave the contaminated area; take deep breaths of fresh air. IMMEDIATELY call a physician and be prepared to transport the victim to a hospital even if no symptoms (such as wheezing, coughing, shortness of Breathing, or burning in the mouth, throat, or chest) develop. Provide proper respiratory protection to rescuers entering an unknown atmosphere. Whenever possible, Self-Contained Breathing Apparatus (SCBA) should be used; if not available, use a level of protection greater than or equal to that advised under Protective Clothing. INGESTION: This compound is a gas, therefore inhalation is the first route of exposure. OTHER: Since this chemical is a known or suspected carcinogen you should contact a physician for advice regarding the possible long term health effects and potential recommendation for medical monitoring. Recommendations from the physician will depend upon the specific compound, its chemical, physical and toxicity properties, the exposure level, length of exposure, and the route of exposure. (NTP, 1992)

OSHA/EPA Occupational Chemical Database

Chemical Identification

Chemical Name: CARBON TETRACHLORIDE

CAS #: 56-23-5 **UN No:** 1846 **Formula:** CCl4

Synonyms: Carbon chloride; Carbon tet; Freon®10; Halon®104; Tetrachloromethane

Physical Properties

Physical Description: Colorless liquid with a characteristic ether-like odor.

BP: 170ºF	**MW:** 153.8	**LEL:** NA	**NFPA Fire Rating:** 0
FRZ/MLT: FRZ: -9ºF	**VP:** 91 mmHg	**UEL:** NA	**NFPA Health Rating:** 3
FP: NA	**VD:** NA		**NFPA Reactivity Rating:** 0
Sp. GR: 1.59	**IP:** 11.47 eV		**NFPA Sp. Inst.:** NA

Exposure Limits

OSHA	NIOSH	Related Information
PEL-TWA ppm: 10	**REL-TWA ppm:** NA	**AIHA Emergency Response Planning Guidelines - ERPG-1/ERPG-2/ERPG-3:** 20 ppm/100 ppm/750 ppm
PEL-TWA mg/m3: NA	**REL-TWA mg/m3:** NA	
PEL-STEL ppm: NA	**REL-STEL ppm:** 2	
PEL-STEL mg/m3: NA	**REL-STEL mg/m3:** 12.6	
PEL-C ppm: 25	**REL-C ppm:** NA	
PEL-C mg/m3: NA	**REL-C mg/m3:** NA	**Carcinogen Classifications:** IARC-2B, NIOSH-Ca, NTP-R, TLV-A2
Skin Notation: No	**Skin Notation:** No	
Notes: PEAK = 200 ppm FOR A 5 MINUTE INTERVAL DURING ANY 4 HOURS	**Notes:** CARCINOGEN (Ca); 60 MINUTE STEL	
	IDLH ppm: 200	
	IDLH mg/m3: NA	
	IDLH Notes: Ca	

NIOSH Pocket Guide to Chemical Hazards (Current through June 2006)

Carbon tetrachloride			CAS: 56-23-5
Formula: CCl4			RTECS: FG4900000
Synonyms & Trade Names: Carbon chloride, Carbon tet, Freon 10, Halon 104, Tetrachloromethane			DOT ID & Guide: 1846 151
Exposure Limits			
NIOSH REL: Ca ST 2 ppm (12.6 mg/m3) [60-minute] See Appendix A		OSHA PEL : TWA 10 ppm C 25 ppm 200 ppm (5-minute maximum peak in any 4 hours)	
IDLH: Ca [200 ppm]		Conversion: 1 ppm = 6.29 mg/m3	
Physical Description			
Colorless liquid with a characteristic ether-like odor.			
MW: 153.8	BP: 170F	FRZ: -9F	Sol: 0.05%
VP: 91 mmHg	IP: 11.47 eV	RGasD: NA	Sp.Gr: 1.59
Fl.P: NA	UEL: NA	LEL: NA	MEC: NA
Noncombustible Liquid (See flammable and combustible liquid classes)			
Incompatibilities & Reactivities			
Chemically-active metals such as sodium, potassium & magnesium; fluorine; aluminum [Note: Forms highly toxic phosgene gas when exposed to flames or welding arcs.]			
Measurement Methods			
NIOSH 1003; OSHA 7			
Personal Protection & Sanitation		**First Aid**	
Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet or contam		Eye: Irr immed Skin: Soap wash immed Breath: Resp support Swallow: Medical attention immed	

Change: N.R. Provide: Eyewash, Quick drench	(See procedures)

NIOSH Respirator Recommendations

NIOSH : SCBAF:PD,PP/SAF:PD,PP:ASCBA Escape: GMFOV/SCBAE
(See symbols and codes)

Exposure Routes

Inh Abs Ing Con

Symptoms

Irrit eyes, skin; CNS depres; nau, vomit; liver, kidney inj; drow, dizz, inco; [carc]
(See abbreviations)

Target Organs

CNS, eyes, lungs, liver, kidneys, skin
(See abbreviations)

DOT Emergency Response Guidebook (ERG 2004)

Guide Number: 151

151 Substances - Toxic (Non-Combustible)
POTENTIAL HAZARDS
HEALTH
* Highly toxic, may be fatal if inhaled, swallowed or absorbed through skin.
* Avoid any skin contact.
* Effects of contact or inhalation may be delayed.
* Fire may produce irritating, corrosive and/or toxic gases.
* Runoff from fire control or dilution water may be corrosive and/or toxic and cause pollution.

FIRE OR EXPLOSION
* Non-combustible, substance itself does not burn but may decompose upon heating to produce corrosive and/or toxic fumes.
* Containers may explode when heated.
* Runoff may pollute waterways.

PUBLIC SAFETY
* CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, refer to appropriate telephone number listed on the inside back cover.
* Isolate spill or leak area immediately for at least 25 to 50 meters (80 to 160 feet) in all directions.
* Keep unauthorized personnel away.
* Stay upwind.
* Keep out of low areas.

PROTECTIVE CLOTHING
* Wear positive pressure self-contained breathing apparatus (SCBA).
* Wear chemical protective clothing which is specifically recommended by the manufacturer. It may provide little or no thermal protection.
* Structural firefighters' protective clothing provides limited protection in fire situations ONLY; it is not effective in spill situations.

EVACUATION
Spill
* See the Table of Initial Isolation and Protective Action Distances for highlighted substances. For non-highlighted substances, increase, in the downwind direction, as necessary, the isolation distance shown under **PUBLIC SAFETY**.

Fire
* If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions.

EMERGENCY RESPONSE
FIRE
Small Fires
* Dry chemical, CO2 or water spray.

Large Fires
* Water spray, fog or regular foam.
* Move containers from fire area if you can do it without risk.
* Dike fire control water for later disposal; do not scatter the material.
* Use water spray or fog; do not use straight streams.

Fire involving Tanks or Car/Trailer Loads
* Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
* Do not get water inside containers.
* Cool containers with flooding quantities of water until well after fire is out.
* Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.
* ALWAYS stay away from tanks engulfed in fire.
* For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn.

SPILL OR LEAK

* Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.
* Stop leak if you can do it without risk.
* Prevent entry into waterways, sewers, basements or confined areas.
* Cover with plastic sheet to prevent spreading.
* Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers.
* DO NOT GET WATER INSIDE CONTAINERS.

FIRST AID

* Move victim to fresh air.
* Call 911 or emergency medical service.
* Apply artificial respiration if victim is not breathing.
* Do not use mouth-to-mouth method if victim ingested or inhaled the substance; induce artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device.
* Administer oxygen if breathing is difficult.
* Remove and isolate contaminated clothing and shoes.
* In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
* For minor skin contact, avoid spreading material on unaffected skin.
* Keep victim warm and quiet.
* Effects of exposure (inhalation, ingestion or skin contact) to substance may be delayed.
* Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves.

Additional Emergency Response Information (CAMEO Data)

Non-fire Spill Response: Keep material out of water sources and sewers. Build dikes to contain flow as necessary. Apply water spray or mist to knock down vapors. Combustion products include corrosive or toxic vapors. Land spill: Dig a pit, pond, lagoon, holding area to contain liquid or solid material. Dike surface flow using soil, sand bags, foamed polyurethane, or foamed concrete. Absorb bulk liquid with fly ash or cement powder. Apply "universal" gelling agent to immobilize spill. Water spill: Use natural deep water pockets, excavated lagoons, or sand bag barriers to trap material at bottom. Remove trapped material with suction hoses. If dissolved, in region of 10 ppm or greater concentration, apply activated carbon at ten times the spilled amount. Use mechanical dredges or lifts to remove immobilized masses of pollutants and precipitates. (AAR, 1999)

Firefighting: Extinguish fire using agent suitable for type of surrounding fire. (Material itself does not burn or burns with difficulty.) (AAR, 1999)

Reactivity: CHEMICAL PROFILE: A commonly used liquid in fire extinguishers to combat small fires. It has no flash point, it is not flammable. However, when heated to decomposition, it will emit fumes of extremely toxic phosgene and of hydrogen chloride. Forms explosive mixtures with chlorine trifluoride, calcium hypochlorite, decaborane, dinitrogen tetroxide, fluorine. Forms impact-sensitive explosive mixtures with particles of many metals: lithium, sodium, potassium, beryllium, zinc, aluminum, barium. Vigorous exothermic reaction with allyl alcohol, boron trifluoride, diborane, disilane, aluminum chloride, dibenzoyl peroxide, potassium tert-butoxide, liquid oxygen, zirconium. [Bretherics, 5th ed., 1995, p. 666]. Potentially dangerous reaction with dimethylformamide or dimethylacetamide in presence of iron [Cardillo, P. et al., Ann. Chim. (Rome), 1984, 74, p. 129). (REACTIVITY, 1999)

First Aid: EYES: First check the victim for contact lenses and remove if present. Flush victim's eyes with water or normal saline solution for 20 to 30 minutes while simultaneously calling a hospital or poison control center. Do not put any ointments, oils, or medication in the victim's eyes without specific instructions from a physician. IMMEDIATELY transport the victim after flushing eyes to a hospital even if no symptoms (such as redness or irritation) develop. SKIN: IMMEDIATELY flood affected skin with water while removing and isolating all contaminated clothing. Gently wash all affected skin areas thoroughly with soap and water. IMMEDIATELY call a hospital or poison control center even if no symptoms (such as redness or irritation) develop. IMMEDIATELY transport the victim to a hospital for treatment after washing the affected areas. INHALATION: IMMEDIATELY leave the contaminated area; take deep breaths of fresh air. IMMEDIATELY call a physician and be prepared to transport the victim to a hospital even if no symptoms (such as wheezing, coughing, shortness of breath, or burning in the mouth, throat, or chest) develop. Provide proper respiratory protection to rescuers entering an unknown atmosphere. Whenever possible, Self-Contained Breathing Apparatus (SCBA) should be used; if not available, use a level of protection greater than or equal to that advised under Protective Clothing. INGESTION: DO NOT INDUCE VOMITING. Volatile chemicals have a high risk of being aspirated into the victim's lungs during vomiting which increases the medical problems. If the victim is conscious and not convulsing, give 1 or 2 glasses of water to dilute the chemical and IMMEDIATELY call a hospital or poison control center. IMMEDIATELY transport the victim to a hospital. If the victim is convulsing or unconscious, do not give anything by mouth, ensure that the victim's airway is open and lay the victim on his/her side with the head lower than the body. DO NOT INDUCE VOMITING. IMMEDIATELY transport the victim to a hospital. OTHER: Since this chemical is a known or suspected carcinogen you should contact a physician for advice regarding the possible long term health effects and potential recommendation for medical monitoring. Recommendations from the physician will depend upon the specific compound, its chemical, physical and toxicity properties, the exposure level, length of exposure, and the route of exposure. (NTP, 1992)

OSHA/EPA Occupational Chemical Database

Chemical Identification

Chemical Name: CADMIUM METAL AND COMPOUNDS, as Cd

CAS #: 7440-43-9 **UN No:** **Formula:** Cd

Synonyms: Cadmium metal: Cadmium. Other synonyms vary depending upon the specific cadmium compound

Physical Properties

Physical Description: Metal: Silver-white, blue-tinged lustrous, odorless solid.

BP: 1409ºF	**MW:** 112.4	**LEL:** NA	**NFPA Fire Rating:** NA
FRZ/MLT: MLT: 610ºF	**VP:** NA	**UEL:** NA	**NFPA Health Rating:** NA
FP: NA	**VD:** NA		**NFPA Reactivity Rating:** NA
Sp. GR: 8.65 (metal)	**IP:** NA		**NFPA Sp. Inst.:** NA

Exposure Limits

OSHA	NIOSH	Related Information
PEL-TWA ppm: NA	**REL-TWA ppm:** NA	**AIHA Emergency Response Planning Guidelines - ERPG-1/ERPG-2/ERPG-3:** NA
PEL-TWA mg/m3: 0.005	**REL-TWA mg/m3:** NA	
PEL-STEL ppm: NA	**REL-STEL ppm:** NA	
PEL-STEL mg/m3: NA	**REL-STEL mg/m3:** NA	
PEL-C ppm: NA	**REL-C ppm:** NA	
PEL-C mg/m3: NA	**REL-C mg/m3:** NA	**Carcinogen Classifications:** IARC-1, NIOSH-Ca, NTP-K, OSHA-Ca, TLV-A2
Skin Notation: No	**Skin Notation:** No	
Notes: SEE 29 CFR 1910.1027, FOR OPERATIONS/SEGMENTS WHERE THE STANDARD IS STAYED/NOT IN EFFECT PEL's ARE LOCATED IN 29 CFR 1910.1000 TABLE Z-2 (DUST: 8-HR TWA=0.2mg/m3, C=0.6mg/m3; FUME: 8-HR TWA=0.1mg/m3, C=0.3mg/m3)	**Notes:** CARCINOGEN (Ca); REDUCE EXPOSURE TO LOWEST FEASIBLE CONCENTRATION (LOQ 0.1 mg/m3)	
	IDLH ppm: NA	
	IDLH mg/m3: 9	
	IDLH Notes: Ca	

NIOSH Pocket Guide to Chemical Hazards (Current through June 2006)

Cadmium dust (as Cd)			CAS: 7440-43-9
Formula: Cd (metal)			RTECS: EU9800000 (metal)
Synonyms & Trade Names: Cadmium metal: Cadmium Other synonyms vary depending upon the specific cadmium compound.			DOT ID & Guide: 2570 154 (cadmium compound)
Exposure Limits			
NIOSH REL*: Ca See Appendix A [*Note: The REL applies to all Cadmium compounds (as Cd).]		OSHA PEL*: [1910.1027] TWA 0.005 mg/m3 [*Note: The PEL applies to all Cadmium compounds (as Cd).]	
IDLH: Ca [9 mg/m3 (as Cd)]		Conversion: NA	
Physical Description			
Metal: Silver-white, blue-tinged lustrous, odorless solid.			
MW: 112.4	BP: 1409F	MLT: 610F	Sol: Insoluble
VP: 0 mmHg (approx)	IP: NA	RGasD: NA	Sp.Gr: 8.65 (metal)
Fl.P: NA	UEL: NA	LEL: NA	MEC: NA
Metal: Noncombustible Solid in bulk form, but will burn in powder form. (See flammable and combustible liquid classes)			
Incompatibilities & Reactivities			
Strong oxidizers; elemental sulfur, selenium & tellurium			
Measurement Methods			
NIOSH 7048, 7300, 7301, 7303, 9102; OSHA ID121, ID125G, ID189, ID206			
Personal Protection & Sanitation		**First Aid**	

Skin: N.R. Eyes: N.R. Wash skin: Daily Remove: N.R. Change: Daily	Eye: Irr immed Skin: Soap wash Breath: Resp support Swallow: Medical attention immed (See procedures)

NIOSH Respirator Recommendations

NIOSH : SCBAF:PD,PP/SAF:PD,PP:ASCBA Escape: HiEF/SCBAE
(See symbols and codes)

Exposure Routes

Inh Ing

Symptoms

Pulm edema, dysp, cough, chest tight, subs pain; head; chills, musc aches; nau, vomit, diarr; anos, emphy, prot, mild anemia; [carc]
(See abbreviations)

Target Organs

Resp sys, kidneys, prostate, blood
(See abbreviations)

DOT Emergency Response Guidebook (ERG 2004)

Guide Number: 154

154 Substances - Toxic and/or Corrosive (Non-Combustible)
POTENTIAL HAZARDS
HEALTH
* TOXIC; inhalation, ingestion, or skin contact with material may cause severe injury or death.
* Contact with molten substance may cause severe burns to skin and eyes.
* Avoid any skin contact.
* Effects of contact or inhalation may be delayed.
* Fire may produce irritating, corrosive and/or toxic gases.
* Runoff from fire control or dilution water may be corrosive and/or toxic and cause pollution.

FIRE OR EXPLOSION
* Non-combustible, substance itself does not burn but may decompose upon heating to produce corrosive and/or toxic fumes.
* Some are oxidizers and may ignite combustibles (wood, paper, oil, clothing, etc.).
* Contact with metals may evolve flammable hydrogen gas.
* Containers may explode when heated.

PUBLIC SAFETY
* CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, refer to appropriate telephone number listed on the inside back cover.
* Isolate spill or leak area immediately for at least 25 to 50 meters (80 to 160 feet) in all directions.
* Keep unauthorized personnel away.
* Stay upwind.
* Keep out of low areas.
* Ventilate enclosed areas.

PROTECTIVE CLOTHING
* Wear positive pressure self-contained breathing apparatus (SCBA).
* Wear chemical protective clothing which is specifically recommended by the manufacturer. It may provide little or no thermal protection.
* Structural firefighters' protective clothing provides limited protection in fire situations ONLY; it is not effective in spill situations.

EVACUATION
Spill
* See the Table of Initial Isolation and Protective Action Distances for highlighted substances. For non-highlighted substances, increase, in the downwind direction, as necessary, the isolation distance shown under **PUBLIC SAFETY**.

Fire
* If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions.

EMERGENCY RESPONSE
FIRE
Small Fires
* Dry chemical, CO2 or water spray.

Large Fires
* Dry chemical, CO2, alcohol-resistant foam or water spray.
* Move containers from fire area if you can do it without risk.
* Dike fire control water for later disposal; do not scatter the material.

Fire involving Tanks or Car/Trailer Loads
* Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
* Do not get water inside containers.

* Cool containers with flooding quantities of water until well after fire is out.
* Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.
* ALWAYS stay away from tanks engulfed in fire.

SPILL OR LEAK

* ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area).
* Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.
* Stop leak if you can do it without risk.
* Prevent entry into waterways, sewers, basements or confined areas.
* Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers.
* DO NOT GET WATER INSIDE CONTAINERS.

FIRST AID

* Move victim to fresh air.
* Call 911 or emergency medical service.
* Apply artificial respiration if victim is not breathing.
* Do not use mouth-to-mouth method if victim ingested or inhaled the substance; induce artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device.
* Administer oxygen if breathing is difficult.
* Remove and isolate contaminated clothing and shoes.
* In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
* For minor skin contact, avoid spreading material on unaffected skin.
* Keep victim warm and quiet.
* Effects of exposure (inhalation, ingestion or skin contact) to substance may be delayed.
* Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves.

Additional Emergency Response Information (CAMEO Data)

Non-fire Spill Response: SMALL SPILLS AND LEAKAGE: If you spill this chemical, you should dampen the solid spill material with water, then transfer the dampened material to a suitable container. Use absorbent paper dampened with water to pick up any remaining material. Seal your contaminated clothing and the absorbent paper in a vapor-tight plastic bag for eventual disposal. Wash all contaminated surfaces with a strong soap and water solution. Do not reenter the contaminated area until the Safety Officer (or other responsible person) has verified that the area has been properly cleaned.STORAGE PRECAUTIONS: You should keep this material in a tightly-closed container under an inert atmosphere, and store it in a freezer. (NTP, 1992)

Firefighting: To extinguish a fire involving this chemical you may use a dry chemical, carbon dioxide, foam or halon extinguisher; a water spray may also be used. (NTP, 1992)

Reactivity: AIR AND WATER REACTIONS: Slowly oxidized by moist air to form cadmium oxide.CHEMICAL PROFILE: A violent explosion occurred 30 minutes after placement of a cadmium rod into hydrazoic acid (Mellor 8 Supp.2:50 1967). Fused ammonium nitrate with powdered metal often produces a violent explosive reaction. Reactivity similar to zinc. (REACTIVITY, 1999)

First Aid: EYES: First check the victim for contact lenses and remove if present. Flush victim's eyes with water or normal saline solution for 20 to 30 minutes while simultaneously calling a hospital or poison control center. Do not put any ointments, oils, or medication in the victim's eyes without specific instructions from a physician. IMMEDIATELY transport the victim after flushing eyes to a hospital even if no symptoms (such as redness or irritation) develop. SKIN: IMMEDIATELY flood affected skin with water while removing and isolating all contaminated clothing. Gently wash all affected skin areas thoroughly with soap and water. If symptoms such as redness or irritation develop, IMMEDIATELY call a physician and be prepared to transport the victim to a hospital for treatment. INHALATION: IMMEDIATELY leave the contaminated area; take deep breaths of fresh air. IMMEDIATELY call a physician and be prepared to transport the victim to a hospital even if no symptoms (such as wheezing, coughing, shortness of breath, or burning in the mouth, throat, or chest) develop. Provide proper respiratory protection to rescuers entering an unknown atmosphere. Whenever possible, Self-Contained Breathing Apparatus (SCBA) should be used; if not available, use a level of protection greater than or equal to that advised under Protective Clothing. INGESTION: Some heavy metals are VERY TOXIC POISONS, especially if their salts are very soluble in water (e.g., lead, chromium, mercury, bismuth, osmium, and arsenic). IMMEDIATELY call a hospital or poison control center and locate activated charcoal, egg whites, or milk in case the medical advisor recommends administering one of them. Also locate Ipecac syrup or a glass of salt water in case the medical advisor recommends inducing vomiting. Usually, this is NOT RECOMMENDED outside of a physician's care. If advice from a physician is not readily available and the victim is conscious and not convulsing, give the victim a glass of activated charcoal slurry in water or, if this is not available, a glass of milk, or beaten egg whites and IMMEDIATELY transport victim to a hospital. If the victim is convulsing or unconscious, do not give anything by mouth, assure that the victim's airway is open and lay the victim on his/her side with the head lower than the body. DO NOT INDUCE VOMITING. IMMEDIATELY transport the victim to a hospital. OTHER: Since this chemical is a known or suspected carcinogen you should contact a physician for advice regarding the possible long term health effects and potential recommendation for medical monitoring. Recommendations from the physician will depend upon the specific compound, its chemical, physical and toxicity properties, the exposure level, length of exposure, and the route of exposure. (NTP, 1992)

OSHA/EPA Occupational Chemical Database

Chemical Identification

Chemical Name: ETHYL METHYL KETONE

CAS #: 78-93-3 **UN No:** 1193 **Formula:** C4H8O

Synonyms: Ethyl methyl ketone; MEK; Methyl acetone; Methyl ethyl ketone

Physical Properties

Physical Description: Colorless liquid with a moderately sharp, fragrant, mint- or acetone-like odor.

BP: 175ºF	**MW:** 72.1	**LEL:** (200ºF): 1.4%	**NFPA Fire Rating:** 3
FRZ/MLT: FRZ: -123ºF	**VP:** 78 mmHg	**UEL:** (200ºF): 11.4%	**NFPA Health Rating:** 1
FP: 16ºF	**VD:** NA		**NFPA Reactivity Rating:** 0
Sp. GR: 0.81	**IP:** 9.54 eV		**NFPA Sp. Inst.:** NA

Exposure Limits

OSHA	NIOSH	Related Information
PEL-TWA ppm: 200	**REL-TWA ppm:** 200	**AIHA Emergency Response Planning Guidelines - ERPG-1/ERPG-2/ERPG-3:** NA
PEL-TWA mg/m3: 590	**REL-TWA mg/m3:** 590	
PEL-STEL ppm: NA	**REL-STEL ppm:** 300	
PEL-STEL mg/m3: NA	**REL-STEL mg/m3:** 885	
PEL-C ppm: NA	**REL-C ppm:** NA	
PEL-C mg/m3: NA	**REL-C mg/m3:** NA	**Carcinogen Classifications:** NA
Skin Notation: No	**Skin Notation:** No	
Notes: NA	**Notes:** NA	
	IDLH ppm: 3000	
	IDLH mg/m3: NA	
	IDLH Notes: NA	

NIOSH Pocket Guide to Chemical Hazards (Current through June 2006)

2-Butanone	CAS: 78-93-3
Formula: CH3COCH2CH3	RTECS: EL6475000
Synonyms & Trade Names: Ethyl methyl ketone, MEK, Methyl acetone, Methyl ethyl ketone	DOT ID & Guide: 1232 127

Exposure Limits

NIOSH REL: TWA 200 ppm (590 mg/m3) ST 300 ppm (885 mg/m3)	OSHA PEL : TWA 200 ppm (590 mg/m3)
IDLH: 3000 ppm	Conversion: 1 ppm = 2.95 mg/m3

Physical Description

Colorless liquid with a moderately sharp, fragrant, mint- or acetone-like odor.

MW: 72.1	BP: 175F	FRZ: -123F	Sol: 28%
VP: 78 mmHg	IP: 9.54 eV	RGasD: NA	Sp.Gr: 0.81
Fl.P: 16F	UEL(200F): 11.4%	LEL(200F): 1.4%	MEC: NA

Class IB Flammable Liquid (See flammable and combustible liquid classes)

Incompatibilities & Reactivities

Strong oxidizers, amines, ammonia, inorganic acids, caustics, isocyanates, pyridines

Measurement Methods

NIOSH 2500, 2555, 3800; OSHA 16, 84, 1004

Personal Protection & Sanitation	First Aid
Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam	Eye: Irr immed Skin: Water wash immed Breath: Fresh air

Remove: When wet (flamm) Change: N.R. Provide: Eyewash	Swallow: Medical attention immed (See procedures)

NIOSH Respirator Recommendations

NIOSH/OSHA 3000 ppm: SA:CF/PAPROV/CCRFOV/GMFOV/SCBAF/SAF : SCBAF:PD,PP/SAF:PD,PP:ASCBA Escape: GMFOV/SCBAE
(See symbols and codes)

Exposure Routes

Inh Ing Con

Symptoms

Irrit eyes, skin, nose; head; dizz; vomit; derm
(See abbreviations)

Target Organs

Eyes, skin, resp sys, CNS
(See abbreviations)

DOT Emergency Response Guidebook (ERG 2004)

Guide Number: 127

127 Flammable Liquids (Polar/Water-Miscible)
POTENTIAL HAZARDS
FIRE OR EXPLOSION
* HIGHLY FLAMMABLE: Will be easily ignited by heat, sparks or flames.
* Vapors may form explosive mixtures with air.
* Vapors may travel to source of ignition and flash back.
* Most vapors are heavier than air. They will spread along ground and collect in low or confined areas (sewers, basements, tanks).
* Vapor explosion hazard indoors, outdoors or in sewers.
* Those substances designated with a P may polymerize explosively when heated or involved in a fire.
* Runoff to sewer may create fire or explosion hazard.
* Containers may explode when heated.
* Many liquids are lighter than water.

HEALTH
* Inhalation or contact with material may irritate or burn skin and eyes.
* Fire may produce irritating, corrosive and/or toxic gases.
* Vapors may cause dizziness or suffocation.
* Runoff from fire control may cause pollution.

PUBLIC SAFETY
* CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, refer to appropriate telephone number listed on the inside back cover.
* Isolate spill or leak area immediately for at least 25 to 50 meters (80 to 160 feet) in all directions.
* Keep unauthorized personnel away.
* Stay upwind.
* Keep out of low areas.
* Ventilate closed spaces before entering.

PROTECTIVE CLOTHING
* Wear positive pressure self-contained breathing apparatus (SCBA).
* Structural firefighters' protective clothing will only provide limited protection.

EVACUATION
Large Spill
* Consider initial downwind evacuation for at least 300 meters (1000 feet).

Fire
* If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions.

EMERGENCY RESPONSE
FIRE
CAUTION: All these products have a very low flash point: Use of water spray when fighting fire may be inefficient.

Small Fires
* Dry chemical, CO2, water spray or alcohol-resistant foam.

Large Fires
* Water spray, fog or alcohol-resistant foam.
* Use water spray or fog; do not use straight streams.
* Move containers from fire area if you can do it without risk.

Fire involving Tanks or Car/Trailer Loads
* Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
* Cool containers with flooding quantities of water until well after fire is out.
* Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.
* ALWAYS stay away from tanks engulfed in fire.
* For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn.

SPILL OR LEAK

* ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area).
* All equipment used when handling the product must be grounded.
* Do not touch or walk through spilled material.
* Stop leak if you can do it without risk.
* Prevent entry into waterways, sewers, basements or confined areas.
* A vapor suppressing foam may be used to reduce vapors.
* Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers.
* Use clean non-sparking tools to collect absorbed material.

Large Spills

* Dike far ahead of liquid spill for later disposal.
* Water spray may reduce vapor; but may not prevent ignition in closed spaces.

FIRST AID

* Move victim to fresh air.
* Call 911 or emergency medical service.
* Apply artificial respiration if victim is not breathing.
* Administer oxygen if breathing is difficult.
* Remove and isolate contaminated clothing and shoes.
* In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
* Wash skin with soap and water.
* Keep victim warm and quiet.
* Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves.

Additional Emergency Response Information (CAMEO Data)

Non-fire Spill Response: Keep sparks, flames, and other sources of ignition away. Keep material out of water sources and sewers. Build dikes to contain flow as necessary. Attempt to stop leak if without undue personnel hazard. Use water spray to disperse vapors and dilute standing pools of liquid. Apply water spray or mist to knock down vapors. Land spill: Dig a pit, pond, lagoon, holding area to contain liquid or solid material. Absorb bulk liquid with fly ash, cement powder, or commercial sorbents. Water spill: Use natural barriers or oil spill control booms to limit spill travel. Remove trapped material with suction hoses. (AAR, 1999)

Firefighting: Do not extinguish fire unless flow can be stopped. Use water in flooding quantities as fog. Solid streams of water may be ineffective. Cool all affected containers with flooding quantities of water. Apply water from as far a distance as possible. Use "alcohol" foam, dry chemical or carbon dioxide. (AAR, 1999)

Reactivity: CHEMICAL PROFILE: Colorless liquid, moderately toxic, highly flammable. Explosive in the form of vapor when exposed to heat, flame or sparks. Ignition on contact with potassium tert-butoxide. Mixture with 2-propanol will form explosive peroxides during storage. Vigorous reaction with chloroform in the presence of alkali (sodium hydroxide, potassium hydroxide), chlorosulfonic acid, fuming sulfuric acid (oleum) [Lewis, 3rd ed., 1993, p. 855]. Reaction with hydrogen peroxide in the presence of nitric acid forms heat- and shock-sensitive explosive acetone peroxides. [Bjorklund, G. H. et al., Trans. R. Soc. Can, 1950, 44, p. 25]. (REACTIVITY, 1999)

First Aid: EYES: First check the victim for contact lenses and remove if present. Flush victim's eyes with water or normal saline solution for 20 to 30 minutes while simultaneously calling a hospital or poison control center. Do not put any ointments, oils, or medication in the victim's eyes without specific instructions from a physician. IMMEDIATELY transport the victim after flushing eyes to a hospital even if no symptoms (such as redness or irritation) develop. SKIN: IMMEDIATELY flood affected skin with water while removing and isolating all contaminated clothing. Gently wash all affected skin areas thoroughly with soap and water. If symptoms such as redness or irritation develop, IMMEDIATELY call a physician and be prepared to transport the victim to a hospital for treatment. INHALATION: IMMEDIATELY leave the contaminated area; take deep breaths of fresh air. If symptoms (such as wheezing, coughing, shortness of Breathing, or burning in the mouth, throat, or chest) develop, call a physician and be prepared to transport the victim to a hospital. Provide proper respiratory protection to rescuers entering an unknown atmosphere. Whenever possible, Self-Contained Breathing Apparatus (SCBA) should be used; if not available, use a level of protection greater than or equal to that advised under Protective Clothing. INGESTION: DO NOT INDUCE VOMITING. Volatile chemicals have a high risk of being aspirated into the victim's lungs during vomiting which increases the medical problems. If the victim is conscious and not convulsing, give 1 or 2 glasses of water to dilute the chemical and IMMEDIATELY call a hospital or poison control center. IMMEDIATELY transport the victim to a hospital. If the victim is convulsing or unconscious, do not give anything by mouth, ensure that the victim's airway is open and lay the victim on his/her side with the Headache lower than the body. DO NOT INDUCE VOMITING. IMMEDIATELY transport the victim to a hospital. (NTP, 1992)

OSHA/EPA Occupational Chemical Database

Chemical Identification

Chemical Name: SEC-BUTYL ALCOHOL

CAS #: 78-92-2 **UN No:** 1993 **Formula:** C4H10O

Synonyms: 2-Butanol; Butylene hydrate; 2-Hydroxybutane; Methyl ethyl carbinol

Physical Properties

Physical Description: Colorless liquid with a strong, pleasant odor.

BP: 211ºF	**MW:** 74.1	**LEL:** (212ºF): 1.7%	**NFPA Fire Rating:** 3
FRZ/MLT: FRZ: -175ºF	**VP:** 12 mmHg	**UEL:** (212ºF): 9.8%	**NFPA Health Rating:** 1
FP: 75ºF	**VD:** NA		**NFPA Reactivity Rating:** 0
Sp. GR: 0.81	**IP:** 10.10 eV		**NFPA Sp. Inst.:** NA

Exposure Limits

OSHA	NIOSH	Related Information
PEL-TWA ppm: 150	**REL-TWA ppm:** 100	**AIHA Emergency Response Planning Guidelines - ERPG-1/ERPG-2/ERPG-3:** NA
PEL-TWA mg/m3: 450	**REL-TWA mg/m3:** 305	
PEL-STEL ppm: NA	**REL-STEL ppm:** 150	
PEL-STEL mg/m3: NA	**REL-STEL mg/m3:** 455	
PEL-C ppm: NA	**REL-C ppm:** NA	
PEL-C mg/m3: NA	**REL-C mg/m3:** NA	**Carcinogen Classifications:** NA
Skin Notation: No	**Skin Notation:** No	
Notes: NA	**Notes:** NA	
	IDLH ppm: 2000	
	IDLH mg/m3: NA	
	IDLH Notes: NA	

NIOSH Pocket Guide to Chemical Hazards (Current through June 2006)

sec-Butyl alcohol			CAS: 78-92-2
Formula: CH3CH(OH)CH2CH3			RTECS: EO1750000
Synonyms & Trade Names: 2-Butanol, Butylene hydrate, 2-Hydroxybutane, Methyl ethyl carbinol			DOT ID & Guide: 1120 129
Exposure Limits			
NIOSH REL: TWA 100 ppm (305 mg/m3) ST 150 ppm (455 mg/m3)		OSHA PEL : TWA 150 ppm (450 mg/m3)	
IDLH: 2000 ppm		Conversion: 1 ppm = 3.03 mg/m3	
Physical Description			
Colorless liquid with a strong, pleasant odor.			
MW: 74.1	BP: 211F	FRZ: -175F	Sol: 16%
VP: 12 mmHg	IP: 10.10 eV	RGasD: NA	Sp.Gr: 0.81
Fl.P: 75F	UEL(212F): 9.8%	LEL(212F): 1.7%	MEC: NA
Class IC Flammable Liquid (See flammable and combustible liquid classes)			
Incompatibilities & Reactivities			
Strong oxidizers, organic peroxides, perchloric & permonosulfuric acids			
Measurement Methods			
NIOSH 1405, 1450; OSHA 7			
Personal Protection & Sanitation		**First Aid**	
Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam		Eye: Irr immed Skin: Water flush prompt Breath: Resp support	

Remove: When wet (flamm) Change: N.R.	Swallow: Medical attention immed (See procedures)

NIOSH Respirator Recommendations

NIOSH/OSHA 1000 ppm: CCROV*/SA* 2000 ppm: SA:CF*/PAPROV*/CCRFOV/GMFOV/SCBAF/SAF : SCBAF:PD,PP/SAF:PD,PP:ASCBA
Escape: GMFOV/SCBAE
(See symbols and codes)

Exposure Routes

Inh Ing Con

Symptoms

Irrit eyes, skin, nose, throat; narco
(See abbreviations)

Target Organs

Eyes, skin, resp sys, CNS
(See abbreviations)

DOT Emergency Response Guidebook (ERG 2004)

Guide Number: 128

128 Flammable Liquids (Non-Polar/Water-Immiscible)
POTENTIAL HAZARDS
FIRE OR EXPLOSION
* HIGHLY FLAMMABLE: Will be easily ignited by heat, sparks or flames.
* Vapors may form explosive mixtures with air.
* Vapors may travel to source of ignition and flash back.
* Most vapors are heavier than air. They will spread along ground and collect in low or confined areas (sewers, basements, tanks).
* Vapor explosion hazard indoors, outdoors or in sewers.
* Those substances designated with a P may polymerize explosively when heated or involved in a fire.
* Runoff to sewer may create fire or explosion hazard.
* Containers may explode when heated.
* Many liquids are lighter than water.
* Substance may be transported hot.

HEALTH
* Inhalation or contact with material may irritate or burn skin and eyes.
* Fire may produce irritating, corrosive and/or toxic gases.
* Vapors may cause dizziness or suffocation.
* Runoff from fire control or dilution water may cause pollution.

PUBLIC SAFETY
* CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, refer to appropriate telephone number listed on the inside back cover.
* Isolate spill or leak area immediately for at least 25 to 50 meters (80 to 160 feet) in all directions.
* Keep unauthorized personnel away.
* Stay upwind.
* Keep out of low areas.
* Ventilate closed spaces before entering.

PROTECTIVE CLOTHING
* Wear positive pressure self-contained breathing apparatus (SCBA).
* Structural firefighters' protective clothing will only provide limited protection.

EVACUATION
Large Spill
* Consider initial downwind evacuation for at least 300 meters (1000 feet).

Fire
* If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions.

EMERGENCY RESPONSE
FIRE
CAUTION: All these products have a very low flash point: Use of water spray when fighting fire may be inefficient.

Small Fires
* Dry chemical, CO2, water spray or regular foam.

Large Fires
* Water spray, fog or regular foam.
* Use water spray or fog; do not use straight streams.
* Move containers from fire area if you can do it without risk.

Fire involving Tanks or Car/Trailer Loads
* Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
* Cool containers with flooding quantities of water until well after fire is out.
* Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.
* ALWAYS stay away from tanks engulfed in fire.

* For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn.

SPILL OR LEAK

* ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area).
* All equipment used when handling the product must be grounded.
* Do not touch or walk through spilled material.
* Stop leak if you can do it without risk.
* Prevent entry into waterways, sewers, basements or confined areas.
* A vapor suppressing foam may be used to reduce vapors.
* Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers.
* Use clean non-sparking tools to collect absorbed material.

Large Spills

* Dike far ahead of liquid spill for later disposal.
* Water spray may reduce vapor; but may not prevent ignition in closed spaces.

FIRST AID

* Move victim to fresh air.
* Call 911 or emergency medical service.
* Apply artificial respiration if victim is not breathing.
* Administer oxygen if breathing is difficult.
* Remove and isolate contaminated clothing and shoes.
* In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
* Wash skin with soap and water.
* Keep victim warm and quiet.
* Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves.

Additional Emergency Response Information (CAMEO Data)

Non-fire Spill Response: Keep sparks, flames, and other sources of ignition away. Keep material out of water sources and sewers. Build dikes to contain flow as necessary. Attempt to stop leak if without undue personnel hazard. Use water spray to knock-down vapors. Land spill: Dig a pit, pond, lagoon, holding area to contain liquid or solid material. Dike surface flow using soil, sand bags, foamed polyurethane, or foamed concrete. (AAR, 1999)

Firefighting: Solid streams of water may be ineffective. Use "alcohol" foam, dry chemical or carbon dioxide. Cool all affected containers with flooding quantities of water. Do not use water. Keep run-off water out of sewers and water sources. (AAR, 1999)

Reactivity: CHEMICAL PROFILE: Attacks plastics. (Handling Chemicals Safely 1980. p. 236). Acetyl bromide reacts violently with alcohols or water (Merck 11th ed. 1989). Mixtures of alcohols with concentrated sulfuric acid and strong hydrogen peroxide can cause explosions. Example: An explosion will occur if dimethylbenzylcarbinol is added to 90% hydrogen peroxide then acidified with concentrated sulfuric acid. Mixtures of ethyl alcohol with concentrated hydrogen peroxide form powerful explosives. Mixtures of hydrogen peroxide and 1-phenyl-2-methyl propyl alcohol tend to explode if acidified with 70% sulfuric acid (Chem. Eng. News 45(43):73 1967; J, Org. Chem. 28:1893 1963). Alkyl hypochlorites are violently explosive. They are readily obtained by reacting hypochlorous acid and alcohols either in aqueous solution or mixed aqueous-carbon tetrachloride solutions. Chlorine plus alcohols would similarly yield alkyl hypochlorites. They decompose in the cold and explode on exposure to sunlight or heat. Tertiary hypochlorites are less unstable than secondary or primary hypochlorites (NFPA 491 M 1991). Base-catalysed reactions of isocyanates with alcohols should be carried out in inert solvents. Such reactions in the absence of solvents often occur with explosive violence (Wischmeyer 1969). (REACTIVITY, 1999)

First Aid: Eye: If this chemical contacts the eyes, immediately wash the eyes with large amounts of water, occasionally lifting the lower and upper lids. Get medical attention immediately. Contact lenses should not be worn when working with this chemical. Skin: If this chemical contacts the skin, flush the contaminated skin with water promptly. If this chemical penetrates the clothing, immediately remove the clothing and flush the skin with water promptly. If irritation persists after washing, get medical attention. Breathing: If a person breathes large amounts of this chemical, move the exposed person to fresh air at once. If breathing has stopped, perform mouth-to-mouth resuscitation. Keep the affected person warm and at rest. Get medical attention as soon as possible. Swallow: If this chemical has been swallowed, get medical attention immediately. (NIOSH, 1997)

OSHA/EPA Occupational Chemical Database

Chemical Identification

Chemical Name: BERYLLIUM METAL AND COMPOUNDS, as Be

CAS #: 7440-41-7 **UN No:** 1567 **Formula:** Be

Synonyms: Beryllium metal: Beryllium Other synonyms vary depending upon the specific beryllium compound.

Physical Properties

Physical Description: Metal: A hard, brittle, gray-white solid.

BP: 4532°F	**MW:** 9.0	**LEL:** NA	**NFPA Fire Rating:** 1
FRZ/MLT: MLT: 2349°F	**VP:** NA	**UEL:** 2349°F	**NFPA Health Rating:** 3
FP: NA	**VD:** NA		**NFPA Reactivity Rating:** 0
Sp. GR: 1.85 (metal)	**IP:** NA		**NFPA Sp. Inst.:** NA

Exposure Limits

OSHA	NIOSH	Related Information
PEL-TWA ppm: NA	**REL-TWA ppm:** NA	**AIHA Emergency Response Planning Guidelines - ERPG-1/ERPG-2/ERPG-3:** NA/ 25 ug/m3 /100 ug/m3
PEL-TWA mg/m3: 0.002	**REL-TWA mg/m3:** NA	
PEL-STEL ppm: NA	**REL-STEL ppm:** NA	
PEL-STEL mg/m3: 0.025	**REL-STEL mg/m3:** NA	
PEL-C ppm: NA	**REL-C ppm:** NA	
PEL-C mg/m3: 0.005	**REL-C mg/m3:** 0.0005	**Carcinogen Classifications:** IARC-1, NIOSH-Ca, NTP-K, TLV-A1
Skin Notation: No	**Skin Notation:** No	
Notes: PEAK = 0.025 mg/m3 FOR 30 MINUTES DURING AN 8-HOUR SHIFT	**Notes:** CARCINOGEN (Ca)	
	IDLH ppm: NA	
	IDLH mg/m3: 4	
	IDLH Notes: Ca	

NIOSH Pocket Guide to Chemical Hazards (Current through June 2006)

Beryllium & beryllium compounds (as Be)			CAS: 7440-41-7
Formula: Be (metal)			RTECS: DS1750000 (metal)
Synonyms & Trade Names: Beryllium metal: Beryllium Other synonyms vary depending upon the specific beryllium compound.			DOT ID & Guide: 1566 154 (compounds) 1567 134 (powder)
Exposure Limits			
NIOSH REL: Ca Not to exceed 0.0005 mg/m3 See Appendix A		OSHA PEL: TWA 0.002 mg/m3 C 0.005 mg/m3 0.025 mg/m3 [30-minute maximum peak]	
IDLH: Ca [4 mg/m3 (as Be)]		Conversion: NA	
Physical Description			
Metal: A hard, brittle, gray-white solid.			
MW: 9.0	BP: 4532F	MLT: 2349F	Sol: Insoluble
VP: 0 mmHg (approx)	IP: NA	RGasD: NA	Sp.Gr: 1.85 (metal)
Fl.P: NA	UEL: NA	LEL: NA	MEC: NA
Metal: Noncombustible Solid in bulk form, but a slight explosion hazard in the form of a powder or dust. (See flammable and combustible liquid classes)			
Incompatibilities & Reactivities			
Acids, caustics, chlorinated hydrocarbons, oxidizers, molten lithium			
Measurement Methods			
NIOSH 7102, 7300, 7301, 7303, 9102; OSHA ID125G, ID206			
Personal Protection & Sanitation		**First Aid**	
Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: Daily		Eye: Irr immed Breath: Fresh air	

Remove: When wet or contam Change: Daily Provide: Eyewash	(See procedures)

NIOSH Respirator Recommendations

NIOSH : SCBAF:PD,PP/SAF:PD,PP:ASCBA Escape: HiEF/SCBAE
(See symbols and codes)

Exposure Routes

Inh Con

Symptoms

Berylliosis (chronic exposure): anor, low-wgt, weak, chest pain, cough, clubbing of fingers, cyan, pulm insufficiency; irrit eyes; derm; [carc]
(See abbreviations)

Target Organs

Eyes, skin, resp sys
(See abbreviations)

DOT Emergency Response Guidebook (ERG 2004)

Guide Number: 134

134 Flammable Solids - Toxic and/or Corrosive

POTENTIAL HAZARDS

FIRE OR EXPLOSION

* Flammable/combustible material.
* May be ignited by heat, sparks or flames.
* When heated, vapors may form explosive mixtures with air: indoors, outdoors, and sewers explosion hazards.
* Contact with metals may evolve flammable hydrogen gas.
* Containers may explode when heated.

HEALTH

* TOXIC; inhalation, ingestion, or skin contact with material may cause severe injury or death.
* Fire will produce irritating, corrosive and/or toxic gases.
* Runoff from fire control or dilution water may be corrosive and/or toxic and cause pollution.

PUBLIC SAFETY

* CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, refer to appropriate telephone number listed on the inside back cover.
* Isolate spill or leak area immediately for at least 25 to 50 meters (80 to 160 feet) in all directions.
* Stay upwind.
* Keep unauthorized personnel away.
* Keep out of low areas.
* Ventilate enclosed areas.

PROTECTIVE CLOTHING

* Wear positive pressure self-contained breathing apparatus (SCBA).
* Wear chemical protective clothing which is specifically recommended by the manufacturer. It may provide little or no thermal protection.
* Structural firefighters' protective clothing provides limited protection in fire situations ONLY; it is not effective in spill situations.

EVACUATION

Large Spill

* Consider initial downwind evacuation for at least 100 meters (330 feet).

Fire

* If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions.

EMERGENCY RESPONSE

FIRE

Small Fires

* Dry chemical, CO_2, water spray or alcohol-resistant foam.

Large Fires

* Water spray, fog or alcohol-resistant foam.
* Move containers from fire area if you can do it without risk.
* Use water spray or fog; do not use straight streams.
* Do not get water inside containers.
* Dike fire control water for later disposal; do not scatter the material.

Fire involving Tanks or Car/Trailer Loads

* Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
* Cool containers with flooding quantities of water until well after fire is out.
* Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.
* ALWAYS stay away from tanks engulfed in fire.

SPILL OR LEAK

* Fully encapsulating, vapor protective clothing should be worn for spills and leaks with no fire.
* ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area).
* Stop leak if you can do it without risk.
* Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.
* Prevent entry into waterways, sewers, basements or confined areas.
* Use clean non-sparking tools to collect material and place it into loosley covered plastic containers for later disposal.

FIRST AID

* Move victim to fresh air.
* Call 911 or emergency medical service.
* Apply artificial respiration if victim is not breathing.
* Do not use mouth-to-mouth method if victim ingested or inhaled the substance; induce artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device.
* Administer oxygen if breathing is difficult.
* Remove and isolate contaminated clothing and shoes.
* In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
* For minor skin contact, avoid spreading material on unaffected skin.
* Keep victim warm and quiet.
* Effects of exposure (inhalation, ingestion or skin contact) to substance may be delayed.
* Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves.

Additional Emergency Response Information (CAMEO Data)

Non-fire Spill Response: Keep sparks, flames, and other sources of ignition away. Keep material out of water sources and sewers. Apply water spray or mist to knock down vapors. Land spill: Dig a pit, pond, lagoon, holding area to contain liquid or solid material. Cover solids with a plastic sheet to prevent dissolving in rain or fire fighting water. Dike surface flow using soil, sand bags, foamed polyurethane, or foamed concrete. Water spill: Use natural barriers or oil spill control booms to limit spill travel. Remove trapped material with suction hoses. (AAR, 1999)

Firefighting: Extinguish fire using agent suitable for type of surrounding fire. (Material itself does not burn or burns with difficulty.) Use water in flooding quantities as fog. Use foam, dry chemical, or carbon dioxide. Keep run-off water out of sewers and water sources. (AAR, 1999)

Reactivity: CHEMICAL PROFILE: Boron trifluoride reacts with incandescence when heated with alkali metals or alkaline earth metals except magnesium (Merck 11th ed. 1989). Finely divided or amalgamated metal reacts with HCl, dil HNO3, or dil H2SO4; attacked by strong base with evolution of hydrogen gas (Merck 11th ed. 1989). It has been determined experimentally that a mixture of beryllium powder with carbon tetrachloride or with trichloroethylene will flash or spark on heavy impact (ASESB Pot. Incid. 39 1968). The reaction between beryllium and the vapors of phosphorus proceeds with incandescence (Mellor 8:842 1946-47). (REACTIVITY, 1999)

First Aid: Eye: If this chemical contacts the eyes, immediately wash the eyes with large amounts of water, occasionally lifting the lower and upper lids. Get medical attention immediately. Contact lenses should not be worn when working with this chemical. Breathing: If a person breaths large amounts of this chemical, move the exposed person to fresh air at once. Other measures are usually unnecessary. (NIOSH, 1997)

OSHA/EPA Occupational Chemical Database

Chemical Identification

Chemical Name: BENZENE
CAS #: 71-43-2 **UN No:** 1114 **Formula:** C6H6
Synonyms: Benzol; Phenyl hydride

Physical Properties

Physical Description: Colorless to light-yellow liquid with an aromatic odor. [Note: A solid below 42ºF.]

BP: 176ºF	**MW:** 78.1	**LEL:** 1.2%	**NFPA Fire Rating:** 3
FRZ/MLT: FRZ: 42ºF	**VP:** 75 mmHg	**UEL:** 7.8%	**NFPA Health Rating:** 2
FP: 12ºF	**VD:** NA		**NFPA Reactivity Rating:** 0
Sp. GR: 0.88	**IP:** 9.24 eV		**NFPA Sp. Inst.:** NA

Exposure Limits

OSHA	NIOSH	Related Information
PEL-TWA ppm: 1	**REL-TWA ppm:** 0.1	**AIHA Emergency Response Planning Guidelines - ERPG-1/ERPG-2/ERPG-3:** 50 ppm/150 ppm/1000 ppm
PEL-TWA mg/m3: NA	**REL-TWA mg/m3:** NA	
PEL-STEL ppm: 5	**REL-STEL ppm:** 1	
PEL-STEL mg/m3: NA	**REL-STEL mg/m3:** NA	
PEL-C ppm: NA	**REL-C ppm:** NA	
PEL-C mg/m3: NA	**REL-C mg/m3:** NA	**Carcinogen Classifications:** IARC-1, NIOSH-Ca, NTP-K, OSHA-Ca, TLV-A1
Skin Notation: No	**Skin Notation:** No	
Notes: SEE 29 CFR 1910.1028, FOR INDUSTRIES EXEMPT FROM THIS STANDARD THE PELs ARE LOCATED IN 29 CFR 1910.1000 TABLE Z-2 (8-HR TWA=10 ppm, C=25ppm, PEAK=50ppm FOR A 10 MINUTE INTERVAL DURING AN 8-HOUR SHIFT)	**Notes:** CARCINOGEN (Ca)	
	IDLH ppm: 500	
	IDLH mg/m3: NA	
	IDLH Notes: Ca	

NIOSH Pocket Guide to Chemical Hazards (Current through June 2006)

Benzene			CAS: 71-43-2
Formula: C6H6			RTECS: CY1400000
Synonyms & Trade Names: Benzol, Phenyl hydride			DOT ID & Guide: 1114 130
Exposure Limits			
NIOSH REL: Ca TWA 0.1 ppm ST 1 ppm See Appendix A		OSHA PEL: [1910.1028] TWA 1 ppm ST 5 ppm See Appendix F	
IDLH: Ca [500 ppm]		Conversion: 1 ppm = 3.19 mg/m3	
Physical Description			
Colorless to light-yellow liquid with an aromatic odor. [Note: A solid below 42F.]			
MW: 78.1	BP: 176F	FRZ: 42F	Sol: 0.07%
VP: 75 mmHg	IP: 9.24 eV	RGasD: NA	Sp.Gr: 0.88
Fl.P: 12F	UEL: 7.8%	LEL: 1.2%	MEC: NA
Class IB Flammable Liquid (See flammable and combustible liquid classes)			
Incompatibilities & Reactivities			
Strong oxidizers, many fluorides & perchlorates, nitric acid			
Measurement Methods			
NIOSH 1500, 1501, 3700, 3800; OSHA 12, 1005			
Personal Protection & Sanitation		**First Aid**	
Skin: Prevent skin contact Eyes: Prevent eye contact		Eye: Irr immed Skin: Soap wash immed	

Wash skin: When contam Remove: When wet (flamm) Change: N.R. Provide: Eyewash, Quick drench	Breath: Resp support Swallow: Medical attention immed (See procedures)

NIOSH Respirator Recommendations

NIOSH : SCBAF:PD,PP/SAF:PD,PP:ASCBA Escape: GMFOV/SCBAE
(See symbols and codes)

Exposure Routes

Inh Abs Ing Con

Symptoms

Irrit eyes, skin, nose, resp sys; gidd; head, nau, staggered gait; ftg, anor, lass; derm; bone marrow depres; [carc]
(See abbreviations)

Target Organs

Eyes, skin, resp sys, blood, CNS, bone marrow
(See abbreviations)

DOT Emergency Response Guidebook (ERG 2004)

Guide Number: 130

130 Flammable Liquids (Non-Polar/Water-Immiscible/Noxious)
POTENTIAL HAZARDS
FIRE OR EXPLOSION
* HIGHLY FLAMMABLE: Will be easily ignited by heat, sparks or flames.
* Vapors may form explosive mixtures with air.
* Vapors may travel to source of ignition and flash back.
* Most vapors are heavier than air. They will spread along ground and collect in low or confined areas (sewers, basements, tanks).
* Vapor explosion hazard indoors, outdoors or in sewers.
* Those substances designated with a P may polymerize explosively when heated or involved in a fire.
* Runoff to sewer may create fire or explosion hazard.
* Containers may explode when heated.
* Many liquids are lighter than water.

HEALTH
* May cause toxic effects if inhaled or absorbed through skin.
* Inhalation or contact with material may irritate or burn skin and eyes.
* Fire will produce irritating, corrosive and/or toxic gases.
* Vapors may cause dizziness or suffocation.
* Runoff from fire control or dilution water may cause pollution.

PUBLIC SAFETY
* CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, refer to appropriate telephone number listed on the inside back cover.
* Isolate spill or leak area immediately for at least 50 to 100 meters (160 to 330 feet) in all directions.
* Keep unauthorized personnel away.
* Stay upwind.
* Keep out of low areas.
* Ventilate closed spaces before entering.

PROTECTIVE CLOTHING
* Wear positive pressure self-contained breathing apparatus (SCBA).
* Structural firefighters' protective clothing will only provide limited protection.

EVACUATION
Large Spill
* Consider initial downwind evacuation for at least 300 meters (1000 feet).

Fire
* If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions.

EMERGENCY RESPONSE
FIRE
CAUTION: All these products have a very low flash point: Use of water spray when fighting fire may be inefficient.

Small Fires
* Dry chemical, CO_2, water spray or regular foam.

Large Fires
* Water spray, fog or regular foam.
* Do not use straight streams.
* Move containers from fire area if you can do it without risk.

Fire involving Tanks or Car/Trailer Loads
* Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
* Cool containers with flooding quantities of water until well after fire is out.
* Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.
* ALWAYS stay away from tanks engulfed in fire.

* For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn.

SPILL OR LEAK

* ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area).
* All equipment used when handling the product must be grounded.
* Do not touch or walk through spilled material.
* Stop leak if you can do it without risk.
* Prevent entry into waterways, sewers, basements or confined areas.
* A vapor suppressing foam may be used to reduce vapors.
* Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers.
* Use clean non-sparking tools to collect absorbed material.

Large Spills

* Dike far ahead of liquid spill for later disposal.
* Water spray may reduce vapor; but may not prevent ignition in closed spaces.

FIRST AID

* Move victim to fresh air.
* Call 911 or emergency medical service.
* Apply artificial respiration if victim is not breathing.
* Administer oxygen if breathing is difficult.
* Remove and isolate contaminated clothing and shoes.
* In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
* Wash skin with soap and water.
* Keep victim warm and quiet.
* Effects of exposure (inhalation, ingestion or skin contact) to substance may be delayed.
* Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves.

Additional Emergency Response Information (CAMEO Data)

Non-fire Spill Response: Keep sparks, flames, and other sources of ignition away. Keep material out of water sources and sewers. Build dikes to contain flow as necessary. Attempt to stop leak if without undue personnel hazard. Use water spray to knock-down vapors. (AAR, 1999)

Firefighting: Do not extinguish fire unless flow can be stopped. Use water in flooding quantities as fog. Solid streams of water may spread fire. Cool all affected containers with flooding quantities of water. Apply water from as far a distance as possible. Use foam, dry chemical, or carbon dioxide. (AAR, 1999)

Reactivity: CHEMICAL PROFILE: Allyl chloride or other alkyl halides will react vigorously with benzene or toluene, even at minus 70C. in the presence of ethyl aluminum dichloride or ethyl aluminum sesquichloride. Explosions have been reported (NFPA 491M 1991). Benzene ignites in contact with the powdered chromic anhydride (Mellor 11:235 1946-47). (REACTIVITY, 1999)

First Aid: EYES: First check the victim for contact lenses and remove if present. Flush victim's eyes with water or normal saline solution for 20 to 30 minutes while simultaneously calling a hospital or poison control center. Do not put any ointments, oils, or medication in the victim's eyes without specific instructions from a physician. IMMEDIATELY transport the victim after flushing eyes to a hospital even if no symptoms (such as redness or irritation) develop. SKIN: IMMEDIATELY flood affected skin with water while removing and isolating all contaminated clothing. Gently wash all affected skin areas thoroughly with soap and water. IMMEDIATELY call a hospital or poison control center even if no symptoms (such as redness or irritation) develop. IMMEDIATELY transport the victim to a hospital for treatment after washing the affected areas. INHALATION: IMMEDIATELY leave the contaminated area; take deep breaths of fresh air. IMMEDIATELY call a physician and be prepared to transport the victim to a hospital even if no symptoms (such as wheezing, coughing, shortness of breath, or burning in the mouth, throat, or chest) develop. Provide proper respiratory protection to rescuers entering an unknown atmosphere. Whenever possible, Self-Contained Breathing Apparatus (SCBA) should be used; if not available, use a level of protection greater than or equal to that advised under Protective Clothing. INGESTION: DO NOT INDUCE VOMITING. Volatile chemicals have a high risk of being aspirated into the victim's lungs during vomiting which increases the medical problems. If the victim is conscious and not convulsing, give 1 or 2 glasses of water to dilute the chemical and IMMEDIATELY call a hospital or poison control center. IMMEDIATELY transport the victim to a hospital. If the victim is convulsing or unconscious, do not give anything by mouth, ensure that the victim's airway is open and lay the victim on his/her side with the head lower than the body. DO NOT INDUCE VOMITING. IMMEDIATELY transport the victim to a hospital. OTHER: Since this chemical is a known or suspected carcinogen you should contact a physician for advice regarding the possible long term health effects and potential recommendation for medical monitoring. Recommendations from the physician will depend upon the specific compound, its chemical, physical and toxicity properties, the exposure level, length of exposure, and the route of exposure. (NTP, 1992)

OSHA/EPA Occupational Chemical Database

Chemical Identification

Chemical Name: BARIUM, SOLUBLE COMPOUNDS EXCEPT BARIUM SULFATE, as Ba
CAS #: 7440-39-3 **UN No:** 1400 **Formula:** Ba
Synonyms:

Physical Properties

Physical Description: White, odorless solid.

BP: NA	**MW:** 137.33	**LEL:** NA	**NFPA Fire Rating:** NA
FRZ/MLT: FRZ: NA	**VP:** Low	**UEL:** NA	**NFPA Health Rating:** NA
FP: NA	**VD:** NA		**NFPA Reactivity Rating:** NA
Sp. GR: NA	**IP:** NA		**NFPA Sp. Inst.:** NA

Exposure Limits

OSHA	NIOSH	Related Information
PEL-TWA ppm: NA	**REL-TWA ppm:** NA	**AIHA Emergency Response Planning Guidelines - ERPG-1/ERPG-2/ERPG-3:** NA
PEL-TWA mg/m3: 0.5	**REL-TWA mg/m3:** 0.5	
PEL-STEL ppm: NA	**REL-STEL ppm:** NA	
PEL-STEL mg/m3: NA	**REL-STEL mg/m3:** NA	
PEL-C ppm: NA	**REL-C ppm:** NA	
PEL-C mg/m3: NA	**REL-C mg/m3:** NA	**Carcinogen Classifications:** TLV-A4
Skin Notation: No	**Skin Notation:** No	
Notes: NA	**Notes:** NA	
	IDLH ppm: NA	
	IDLH mg/m3: NA	
	IDLH Notes: NA	

NIOSH Pocket Guide to Chemical Hazards (Current through June 2006)

NA			CAS: NA
Formula: NA			RTECS: NA
Synonyms & Trade Names: NA			DOT ID & Guide: NA
Exposure Limits			
NIOSH REL: NA		OSHA PEL: NA	
IDLH: NIOSH IDLH: NA		Conversion: NA	
Physical Description			
Description: NA			
MW: NA	BP: NA	FRZ: NA	Sol: NA
VP: NA	IP: NA	RGasD: NA	SG: NA
FP: NA	UEL: NA	LEL: NA	MEC: NA
NA (See flammable and combustible liquid classes)			
Incompatibilities & Reactivities			
NA			
Measurement Methods			
NA			
Personal Protection & Sanitation		**First Aid**	
NA		NA (See procedures)	
NIOSH Respirator Recommendations			
NA (See symbols and codes)			
Exposure Routes			
NA			

Symptoms

NA
(See abbreviations)

Target Organs

NA
(See abbreviations)

DOT Emergency Response Guidebook (ERG 2004)

Guide Number: 138

138 Substances - Water-Reactive (Emitting Flammable Gases)
POTENTIAL HAZARDS
FIRE OR EXPLOSION
* Produce flammable gases on contact with water.
* May ignite on contact with water or moist air.
* Some react vigorously or explosively on contact with water.
* May be ignited by heat, sparks or flames.
* May re-ignite after fire is extinguished.
* Some are transported in highly flammable liquids.
* Runoff may create fire or explosion hazard.

HEALTH
* Inhalation or contact with vapors, substance, or decomposition products may cause severe injury or death.
* May produce corrosive solutions on contact with water.
* Fire will produce irritating, corrosive and/or toxic gases.
* Runoff from fire control may cause pollution.

PUBLIC SAFETY
* CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, refer to appropriate telephone number listed on the inside back cover.
* Isolate spill or leak area immediately for at least 50 to 100 meters (160 to 330 feet) in all directions.
* Keep unauthorized personnel away.
* Stay upwind.
* Keep out of low areas.
* Ventilate the area before entry.

PROTECTIVE CLOTHING
* Wear positive pressure self-contained breathing apparatus (SCBA).
* Structural firefighters' protective clothing will only provide limited protection.

EVACUATION
Large Spill
* Consider initial downwind evacuation for at least 250 meters (800 feet).

Fire
* If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions.

EMERGENCY RESPONSE
FIRE
* DO NOT USE WATER OR FOAM.

Small Fires
* Dry chemical, soda ash, lime or sand.

Large Fires
* DRY sand, dry chemical, soda ash or lime or withdraw from area and let fire burn.
* Move containers from fire area if you can do it without risk.

Magnesium Fires
* DRY sand, sodium chloride powder, graphite powder or Met-L-X powder.

Lithium Fires
* DRY sand, sodium chloride powder, graphite powder, copper powder or Lith-X powder.

Fire involving Tanks or Car/Trailer Loads
* Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
* Do not get water inside containers.
* Cool containers with flooding quantities of water until well after fire is out.
* Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.
* ALWAYS stay away from tanks engulfed in fire.

SPILL OR LEAK
* ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area).
* Do not touch or walk through spilled material.
* Stop leak if you can do it without risk.
* Use water spray to reduce vapors or divert vapor cloud drift. Avoid allowing water runoff to contact spilled material.
* DO NOT GET WATER on spilled substance or inside containers.

Small Spills
* Cover with DRY earth, DRY sand, or other non-combustible material

followed with plastic sheet to minimize spreading or contact with rain.
* Dike for later disposal; do not apply water unless directed to do so.

Powder Spills
* Cover powder spill with plastic sheet or tarp to minimize spreading and keep powder dry.
* DO NOT CLEAN-UP OR DISPOSE OF, EXCEPT UNDER SUPERVISION OF A SPECIALIST.

FIRST AID
* Move victim to fresh air.
* Call 911 or emergency medical service.
* Apply artificial respiration if victim is not breathing.
* Administer oxygen if breathing is difficult.
* Remove and isolate contaminated clothing and shoes.
* In case of contact with substance, wipe from skin immediately; flush skin or eyes with running water for at least 20 minutes.
* Keep victim warm and quiet.
* Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves.

Additional Emergency Response Information (CAMEO Data)

Non-fire Spill Response: Keep sparks, flames, and other sources of ignition away. Keep material out of water sources and sewers. Do not use water. Cover all suspected material with dry sand or earth to prevent ignition until material can be permanently disposed of. (AAR, 1999)

Firefighting: Do not use water. Use graphite, soda ash, powdered sodium chloride, or suitable dry powder. If fire is massive, back off, protect surroundings, and let burn. Keep run-off water out of sewers and water sources. (AAR, 1999)

Reactivity: AIR AND WATER REACTIONS: Rapidly decomposes with water. The heat of reaction is sufficient that the evolved hydrogen may ignite (Lab. Govt. Chemist 1965). Barium reacts with water forming H2 gas and caustic solution; finely divided metal powder is pyrophoric (Bretherick, 1979 p. 170-171).CHEMICAL PROFILE: Boron trifluoride reacts with incandescence when heated with alkali metals or alkaline earth metals except magnesium (Merck 11th ed. 1989). It has been determined experimentally that mixtures of finely divided barium metal and a number of halogenated hydrocarbons possess an explosive capability. Specifically, impact-sensitivity tests have shown that granular barium in contact with monofluorotrichloromethane, trichlorotrifluoroethane, carbon tetrachloride, trichloroethylene, or tetrachloroethylene can detonate (ASESB Pot. Incid. 39 1968; Chem. Eng. News 46(9):38 1968). (REACTIVITY, 1999)

First Aid: EYES: First check the victim for contact lenses and remove if present. Flush victim's eyes with water or normal saline solution for 20 to 30 minutes while simultaneously calling a hospital or poison control center. Do not put any ointments, oils, or medication in the victim's eyes without specific instructions from a physician. IMMEDIATELY transport the victim after flushing eyes to a hospital even if no symptoms (such as redness or irritation) develop. SKIN: IMMEDIATELY flood affected skin with water while removing and isolating all contaminated clothing. Gently wash all affected skin areas thoroughly with soap and water. If symptoms such as redness or irritation develop, IMMEDIATELY call a physician and be prepared to transport the victim to a hospital for treatment. INHALATION: IMMEDIATELY leave the contaminated area; take deep breaths of fresh air. If symptoms (such as wheezing, coughing, shortness of breath, or burning in the mouth, throat, or chest) develop, call a physician and be prepared to transport the victim to a hospital. Provide proper respiratory protection to rescuers entering an unknown atmosphere. Whenever possible, Self-Contained Breathing Apparatus (SCBA) should be used; if not available, use a level of protection greater than or equal to that advised under Protective Clothing. INGESTION: Some heavy metals are VERY TOXIC POISONS, especially if their salts are very soluble in water (e.g., lead, chromium, mercury, bismuth, osmium, and arsenic). IMMEDIATELY call a hospital or poison control center and locate activated charcoal, egg whites, or milk in case the medical advisor recommends administering one of them. Also locate Ipecac syrup or a glass of salt water in case the medical advisor recommends inducing vomiting. Usually, this is NOT RECOMMENDED outside of a physician's care. If advice from a physician is not readily available and the victim is conscious and not convulsing, give the victim a glass of activated charcoal slurry in water or, if this is not available, a glass of milk, or beaten egg whites and IMMEDIATELY transport victim to a hospital. If the victim is convulsing or unconscious, do not give anything by mouth, assure that the victim's airway is open and lay the victim on his/her side with the head lower than the body. DO NOT INDUCE VOMITING. IMMEDIATELY transport the victim to a hospital. (NTP, 1992)

OSHA/EPA Occupational Chemical Database

Chemical Identification

Chemical Name: ARSENIC METAL AND INORGANIC COMPOUNDS, as As

CAS #: 7440-38-2 **UN No:** 1558 **Formula:** As

Synonyms: Arsenic metal: Arsenia Other synonyms vary depending upon the specific As compound.

Physical Properties

Physical Description: Metal: Silver-gray or tin-white, brittle, odorless solid.

BP: Sublimes	**MW:** 74.9	**LEL:** NA	**NFPA Fire Rating:** 2
FRZ/MLT: FRZ: NA	**VP:** NA	**UEL:** 1135ºF (Sublimes)	**NFPA Health Rating:** 3
FP: NA	**VD:** NA		**NFPA Reactivity Rating:** 0
Sp. GR: 5.73 (metal)	**IP:** NA		**NFPA Sp. Inst.:** NA

Exposure Limits

OSHA	NIOSH	Related Information
PEL-TWA ppm: NA	**REL-TWA ppm:** NA	**AIHA Emergency Response Planning Guidelines - ERPG-1/ERPG-2/ERPG-3:** NA
PEL-TWA mg/m3: 0.01	**REL-TWA mg/m3:** NA	
PEL-STEL ppm: NA	**REL-STEL ppm:** NA	
PEL-STEL mg/m3: NA	**REL-STEL mg/m3:** NA	
PEL-C ppm: NA	**REL-C ppm:** NA	
PEL-C mg/m3: NA	**REL-C mg/m3:** 0.002	**Carcinogen Classifications:** IARC-1, NIOSH-Ca, NTP-K, OSHA-Ca, TLV-A1
Skin Notation: No	**Skin Notation:** No	
Notes: as As; SEE 29 CFR 1910.1018	**Notes:** CARCINOGEN (Ca); as As;15 MINUTE CEILING	
	IDLH ppm: NA	
	IDLH mg/m3: 5	
	IDLH Notes: Ca	

NIOSH Pocket Guide to Chemical Hazards (Current through June 2006)

Arsenic (inorganic compounds, as As)	CAS: 7440-38-2
Formula: As (metal)	RTECS: CG0525000 (metal)
Synonyms & Trade Names: Arsenic metal: Arsenia Other synonyms vary depending upon the specific As compound.	DOT ID & Guide: 1558 152 (metal) 1562 152 (dust)

Exposure Limits

NIOSH REL: Ca C 0.002 mg/m3 [15-minute] See Appendix A	OSHA PEL: [1910.1018] TWA 0.010 mg/m3
IDLH: Ca [5 mg/m3 (as As)]	Conversion: NA

Physical Description

Metal: Silver-gray or tin-white, brittle, odorless solid.

MW: 74.9	BP: Sublimes	MLT: 1135F (Sublimes)	Sol: Insoluble
VP: 0 mmHg (approx)	IP: NA	RGasD: NA	Sp.Gr: 5.73 (metal)
Fl.P: NA	UEL: NA	LEL: NA	MEC: NA

Metal: Noncombustible Solid in bulk form, but a slight explosion hazard in the form of dust when exposed to flame. (See flammable and combustible liquid classes)

Incompatibilities & Reactivities

Strong oxidizers, bromine azide [Note: Hydrogen gas can react with inorganic arsenic to form the highly toxic gas arsine.]

Measurement Methods

NIOSH 7300, 7301, 7303, 7900, 9102; OSHA ID105

Personal Protection & Sanitation	First Aid
Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam/Daily	Eye: Irr immed Skin: Soap wash immed Breath: Resp support

Remove: When wet or contam Change: Daily Provide: Eyewash, Quick drench	Swallow: Medical attention immed (See procedures)

NIOSH Respirator Recommendations

NIOSH : SCBAF:PD,PP/SAF:PD,PP:ASCBA Escape: GMFAGHiE/SCBAE
(See symbols and codes)

Exposure Routes

Inh Abs Con Ing

Symptoms

Ulceration of nasal septum, derm, GI disturbances, peri neur, resp irrit, hyperpig of skin, [carc]
(See abbreviations)

Target Organs

Liver, kidneys, skin, lungs, lymphatic sys
(See abbreviations)

DOT Emergency Response Guidebook (ERG 2004)

Guide Number: 152

152 Substances - Toxic (Combustible)
POTENTIAL HAZARDS
HEALTH
* Highly toxic, may be fatal if inhaled, swallowed or absorbed through skin.
* Contact with molten substance may cause severe burns to skin and eyes.
* Avoid any skin contact.
* Effects of contact or inhalation may be delayed.
* Fire may produce irritating, corrosive and/or toxic gases.
* Runoff from fire control or dilution water may be corrosive and/or toxic and cause pollution.

FIRE OR EXPLOSION
* Combustible material: may burn but does not ignite readily.
* Containers may explode when heated.
* Runoff may pollute waterways.
* Substance may be transported in a molten form.

PUBLIC SAFETY
* CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, refer to appropriate telephone number listed on the inside back cover.
* Isolate spill or leak area immediately for at least 25 to 50 meters (80 to 160 feet) in all directions.
* Keep unauthorized personnel away.
* Stay upwind.
* Keep out of low areas.

PROTECTIVE CLOTHING
* Wear positive pressure self-contained breathing apparatus (SCBA).
* Wear chemical protective clothing which is specifically recommended by the manufacturer. It may provide little or no thermal protection.
* Structural firefighters' protective clothing provides limited protection in fire situations ONLY; it is not effective in spill situations.

EVACUATION
Spill
* See the Table of Initial Isolation and Protective Action Distances for highlighted substances. For non-highlighted substances, increase, in the downwind direction, as necessary, the isolation distance shown under **PUBLIC SAFETY**.

Fire
* If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions.

EMERGENCY RESPONSE
FIRE
Small Fires
* Dry chemical, CO2 or water spray.

Large Fires
* Water spray, fog or regular foam.
* Move containers from fire area if you can do it without risk.
* Dike fire control water for later disposal; do not scatter the material.
* Use water spray or fog; do not use straight streams.

Fire involving Tanks or Car/Trailer Loads
* Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
* Do not get water inside containers.
* Cool containers with flooding quantities of water until well after fire is out.
* Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.
* ALWAYS stay away from tanks engulfed in fire.

* For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn.

SPILL OR LEAK

* Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.
* Stop leak if you can do it without risk.
* Prevent entry into waterways, sewers, basements or confined areas.
* Cover with plastic sheet to prevent spreading.
* Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers.
* DO NOT GET WATER INSIDE CONTAINERS.

FIRST AID

* Move victim to fresh air.
* Call 911 or emergency medical service.
* Apply artificial respiration if victim is not breathing.
* Do not use mouth-to-mouth method if victim ingested or inhaled the substance; induce artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device.
* Administer oxygen if breathing is difficult.
* Remove and isolate contaminated clothing and shoes.
* In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
* For minor skin contact, avoid spreading material on unaffected skin.
* Keep victim warm and quiet.
* Effects of exposure (inhalation, ingestion or skin contact) to substance may be delayed.
* Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves.

Additional Emergency Response Information (CAMEO Data)

Non-fire Spill Response: Keep material out of water sources and sewers. Land spill: Dig a pit, pond, lagoon, holding area to contain liquid or solid material. Cover solids with a plastic sheet to prevent dissolving in rain or fire fighting water. Dike surface flow using soil, sand bags, foamed polyurethane, or foamed concrete. Water spill: Use natural barriers or oil spill control booms to limit spill travel. Use natural deep water pockets, excavated lagoons, or sand bag barriers to trap material at bottom. Remove trapped material with suction hoses. (AAR, 1999)

Firefighting: Extinguish fire using agent suitable for type of surrounding fire. (Material itself does not burn or burns with difficulty.) Use water in flooding quantities as fog. Use foam, dry chemical, or carbon dioxide. (AAR, 1999)

Reactivity: CHEMICAL PROFILE: Even at 10C, bromine trifluoride reacts with antimony incandescently. Bromine trifluoride reacts similarly with arsenic, boron, bromine, iodine, phosphorus, and sulfur (Mellor 2:113 1946-47). Bromoazide explodes on contact with antimony, arsenic, phosphorus, silver foil or sodium. When antimony or arsenic and solid potassium permanganate are ground together, the metals ignite (Mellor 12:322 1946-47). Sodium peroxide oxidizes antimony, arsenic, copper, potassium, tin, and zinc with incandescence (Mellor 2:490-93 1946-47). A combination of finely divided arsenic with finely divided bromates (also chlorates and iodates) of barium, calcium, magnesium, potassium, sodium, or zinc can explode by heat, percussion, and friction (Mellor 2:310 1946-47). Bromine pentafluoride reacts readily in the cold with arsenic ignition usually occurs. A few drops of the liquid falling in water produces an explosion. Fluorine vigorously reacts with arsenic and arsenic trioxide at ordinary temperatures (Mellor 9:34 1946-47). (REACTIVITY, 1999)

First Aid: Eye: If this chemical contacts the eyes, immediately wash the eyes with large amounts of water, occasionally lifting the lower and upper lids. Get medical attention immediately. Contact lenses should not be worn when working with this chemical. Skin: If this chemical contacts the skin, immediately wash the contaminated skin with soap and water. If this chemical penetrates the clothing immediately remove the clothing and wash the skin with soap and water. Get medical attention promptly. Breathing: If a person breathes large amounts of this chemical, move the exposed person to fresh air at once. If breathing has stopped, perform mouth-to-mouth resuscitation. Keep the affected person warm and at rest. Get medical attention as soon as possible. Swallow: If this chemical has been swallowed, get medical attention immediately. (NIOSH, 1997)

OSHA/EPA Occupational Chemical Database

Chemical Identification

Chemical Name: ACETONE

CAS #: 67-64-1 **UN No:** 1090 **Formula:** C3H6O

Synonyms: Dimethyl ketone; Ketone propane; 2-Propanone

Physical Properties

Physical Description: Colorless liquid with a fragrant, mint-like odor.

BP: 133ºF	**MW:** 58.1	**LEL:** 2.5%	**NFPA Fire Rating:** 3
FRZ/MLT: FRZ: -140ºF	**VP:** 180 mmHg	**UEL:** 12.8%	**NFPA Health Rating:** 1
FP: 0ºF	**VD:** NA		**NFPA Reactivity Rating:** 0
Sp. GR: 0.79	**IP:** 9.69 eV		**NFPA Sp. Inst.:** NA

Exposure Limits

OSHA	NIOSH	Related Information
PEL-TWA ppm: 1000	**REL-TWA ppm:** 250	**AIHA Emergency Response Planning Guidelines - ERPG-1/ERPG-2/ERPG-3:** NA
PEL-TWA mg/m3: 2400	**REL-TWA mg/m3:** 590	
PEL-STEL ppm: NA	**REL-STEL ppm:** NA	
PEL-STEL mg/m3: NA	**REL-STEL mg/m3:** NA	
PEL-C ppm: NA	**REL-C ppm:** NA	
PEL-C mg/m3: NA	**REL-C mg/m3:** NA	**Carcinogen Classifications:** TLV-A4
Skin Notation: No	**Skin Notation:** No	
Notes: NA	**Notes:** NA	
	IDLH ppm: 2500	
	IDLH mg/m3: NA	
	IDLH Notes: 10% of LEL	

NIOSH Pocket Guide to Chemical Hazards (Current through June 2006)

Acetone	CAS: 67-64-1
Formula: (CH3)2CO	RTECS: AL3150000
Synonyms & Trade Names: Dimethyl ketone, Ketone propane, 2-Propanone	DOT ID & Guide: 1090 127

Exposure Limits

NIOSH REL: TWA 250 ppm (590 mg/m3)	OSHA PEL : TWA 1000 ppm (2400 mg/m3)
IDLH: 2500 ppm [10%LEL]	Conversion: 1 ppm = 2.38 mg/m3

Physical Description

Colorless liquid with a fragrant, mint-like odor.

MW: 58.1	BP: 133F	FRZ: -140F	Sol: Miscible
VP: 180 mmHg	IP: 9.69 eV	RGasD: NA	Sp.Gr: 0.79
Fl.P: 0F	UEL: 12.8%	LEL: 2.5%	MEC: NA

Class IB Flammable Liquid (See flammable and combustible liquid classes)

Incompatibilities & Reactivities

Oxidizers, acids

Measurement Methods

NIOSH 1300, 2555, 3800; OSHA 69

Personal Protection & Sanitation	First Aid
Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet (flamm) Change: N.R.	Eye: Irr immed Skin: Soap wash immed Breath: Resp support Swallow: Medical attention immed (See procedures)

NIOSH Respirator Recommendations

NIOSH 2500 ppm: CCROV*/PAPROV*/GMFOV/SA*/SCBAF : SCBAF:PD,PP/SAF:PD,PP:ASCBA Escape: GMFOV/SCBAE

(See symbols and codes)

Exposure Routes

Inh Ing Con

Symptoms

Irrit eyes, nose, throat; head, dizz, CNS depres; derm
(See abbreviations)

Target Organs

Eyes, skin, resp sys, CNS
(See abbreviations)

DOT Emergency Response Guidebook (ERG 2004)

Guide Number: 127

127 Flammable Liquids (Polar/Water-Miscible)
POTENTIAL HAZARDS
FIRE OR EXPLOSION
* HIGHLY FLAMMABLE: Will be easily ignited by heat, sparks or flames.
* Vapors may form explosive mixtures with air.
* Vapors may travel to source of ignition and flash back.
* Most vapors are heavier than air. They will spread along ground and collect in low or confined areas (sewers, basements, tanks).
* Vapor explosion hazard indoors, outdoors or in sewers.
* Those substances designated with a P may polymerize explosively when heated or involved in a fire.
* Runoff to sewer may create fire or explosion hazard.
* Containers may explode when heated.
* Many liquids are lighter than water.

HEALTH
* Inhalation or contact with material may irritate or burn skin and eyes.
* Fire may produce irritating, corrosive and/or toxic gases.
* Vapors may cause dizziness or suffocation.
* Runoff from fire control may cause pollution.

PUBLIC SAFETY
* CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, refer to appropriate telephone number listed on the inside back cover.
* Isolate spill or leak area immediately for at least 25 to 50 meters (80 to 160 feet) in all directions.
* Keep unauthorized personnel away.
* Stay upwind.
* Keep out of low areas.
* Ventilate closed spaces before entering.

PROTECTIVE CLOTHING
* Wear positive pressure self-contained breathing apparatus (SCBA).
* Structural firefighters' protective clothing will only provide limited protection.

EVACUATION
Large Spill
* Consider initial downwind evacuation for at least 300 meters (1000 feet).

Fire
* If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions.

EMERGENCY RESPONSE
FIRE
CAUTION: All these products have a very low flash point: Use of water spray when fighting fire may be inefficient.

Small Fires
* Dry chemical, CO_2, water spray or alcohol-resistant foam.

Large Fires
* Water spray, fog or alcohol-resistant foam.
* Use water spray or fog; do not use straight streams.
* Move containers from fire area if you can do it without risk.

Fire involving Tanks or Car/Trailer Loads
* Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
* Cool containers with flooding quantities of water until well after fire is out.
* Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.
* ALWAYS stay away from tanks engulfed in fire.
* For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn.

SPILL OR LEAK
* ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area).
* All equipment used when handling the product must be grounded.
* Do not touch or walk through spilled material.

* Stop leak if you can do it without risk.
* Prevent entry into waterways, sewers, basements or confined areas.
* A vapor suppressing foam may be used to reduce vapors.
* Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers.
* Use clean non-sparking tools to collect absorbed material.

Large Spills

* Dike far ahead of liquid spill for later disposal.
* Water spray may reduce vapor; but may not prevent ignition in closed spaces.

FIRST AID

* Move victim to fresh air.
* Call 911 or emergency medical service.
* Apply artificial respiration if victim is not breathing.
* Administer oxygen if breathing is difficult.
* Remove and isolate contaminated clothing and shoes.
* In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
* Wash skin with soap and water.
* Keep victim warm and quiet.
* Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves.

Additional Emergency Response Information (CAMEO Data)

Non-fire Spill Response: Keep sparks, flames, and other sources of ignition away. Keep material out of water sources and sewers. Build dikes to contain flow as necessary. Attempt to stop leak if without undue personnel hazard. Use water spray to disperse vapors and dilute standing pools of liquid. Apply water spray or mist to knock down vapors. Land spill: Dig a pit, pond, lagoon, holding area to contain liquid or solid material. Dike surface flow using soil, sand bags, foamed polyurethane, or foamed concrete. Absorb bulk liquid with fly ash, cement powder, or commercial sorbents. Water spill: Use natural barriers or oil spill control booms to limit spill travel. Remove trapped material with suction hoses. (AAR, 1999)

Firefighting: Do not extinguish fire unless flow can be stopped. Use water in flooding quantities as fog. Solid streams of water may be ineffective. Cool all affected containers with flooding quantities of water. Apply water from as far a distance as possible. Use "alcohol" foam, dry chemical or carbon dioxide. (AAR, 1999)

Reactivity: CHEMICAL PROFILE: A mixture of acetone and chloroform in a residue bottle exploded. Since addition of acetone to chloroform in the presence of base will result in a highly exothermic reaction, it is thought that a base was in the bottle (MCA Case History 1661. 1970). Nitrosyl chloride sealed in a tube with a residue of acetone in the presence of platinum catayst gave an explosive reaction (Chem. Eng. News 35(43):60. 1967). The reaction of nitrsyl perchlorate and acetone ignites and explodes. Explosions occur with mixtures of nitrosyl perchlorate and primary amine (Ann. Chem. 42:2031. 1909). (REACTIVITY, 1999)

First Aid: EYES: First check the victim for contact lenses and remove if present. Flush victim's eyes with water or normal saline solution for 20 to 30 minutes while simultaneously calling a hospital or poison control center. Do not put any ointments, oils, or medication in the victim's eyes without specific instructions from a physician. IMMEDIATELY transport the victim after flushing eyes to a hospital even if no symptoms (such as redness or irritation) develop. SKIN: IMMEDIATELY flood affected skin with water while removing and isolating all contaminated clothing. Gently wash all affected skin areas thoroughly with soap and water. If symptoms such as redness or irritation develop, IMMEDIATELY call a physician and be prepared to transport the victim to a hospital for treatment. INHALATION: IMMEDIATELY leave the contaminated area; take deep breaths of fresh air. If symptoms (such as wheezing, coughing, shortness of breath, or burning in the mouth, throat, or chest) develop, call a physician and be prepared to transport the victim to a hospital. Provide proper respiratory protection to rescuers entering an unknown atmosphere. Whenever possible, Self-Contained Breathing Apparatus (SCBA) should be used; if not available, use a level of protection greater than or equal to that advised under Protective Clothing. INGESTION: DO NOT INDUCE VOMITING. Volatile chemicals have a high risk of being aspirated into the victim's lungs during vomiting which increases the medical problems. If the victim is conscious and not convulsing, give 1 or 2 glasses of water to dilute the chemical and IMMEDIATELY call a hospital or poison control center. IMMEDIATELY transport the victim to a hospital. If the victim is convulsing or unconscious, do not give anything by mouth, ensure that the victim's airway is open and lay the victim on his/her side with the head lower than the body. DO NOT INDUCE VOMITING. IMMEDIATELY transport the victim to a hospital. (NTP, 1992)

OSHA/EPA Occupational Chemical Database

Chemical Identification

Chemical Name: ISOPROPANOL

CAS #: 67-63-0 **UN No:** 1219 **Formula:** C3H8O

Synonyms: Dimethyl carbinol; IPA; Isopropanol; 2-Propanol; sec-Propyl alcohol; Rubbing alcohol; isopropyl alcohol

Physical Properties

Physical Description: Colorless liquid with the odor of rubbing alcohol.

BP: 181ºF	**MW:** 60.1	**LEL:** 2.0%	**NFPA Fire Rating:** 3
FRZ/MLT: FRZ: -127ºF	**VP:** 33 mmHg	**UEL:** (200ºF): 12.7%	**NFPA Health Rating:** 1
FP: 53ºF	**VD:** NA		**NFPA Reactivity Rating:** 0
Sp. GR: 0.79	**IP:** 10.10 eV		**NFPA Sp. Inst.:** NA

Exposure Limits

OSHA	NIOSH	Related Information
PEL-TWA ppm: 400	**REL-TWA ppm:** 400	**AIHA Emergency Response Planning Guidelines - ERPG-1/ERPG-2/ERPG-3:** NA
PEL-TWA mg/m3: 980	**REL-TWA mg/m3:** 980	
PEL-STEL ppm: NA	**REL-STEL ppm:** 500	
PEL-STEL mg/m3: NA	**REL-STEL mg/m3:** 1225	
PEL-C ppm: NA	**REL-C ppm:** NA	
PEL-C mg/m3: NA	**REL-C mg/m3:** NA	**Carcinogen Classifications:** IARC-3, TLV-A4
Skin Notation: No	**Skin Notation:** No	
Notes: NA	**Notes:** NA	
	IDLH ppm: 2000	
	IDLH mg/m3: NA	
	IDLH Notes: 10% of LEL	

NIOSH Pocket Guide to Chemical Hazards (Current through June 2006)

Isopropyl alcohol			CAS: 67-63-0
Formula: (CH3)2CHOH			RTECS: NT8050000
Synonyms & Trade Names: Dimethyl carbinol, IPA, Isopropanol, 2-Propanol, sec-Propyl alcohol, Rubbing alcohol			DOT ID & Guide: 1219 129
Exposure Limits			
NIOSH REL: TWA 400 ppm (980 mg/m3) ST 500 ppm (1225 mg/m3)		OSHA PEL : TWA 400 ppm (980 mg/m3)	
IDLH: 2000 ppm [10%LEL]		Conversion: 1 ppm = 2.46 mg/m3	
Physical Description			
Colorless liquid with the odor of rubbing alcohol.			
MW: 60.1	BP: 181F	FRZ: -127F	Sol: Miscible
VP: 33 mmHg	IP: 10.10 eV	RGasD: NA	Sp.Gr: 0.79
Fl.P: 53F	UEL(200F): 12.7%	LEL: 2.0%	MEC: NA
Class IB Flammable Liquid (See flammable and combustible liquid classes)			
Incompatibilities & Reactivities			
Strong oxidizers, acetaldehyde, chlorine, ethylene oxide, acids, isocyanates			
Measurement Methods			
NIOSH 1400; OSHA 109			
Personal Protection & Sanitation		**First Aid**	
Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet (flamm) Change: N.R.		Eye: Irr immed Skin: Water flush Breath: Resp support Swallow: Medical attention immed (See procedures)	
NIOSH Respirator Recommendations			
NIOSH/OSHA 2000 ppm: SA:CF/CCRFOV/GMFOV/PAPROV/SCBAF/SAF : SCBAF:PD,PP/SAF:PD,PP:ASCBA Escape: GMFOV/SCBAE			

(See symbols and codes)

Exposure Routes

Inh Ing Con

Symptoms

Irrit eyes, nose, throat; drow, dizz, head; dry cracking skin; in animals: narco
(See abbreviations)

Target Organs

Eyes, skin, resp sys
(See abbreviations)

DOT Emergency Response Guidebook (ERG 2004)

Guide Number: 129

129 Flammable Liquids (Polar/Water-Miscible/Noxious)
POTENTIAL HAZARDS
FIRE OR EXPLOSION
* HIGHLY FLAMMABLE: Will be easily ignited by heat, sparks or flames.
* Vapors may form explosive mixtures with air.
* Vapors may travel to source of ignition and flash back.
* Most vapors are heavier than air. They will spread along ground and collect in low or confined areas (sewers, basements, tanks).
* Vapor explosion hazard indoors, outdoors or in sewers.
* Those substances designated with a P may polymerize explosively when heated or involved in a fire.
* Runoff to sewer may create fire or explosion hazard.
* Containers may explode when heated.
* Many liquids are lighter than water.

HEALTH
* May cause toxic effects if inhaled or absorbed through skin.
* Inhalation or contact with material may irritate or burn skin and eyes.
* Fire will produce irritating, corrosive and/or toxic gases.
* Vapors may cause dizziness or suffocation.
* Runoff from fire control or dilution water may cause pollution.

PUBLIC SAFETY
* CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, refer to appropriate telephone number listed on the inside back cover.
* Isolate spill or leak area immediately for at least 50 to 100 meters (160 to 330 feet) in all directions.
* Keep unauthorized personnel away.
* Stay upwind.
* Keep out of low areas.
* Ventilate closed spaces before entering.

PROTECTIVE CLOTHING
* Wear positive pressure self-contained breathing apparatus (SCBA).
* Structural firefighters' protective clothing will only provide limited protection.

EVACUATION
Large Spill
* Consider initial downwind evacuation for at least 300 meters (1000 feet).

Fire
* If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions.

EMERGENCY RESPONSE
FIRE
CAUTION: All these products have a very low flash point: Use of water spray when fighting fire may be inefficient.

Small Fires
* Dry chemical, CO2, water spray or alcohol-resistant foam.
* Do not use dry chemical extinguishers to control fires involving nitromethane or nitroethane.

Large Fires
* Water spray, fog or alcohol-resistant foam.
* Do not use straight streams.
* Move containers from fire area if you can do it without risk.

Fire involving Tanks or Car/Trailer Loads
* Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
* Cool containers with flooding quantities of water until well after fire is out.
* Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.
* ALWAYS stay away from tanks engulfed in fire.
* For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn.

SPILL OR LEAK
* ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area).
* All equipment used when handling the product must be grounded.
* Do not touch or walk through spilled material.
* Stop leak if you can do it without risk.
* Prevent entry into waterways, sewers, basements or confined areas.

* A vapor suppressing foam may be used to reduce vapors.
* Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers.
* Use clean non-sparking tools to collect absorbed material.

Large Spills

* Dike far ahead of liquid spill for later disposal.
* Water spray may reduce vapor; but may not prevent ignition in closed spaces.

FIRST AID

* Move victim to fresh air.
* Call 911 or emergency medical service.
* Apply artificial respiration if victim is not breathing.
* Administer oxygen if breathing is difficult.
* Remove and isolate contaminated clothing and shoes.
* In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
* Wash skin with soap and water.
* Keep victim warm and quiet.
* Effects of exposure (inhalation, ingestion or skin contact) to substance may be delayed.
* Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves.

Additional Emergency Response Information (CAMEO Data)

Non-fire Spill Response: Keep sparks, flames, and other sources of ignition away. Keep material out of water sources and sewers. Build dikes to contain flow as necessary. Attempt to stop leak if without undue personnel hazard. Use water spray to disperse vapors and dilute standing pools of liquid. (AAR, 1999)

Firefighting: Do not extinguish fire unless flow can be stopped. Use water in flooding quantities as fog. Solid streams of water may be ineffective. Cool all affected containers with flooding quantities of water. Apply water from as far a distance as possible. Use "alcohol" foam, dry chemical or carbon dioxide. (AAR, 1999)

Reactivity: STABILITY: This chemical is sensitive to heat. Solutions of this chemical in water, DMSO, 95% ethanol or acetone should be stable for 24 hours under normal lab conditions.REACTIVITY: This chemical reacts with air or oxygen to form dangerously unstable peroxides. Contact with 2-butanone increases the reaction rate for peroxide formation. A violent, explosive reaction occurs when it is heated with (aluminum isopropoxide + crotonaldehyde). It forms explosive mixtures with trinitromethane and hydrogen peroxide. This chemical reacts with barium perchlorate to form a highly explosive compound. It ignites on contact with dioxygenyl tetrafluoroborate, chromium trioxide and potassium-tert-butoxide. Vigorous reactions occur with (hydrogen + palladium), nitroform, oleum, $COCl_2$, aluminum triisopropoxide and oxidizers. It also reacts explosively with phosgene in the presence of iron salts. It is incompatible with acids, acid anhydrides, halogens and aluminum. (NTP, 1992)

First Aid: EYES: First check the victim for contact lenses and remove if present. Flush victim's eyes with water or normal saline solution for 20 to 30 minutes while simultaneously calling a hospital or poison control center. Do not put any ointments, oils, or medication in the victim's eyes without specific instructions from a physician. IMMEDIATELY transport the victim after flushing eyes to a hospital even if no symptoms (such as redness or irritation) develop. SKIN: IMMEDIATELY flood affected skin with water while removing and isolating all contaminated clothing. Gently wash all affected skin areas thoroughly with soap and water. If symptoms such as redness or irritation develop, IMMEDIATELY call a physician and be prepared to transport the victim to a hospital for treatment. INHALATION: IMMEDIATELY leave the contaminated area; take deep breaths of fresh air. If symptoms (such as wheezing, coughing, shortness of Breathing, or burning in the mouth, throat, or chest) develop, call a physician and be prepared to transport the victim to a hospital. Provide proper respiratory protection to rescuers entering an unknown atmosphere. Whenever possible, Self-Contained Breathing Apparatus (SCBA) should be used; if not available, use a level of protection greater than or equal to that advised under Protective Clothing. INGESTION: DO NOT INDUCE VOMITING. Volatile chemicals have a high risk of being aspirated into the victim's lungs during vomiting which increases the medical problems. If the victim is conscious and not convulsing, give 1 or 2 glasses of water to dilute the chemical and IMMEDIATELY call a hospital or poison control center. IMMEDIATELY transport the victim to a hospital. If the victim is convulsing or unconscious, do not give anything by mouth, ensure that the victim's airway is open and lay the victim on his/her side with the Headache lower than the body. DO NOT INDUCE VOMITING. IMMEDIATELY transport the victim to a hospital. (NTP, 1992)

OSHA/EPA Occupational Chemical Database

Chemical Identification

Chemical Name: 1,2-DICHLOROETHYLENE, ALL ISOMERS
CAS #: 540-59-0 **UN No:** 1150 **Formula:** C2H2Cl2
Synonyms: Acetylene dichloride; cis-Acetylene dichloride; trans-Acetylene dichloride; sym-Dichloroethylene

Physical Properties

Physical Description: Colorless liquid (usually a mixture of the cis & trans isomers) with a slightly acrid, chloroform-like odor.

BP: 118-140ºF	**MW:** 97.0	**LEL:** 5.6%	**NFPA Fire Rating:** 3
FRZ/MLT: FRZ: -57 to -115ºF	**VP:** 180-265 mmHg	**UEL:** 12.8%	**NFPA Health Rating:** 2
FP: 36-39ºF	**VD:** NA		**NFPA Reactivity Rating:** 2
Sp. GR: (77ºF): 1.27	**IP:** 9.65 eV		**NFPA Sp. Inst.:** NA

Exposure Limits

OSHA	NIOSH	Related Information
PEL-TWA ppm: 200	**REL-TWA ppm:** 200	**AIHA Emergency Response Planning Guidelines - ERPG-1/ERPG-2/ERPG-3:** NA
PEL-TWA mg/m3: 790	**REL-TWA mg/m3:** 790	
PEL-STEL ppm: NA	**REL-STEL ppm:** NA	
PEL-STEL mg/m3: NA	**REL-STEL mg/m3:** NA	
PEL-C ppm: NA	**REL-C ppm:** NA	
PEL-C mg/m3: NA	**REL-C mg/m3:** NA	**Carcinogen Classifications:** NA
Skin Notation: No	**Skin Notation:** No	
Notes: NA	**Notes:** NA	
	IDLH ppm: 1000	
	IDLH mg/m3: NA	
	IDLH Notes: NA	

NIOSH Pocket Guide to Chemical Hazards (Current through June 2006)

1,2-Dichloroethylene			CAS: 540-59-0
Formula: ClCH=CHCl			RTECS: KV9360000
Synonyms & Trade Names: Acetylene dichloride, cis-Acetylene dichloride, trans-Acetylene dichloride, sym-Dichloroethylene			DOT ID & Guide: 1150 130P
Exposure Limits			
NIOSH REL: TWA 200 ppm (790 mg/m3)		OSHA PEL: TWA 200 ppm (790 mg/m3)	
IDLH: 1000 ppm		Conversion: 1 ppm = 3.97 mg/m3	
Physical Description			
Colorless liquid (usually a mixture of the cis & trans isomers) with a slightly acrid, chloroform-like odor.			
MW: 97.0	BP: 118-140F	FRZ: -57 to -115F	Sol: 0.4%
VP: 180-265 mmHg	IP: 9.65 eV	RGasD: NA	Sp.Gr(77F): 1.27
Fl.P: 36-39F	UEL: 12.8%	LEL: 5.6%	MEC: NA
Class IB Flammable Liquid (See flammable and combustible liquid classes)			
Incompatibilities & Reactivities			
Strong oxidizers, strong alkalis, potassium hydroxide, copper [Note: Usually contains inhibitors to prevent polymerization.]			
Measurement Methods			
NIOSH 1003; OSHA 7			
Personal Protection & Sanitation		**First Aid**	
Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet (flamm) Change: N.R.		Eye: Irr immed Skin: Soap wash prompt Breath: Resp support Swallow: Medical attention immed (See procedures)	
NIOSH Respirator Recommendations			
NIOSH/OSHA 1000 ppm: SA:CF/PAPROV/CCRFOV/GMFOV/SCBAF/SAF : SCBAF:PD,PP/SAF:PD,PP:ASCBA Escape: GMFOV/SCBAE (See symbols and codes)			
Exposure Routes			

Inh Ing Con

Symptoms

Irrit eyes, resp sys; CNS depres
(See abbreviations)

Target Organs

Eyes, resp sys, CNS
(See abbreviations)

DOT Emergency Response Guidebook (ERG 2004)

Guide Number: 130P

130 Flammable Liquids (Non-Polar/Water-Immiscible/Noxious)
POTENTIAL HAZARDS
FIRE OR EXPLOSION
* HIGHLY FLAMMABLE: Will be easily ignited by heat, sparks or flames.
* Vapors may form explosive mixtures with air.
* Vapors may travel to source of ignition and flash back.
* Most vapors are heavier than air. They will spread along ground and collect in low or confined areas (sewers, basements, tanks).
* Vapor explosion hazard indoors, outdoors or in sewers.
* Those substances designated with a P may polymerize explosively when heated or involved in a fire.
* Runoff to sewer may create fire or explosion hazard.
* Containers may explode when heated.
* Many liquids are lighter than water.

HEALTH
* May cause toxic effects if inhaled or absorbed through skin.
* Inhalation or contact with material may irritate or burn skin and eyes.
* Fire will produce irritating, corrosive and/or toxic gases.
* Vapors may cause dizziness or suffocation.
* Runoff from fire control or dilution water may cause pollution.

PUBLIC SAFETY
* CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, refer to appropriate telephone number listed on the inside back cover.
* Isolate spill or leak area immediately for at least 50 to 100 meters (160 to 330 feet) in all directions.
* Keep unauthorized personnel away.
* Stay upwind.
* Keep out of low areas.
* Ventilate closed spaces before entering.

PROTECTIVE CLOTHING
* Wear positive pressure self-contained breathing apparatus (SCBA).
* Structural firefighters' protective clothing will only provide limited protection.

EVACUATION
Large Spill
* Consider initial downwind evacuation for at least 300 meters (1000 feet).

Fire
* If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions.

EMERGENCY RESPONSE
FIRE
CAUTION: All these products have a very low flash point: Use of water spray when fighting fire may be inefficient.
Small Fires
* Dry chemical, CO2, water spray or regular foam.

Large Fires
* Water spray, fog or regular foam.
* Do not use straight streams.
* Move containers from fire area if you can do it without risk.

Fire involving Tanks or Car/Trailer Loads
* Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
* Cool containers with flooding quantities of water until well after fire is out.
* Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.
* ALWAYS stay away from tanks engulfed in fire.
* For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn.

SPILL OR LEAK
* ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area).
* All equipment used when handling the product must be grounded.
* Do not touch or walk through spilled material.
* Stop leak if you can do it without risk.
* Prevent entry into waterways, sewers, basements or confined areas.
* A vapor suppressing foam may be used to reduce vapors.
* Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers.
* Use clean non-sparking tools to collect absorbed material.

Large Spills

* Dike far ahead of liquid spill for later disposal.
* Water spray may reduce vapor; but may not prevent ignition in closed spaces.

FIRST AID

* Move victim to fresh air.
* Call 911 or emergency medical service.
* Apply artificial respiration if victim is not breathing.
* Administer oxygen if breathing is difficult.
* Remove and isolate contaminated clothing and shoes.
* In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
* Wash skin with soap and water.
* Keep victim warm and quiet.
* Effects of exposure (inhalation, ingestion or skin contact) to substance may be delayed.
* Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves.

The letter **P** following the guide number identifies those materials which present a polymerization hazard under certain conditions. First responders at the scene of a dangerous goods incident should seek additional specific information about any material in question as soon as possible. The information received by contacting the appropriate emergency response agency, the emergency response number on the shipping document, or by consulting the information on or accompanying the shipping document, may be more specific and accurate than this guidebook in providing guidance for the materials involved.

Additional Emergency Response Information (CAMEO Data)

Non-fire Spill Response: SMALL SPILLS AND LEAKAGE: If you spill this chemical, FIRST REMOVE ALL SOURCES OF IGNITION. Then, use absorbent paper to pick up all liquid spill material. Your contaminated clothing and absorbent paper should be sealed in a vapor-tight plastic bag for eventual disposal. Solvent wash all contaminated surfaces with 60-70% ethanol followed by washing with a soap and water solution. Do not reenter the contaminated area until the Safety Officer (or other responsible person) has verified that the area has been properly cleaned.STORAGE PRECAUTIONS: You should protect this chemical from exposure to light. Keep the container tightly closed under an inert atmosphere, and store it in an explosion-proof refrigerator. STORE AWAY FROM SOURCES OF IGNITION. (NTP, 1992)

Firefighting: Fires involving this material should be controlled using a dry chemical, carbon dioxide or Halon extinguisher. A water spray may also be used. (NTP, 1992)

Reactivity: STABILITY: Solutions of this chemical in water, DMSO, 95% ethanol or acetone should be stable for 24 hours under normal lab conditions This compound will decompose on exposure to air, moisture and light.REACTIVITY: This compound will react with alkalies, difluoromethylene, dihypofluorite, and nitrogen tetraoxide. Contact with solid caustic alkalies or their concentrated solutions will form chloroacetylene which ignites in air. Avoid contact with copper and copper alloys. It is corrosive to metals unless an inhibitor has been added. Oxidation in the presence of concentrated sulfuric acid or a free radical initiator gives chloroacetyl chloride via epoxide intermediates. It is incompatible with organic peroxides. (NTP, 1992)

First Aid: EYES: First check the victim for contact lenses and remove if present. Flush victim's eyes with water or normal saline solution for 20 to 30 minutes while simultaneously calling a hospital or poison control center. Do not put any ointments, oils, or medication in the victim's eyes without specific instructions from a physician. IMMEDIATELY transport the victim after flushing eyes to a hospital even if no symptoms (such as redness or irritation) develop. SKIN: IMMEDIATELY flood affected skin with water while removing and isolating all contaminated clothing. Gently wash all affected skin areas thoroughly with soap and water. If symptoms such as redness or irritation develop, IMMEDIATELY call a physician and be prepared to transport the victim to a hospital for treatment. INHALATION: IMMEDIATELY leave the contaminated area; take deep breaths of fresh air. If symptoms (such as wheezing, coughing, shortness of breath, or burning in the mouth, throat, or chest) develop, call a physician and be prepared to transport the victim to a hospital. Provide proper respiratory protection to rescuers entering an unknown atmosphere. Whenever possible, Self-Contained Breathing Apparatus (SCBA) should be used; if not available, use a level of protection greater than or equal to that advised under Protective Clothing. INGESTION: DO NOT INDUCE VOMITING. Volatile chemicals have a high risk of being aspirated into the victim's lungs during vomiting which increases the medical problems. If the victim is conscious and not convulsing, give 1 or 2 glasses of water to dilute the chemical and IMMEDIATELY call a hospital or poison control center. IMMEDIATELY transport the victim to a hospital. If the victim is convulsing or unconscious, do not give anything by mouth, ensure that the victim's airway is open and lay the victim on his/her side with the head lower than the body. DO NOT INDUCE VOMITING. IMMEDIATELY transport the victim to a hospital. (NTP, 1992)

OSHA/EPA Occupational Chemical Database

Chemical Identification

Chemical Name: ETHYLENE DICHLORIDE

CAS #: 107-06-2 **UN No:** 1184 **Formula:** C2H4Cl2

Synonyms: 1,2-Dichloroethane; Ethylene chloride; Glycol dichloride

Physical Properties

Physical Description: Colorless liquid with a pleasant, chloroform-like odor. [Note: Decomposes slowly, becomes acidic & darkens in color.]

BP: 182ºF	**MW:** 99.0	**LEL:** 6.2%	**NFPA Fire Rating:** 3
FRZ/MLT: FRZ: -32ºF	**VP:** 64 mmHg	**UEL:** 16%	**NFPA Health Rating:** 2
FP: 56ºF	**VD:** NA		**NFPA Reactivity Rating:** 0
Sp. GR: 1.24	**IP:** 11.05 eV		**NFPA Sp. Inst.:** NA

Exposure Limits

OSHA	NIOSH	Related Information
PEL-TWA ppm: 50	**REL-TWA ppm:** 1	**AIHA Emergency Response Planning Guidelines - ERPG-1/ERPG-2/ERPG-3:** NA
PEL-TWA mg/m3: NA	**REL-TWA mg/m3:** 4	
PEL-STEL ppm: NA	**REL-STEL ppm:** 2	
PEL-STEL mg/m3: NA	**REL-STEL mg/m3:** 8	
PEL-C ppm: 100	**REL-C ppm:** NA	
PEL-C mg/m3: NA	**REL-C mg/m3:** NA	**Carcinogen Classifications:** IARC-2B, NIOSH-Ca, NTP-R, TLV-A4
Skin Notation: No	**Skin Notation:** No	
Notes: PEAK = 200 ppm FOR A 5 MINUTE INTERVAL DURING ANY 3 HOURS	**Notes:** CARCINOGEN (Ca)	
	IDLH ppm: 50	
	IDLH mg/m3: NA	
	IDLH Notes: Ca	

NIOSH Pocket Guide to Chemical Hazards (Current through June 2006)

Ethylene dichloride			CAS: 107-06-2
Formula: ClCH2CH2Cl			RTECS: KI0525000
Synonyms & Trade Names: 1,2-Dichloroethane; Ethylene chloride; Glycol dichloride			DOT ID & Guide: 1184 131
Exposure Limits			
NIOSH REL: Ca TWA 1 ppm (4 mg/m3) ST 2 ppm (8 mg/m3) See Appendix A See Appendix C (Chloroethanes)		OSHA PEL : TWA 50 ppm C 100 ppm 200 ppm [5-minute maximum peak in any 3 hours]	
IDLH: Ca [50 ppm]		Conversion: 1 ppm = 4.05 mg/m3	
Physical Description			
Colorless liquid with a pleasant, chloroform-like odor. [Note: Decomposes slowly, becomes acidic & darkens in color.]			
MW: 99.0	BP: 182F	FRZ: -32F	Sol: 0.9%
VP: 64 mmHg	IP: 11.05 eV	RGasD: NA	Sp.Gr: 1.24
Fl.P: 56F	UEL: 16%	LEL: 6.2%	MEC: NA
Class IB Flammable Liquid (See flammable and combustible liquid classes)			
Incompatibilities & Reactivities			
Strong oxidizers & caustics; chemically-active metals such as magnesium or aluminum powder, sodium & potassium; liquid ammonia [Note: Decomposes to vinyl chloride & HCl above 1112F.]			
Measurement Methods			
NIOSH 1003; OSHA 3			
Personal Protection & Sanitation		**First Aid**	
Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam		Eye: Irr immed Skin: Soap wash prompt Breath: Resp support	

Remove: When wet (flamm) Change: N.R. Provide: Eyewash, Quick drench	Swallow: Medical attention immed (See procedures)

NIOSH Respirator Recommendations

NIOSH : SCBAF:PD,PP/SAF:PD,PP:ASCBA Escape: GMFOV/SCBAE
(See symbols and codes)

Exposure Routes

Inh Ing Abs Con

Symptoms

Irrit eyes, corn opac; CNS depres; nau, vomit; derm; liver, kidney, CVS damage; [carc]
(See abbreviations)

Target Organs

Eyes, skin, kidneys, liver, CNS, CVS
(See abbreviations)

DOT Emergency Response Guidebook (ERG 2004)

Guide Number: 129

129 Flammable Liquids (Polar/Water-Miscible/Noxious)
POTENTIAL HAZARDS
FIRE OR EXPLOSION
* HIGHLY FLAMMABLE: Will be easily ignited by heat, sparks or flames.
* Vapors may form explosive mixtures with air.
* Vapors may travel to source of ignition and flash back.
* Most vapors are heavier than air. They will spread along ground and collect in low or confined areas (sewers, basements, tanks).
* Vapor explosion hazard indoors, outdoors or in sewers.
* Those substances designated with a P may polymerize explosively when heated or involved in a fire.
* Runoff to sewer may create fire or explosion hazard.
* Containers may explode when heated.
* Many liquids are lighter than water.

HEALTH
* May cause toxic effects if inhaled or absorbed through skin.
* Inhalation or contact with material may irritate or burn skin and eyes.
* Fire will produce irritating, corrosive and/or toxic gases.
* Vapors may cause dizziness or suffocation.
* Runoff from fire control or dilution water may cause pollution.

PUBLIC SAFETY
* CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, refer to appropriate telephone number listed on the inside back cover.
* Isolate spill or leak area immediately for at least 50 to 100 meters (160 to 330 feet) in all directions.
* Keep unauthorized personnel away.
* Stay upwind.
* Keep out of low areas.
* Ventilate closed spaces before entering.

PROTECTIVE CLOTHING
* Wear positive pressure self-contained breathing apparatus (SCBA).
* Structural firefighters' protective clothing will only provide limited protection.

EVACUATION
Large Spill
* Consider initial downwind evacuation for at least 300 meters (1000 feet).

Fire
* If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions.

EMERGENCY RESPONSE
FIRE
CAUTION: All these products have a very low flash point: Use of water spray when fighting fire may be inefficient.

Small Fires
* Dry chemical, CO_2, water spray or alcohol-resistant foam.
* Do not use dry chemical extinguishers to control fires involving nitromethane or nitroethane.

Large Fires
* Water spray, fog or alcohol-resistant foam.
* Do not use straight streams.
* Move containers from fire area if you can do it without risk.

Fire involving Tanks or Car/Trailer Loads
* Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
* Cool containers with flooding quantities of water until well after fire is out.
* Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.

* ALWAYS stay away from tanks engulfed in fire.
* For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn.

SPILL OR LEAK

* ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area).
* All equipment used when handling the product must be grounded.
* Do not touch or walk through spilled material.
* Stop leak if you can do it without risk.
* Prevent entry into waterways, sewers, basements or confined areas.
* A vapor suppressing foam may be used to reduce vapors.
* Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers.
* Use clean non-sparking tools to collect absorbed material.

Large Spills

* Dike far ahead of liquid spill for later disposal.
* Water spray may reduce vapor; but may not prevent ignition in closed spaces.

FIRST AID

* Move victim to fresh air.
* Call 911 or emergency medical service.
* Apply artificial respiration if victim is not breathing.
* Administer oxygen if breathing is difficult.
* Remove and isolate contaminated clothing and shoes.
* In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
* Wash skin with soap and water.
* Keep victim warm and quiet.
* Effects of exposure (inhalation, ingestion or skin contact) to substance may be delayed.
* Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves.

Additional Emergency Response Information (CAMEO Data)

Non-fire Spill Response: Keep sparks, flames, and other sources of ignition away. Keep material out of water sources and sewers. Build dikes to contain flow as necessary. Attempt to stop leak if without undue personnel hazard. Use water spray to knock-down vapors. Combustion products include corrosive or toxic vapors. Land spill: Dig a pit, pond, lagoon, holding area to contain liquid or solid material. Dike surface flow using soil, sand bags, foamed polyurethane, or foamed concrete. Absorb bulk liquid with fly ash, cement powder, or commercial sorbents. Apply "universal" gelling agent to immobilize spill. Apply approriate foam to diminish vapor and fire hazard. Water spill: Use natural deep water pockets, excavated lagoons, or sand bag barriers to trap material at bottom. If dissolved, in region of 10 ppm or greater concentration, apply activated carbon at ten times the spilled amount. Remove trapped material with suction hoses. Use mechanical dredges or lifts to remove immobilized masses of pollutants and precipitates. (AAR, 1999)

Firefighting: Do not extinguish fire unless flow can be stopped. Use water in flooding quantities as fog. Solid streams of water may spread fire. Cool all affected containers with flooding quantities of water. Apply water from as far a distance as possible. Use foam, dry chemical, or carbon dioxide. (AAR, 1999)

Reactivity: CHEMICAL PROFILE: Liquid ammonia and ethylene dichloride can cause an explosion when mixed, NFPA 491M, 1991. A tank of dimethyl amino propyl amine exploded violently when it reacted with wet ethylene dichloride which had been the tanks previous contents, Doyle(1973). (REACTIVITY, 1999)

First Aid: EYES: First check the victim for contact lenses and remove if present. Flush victim's eyes with water or normal saline solution for 20 to 30 minutes while simultaneously calling a hospital or poison control center. Do not put any ointments, oils, or medication in the victim's eyes without specific instructions from a physician. IMMEDIATELY transport the victim after flushing eyes to a hospital even if no symptoms (such as redness or irritation) develop. SKIN: IMMEDIATELY flood affected skin with water while removing and isolating all contaminated clothing. Gently wash all affected skin areas thoroughly with soap and water. IMMEDIATELY call a hospital or poison control center even if no symptoms (such as redness or irritation) develop. IMMEDIATELY transport the victim to a hospital for treatment after washing the affected areas. INHALATION: IMMEDIATELY leave the contaminated area; take deep breaths of fresh air. IMMEDIATELY call a physician and be prepared to transport the victim to a hospital even if no symptoms (such as wheezing, coughing, shortness of Breathing, or burning in the mouth, throat, or chest) develop. Provide proper respiratory protection to rescuers entering an unknown atmosphere. Whenever possible, Self-Contained Breathing Apparatus (SCBA) should be used; if not available, use a level of protection greater than or equal to that advised under Protective Clothing. INGESTION: DO NOT INDUCE VOMITING. Volatile chemicals have a high risk of being aspirated into the victim's lungs during vomiting which increases the medical problems. If the victim is conscious and not convulsing, give 1 or 2 glasses of water to dilute the chemical and IMMEDIATELY call a hospital or poison control center. IMMEDIATELY transport the victim to a hospital. If the victim is convulsing or unconscious, do not give anything by mouth, ensure that the victim's airway is open and lay the victim on his/her side with the Headache lower than the body. DO NOT INDUCE VOMITING. IMMEDIATELY transport the victim to a hospital. OTHER: Since this chemical is a known or suspected carcinogen you should contact a physician for advice regarding the possible long term health effects and potential recommendation for medical monitoring. Recommendations from the physician will depend upon the specific compound, its chemical, physical and toxicity properties, the exposure level, length of exposure, and the route of exposure. (NTP, 1992)

OSHA/EPA Occupational Chemical Database

Chemical Identification

Chemical Name: 1,2-DICHLOROETHYLENE, ALL ISOMERS

CAS #: 540-59-0 **UN No:** 1150 **Formula:** C2H2Cl2

Synonyms: Acetylene dichloride; cis-Acetylene dichloride; trans-Acetylene dichloride; sym-Dichloroethylene

Physical Properties

Physical Description: Colorless liquid (usually a mixture of the cis & trans isomers) with a slightly acrid, chloroform-like odor.

BP: 118-140ºF	**MW:** 97.0	**LEL:** 5.6%	**NFPA Fire Rating:** 3
FRZ/MLT: FRZ: -57 to -115ºF	**VP:** 180-265 mmHg	**UEL:** 12.8%	**NFPA Health Rating:** 2
FP: 36-39ºF	**VD:** NA		**NFPA Reactivity Rating:** 2
Sp. GR: (77ºF): 1.27	**IP:** 9.65 eV		**NFPA Sp. Inst.:** NA

Exposure Limits

OSHA	NIOSH	Related Information
PEL-TWA ppm: 200	**REL-TWA ppm:** 200	**AIHA Emergency Response Planning Guidelines - ERPG-1/ERPG-2/ERPG-3:** NA
PEL-TWA mg/m3: 790	**REL-TWA mg/m3:** 790	
PEL-STEL ppm: NA	**REL-STEL ppm:** NA	
PEL-STEL mg/m3: NA	**REL-STEL mg/m3:** NA	
PEL-C ppm: NA	**REL-C ppm:** NA	
PEL-C mg/m3: NA	**REL-C mg/m3:** NA	**Carcinogen Classifications:** NA
Skin Notation: No	**Skin Notation:** No	
Notes: NA	**Notes:** NA	
	IDLH ppm: 1000	
	IDLH mg/m3: NA	
	IDLH Notes: NA	

NIOSH Pocket Guide to Chemical Hazards (Current through June 2006)

1,2-Dichloroethylene	CAS: 540-59-0
Formula: ClCH=CHCl	RTECS: KV9360000
Synonyms & Trade Names: Acetylene dichloride, cis-Acetylene dichloride, trans-Acetylene dichloride, sym-Dichloroethylene	DOT ID & Guide: 1150 130P

Exposure Limits

NIOSH REL: TWA 200 ppm (790 mg/m3)	OSHA PEL: TWA 200 ppm (790 mg/m3)
IDLH: 1000 ppm	Conversion: 1 ppm = 3.97 mg/m3

Physical Description

Colorless liquid (usually a mixture of the cis & trans isomers) with a slightly acrid, chloroform-like odor.

MW: 97.0	BP: 118-140F	FRZ: -57 to -115F	Sol: 0.4%
VP: 180-265 mmHg	IP: 9.65 eV	RGasD: NA	Sp.Gr(77F): 1.27
Fl.P: 36-39F	UEL: 12.8%	LEL: 5.6%	MEC: NA

Class IB Flammable Liquid (See flammable and combustible liquid classes)

Incompatibilities & Reactivities

Strong oxidizers, strong alkalis, potassium hydroxide, copper [Note: Usually contains inhibitors to prevent polymerization.]

Measurement Methods

NIOSH 1003; OSHA 7

Personal Protection & Sanitation	First Aid
Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet (flamm) Change: N.R.	Eye: Irr immed Skin: Soap wash prompt Breath: Resp support Swallow: Medical attention immed (See procedures)

NIOSH Respirator Recommendations

NIOSH/OSHA 1000 ppm: SA:CF/PAPROV/CCRFOV/GMFOV/SCBAF/SAF : SCBAF:PD,PP/SAF:PD,PP:ASCBA Escape: GMFOV/SCBAE
(See symbols and codes)

Exposure Routes

Inh Ing Con

Symptoms

Irrit eyes, resp sys; CNS depres
(See abbreviations)

Target Organs

Eyes, resp sys, CNS
(See abbreviations)

DOT Emergency Response Guidebook (ERG 2004)

Guide Number: 130P

130 Flammable Liquids (Non-Polar/Water-Immiscible/Noxious)
POTENTIAL HAZARDS
FIRE OR EXPLOSION
* HIGHLY FLAMMABLE: Will be easily ignited by heat, sparks or flames.
* Vapors may form explosive mixtures with air.
* Vapors may travel to source of ignition and flash back.
* Most vapors are heavier than air. They will spread along ground and collect in low or confined areas (sewers, basements, tanks).
* Vapor explosion hazard indoors, outdoors or in sewers.
* Those substances designated with a P may polymerize explosively when heated or involved in a fire.
* Runoff to sewer may create fire or explosion hazard.
* Containers may explode when heated.
* Many liquids are lighter than water.

HEALTH
* May cause toxic effects if inhaled or absorbed through skin.
* Inhalation or contact with material may irritate or burn skin and eyes.
* Fire will produce irritating, corrosive and/or toxic gases.
* Vapors may cause dizziness or suffocation.
* Runoff from fire control or dilution water may cause pollution.

PUBLIC SAFETY
* CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, refer to appropriate telephone number listed on the inside back cover.
* Isolate spill or leak area immediately for at least 50 to 100 meters (160 to 330 feet) in all directions.
* Keep unauthorized personnel away.
* Stay upwind.
* Keep out of low areas.
* Ventilate closed spaces before entering.

PROTECTIVE CLOTHING
* Wear positive pressure self-contained breathing apparatus (SCBA).
* Structural firefighters' protective clothing will only provide limited protection.

EVACUATION
Large Spill
* Consider initial downwind evacuation for at least 300 meters (1000 feet).

Fire
* If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions.

EMERGENCY RESPONSE
FIRE
CAUTION: All these products have a very low flash point: Use of water spray when fighting fire may be inefficient.
Small Fires
* Dry chemical, CO2, water spray or regular foam.

Large Fires
* Water spray, fog or regular foam.
* Do not use straight streams.
* Move containers from fire area if you can do it without risk.

Fire involving Tanks or Car/Trailer Loads
* Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
* Cool containers with flooding quantities of water until well after fire is out.
* Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.
* ALWAYS stay away from tanks engulfed in fire.
* For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn.

SPILL OR LEAK
* ELIMINATE all ignition sources (no smoking, flares, sparks or flames

in immediate area).
* All equipment used when handling the product must be grounded.
* Do not touch or walk through spilled material.
* Stop leak if you can do it without risk.
* Prevent entry into waterways, sewers, basements or confined areas.
* A vapor suppressing foam may be used to reduce vapors.
* Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers.
* Use clean non-sparking tools to collect absorbed material.

Large Spills
* Dike far ahead of liquid spill for later disposal.
* Water spray may reduce vapor; but may not prevent ignition in closed spaces.

FIRST AID
* Move victim to fresh air.
* Call 911 or emergency medical service.
* Apply artificial respiration if victim is not breathing.
* Administer oxygen if breathing is difficult.
* Remove and isolate contaminated clothing and shoes.
* In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
* Wash skin with soap and water.
* Keep victim warm and quiet.
* Effects of exposure (inhalation, ingestion or skin contact) to substance may be delayed.
* Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves.

The letter **P** following the guide number identifies those materials which present a polymerization hazard under certain conditions. First responders at the scene of a dangerous goods incident should seek additional specific information about any material in question as soon as possible. The information received by contacting the appropriate emergency response agency, the emergency response number on the shipping document, or by consulting the information on or accompanying the shipping document, may be more specific and accurate than this guidebook in providing guidance for the materials involved.

Additional Emergency Response Information (CAMEO Data)

Non-fire Spill Response: SMALL SPILLS AND LEAKAGE: If you spill this chemical, FIRST REMOVE ALL SOURCES OF IGNITION. Then, use absorbent paper to pick up all liquid spill material. Your contaminated clothing and absorbent paper should be sealed in a vapor-tight plastic bag for eventual disposal. Solvent wash all contaminated surfaces with 60-70% ethanol followed by washing with a soap and water solution. Do not reenter the contaminated area until the Safety Officer (or other responsible person) has verified that the area has been properly cleaned.STORAGE PRECAUTIONS: You should protect this chemical from exposure to light. Keep the container tightly closed under an inert atmosphere, and store it in an explosion-proof refrigerator. STORE AWAY FROM SOURCES OF IGNITION. (NTP, 1992)

Firefighting: Fires involving this material should be controlled using a dry chemical, carbon dioxide or Halon extinguisher. A water spray may also be used. (NTP, 1992)

Reactivity: STABILITY: Solutions of this chemical in water, DMSO, 95% ethanol or acetone should be stable for 24 hours under normal lab conditions This compound will decompose on exposure to air, moisture and light.REACTIVITY: This compound will react with alkalies, difluoromethylene, dihypofluorite, and nitrogen tetraoxide. Contact with solid caustic alkalies or their concentrated solutions will form chloroacetylene which ignites in air. Avoid contact with copper and copper alloys. It is corrosive to metals unless an inhibitor has been added. Oxidation in the presence of concentrated sulfuric acid or a free radical initiator gives chloroacetyl chloride via epoxide intermediates. It is incompatible with organic peroxides. (NTP, 1992)

First Aid: EYES: First check the victim for contact lenses and remove if present. Flush victim's eyes with water or normal saline solution for 20 to 30 minutes while simultaneously calling a hospital or poison control center. Do not put any ointments, oils, or medication in the victim's eyes without specific instructions from a physician. IMMEDIATELY transport the victim after flushing eyes to a hospital even if no symptoms (such as redness or irritation) develop. SKIN: IMMEDIATELY flood affected skin with water while removing and isolating all contaminated clothing. Gently wash all affected skin areas thoroughly with soap and water. If symptoms such as redness or irritation develop, IMMEDIATELY call a physician and be prepared to transport the victim to a hospital for treatment. INHALATION: IMMEDIATELY leave the contaminated area; take deep breaths of fresh air. If symptoms (such as wheezing, coughing, shortness of breath, or burning in the mouth, throat, or chest) develop, call a physician and be prepared to transport the victim to a hospital. Provide proper respiratory protection to rescuers entering an unknown atmosphere. Whenever possible, Self-Contained Breathing Apparatus (SCBA) should be used; if not available, use a level of protection greater than or equal to that advised under Protective Clothing. INGESTION: DO NOT INDUCE VOMITING. Volatile chemicals have a high risk of being aspirated into the victim's lungs during vomiting which increases the medical problems. If the victim is conscious and not convulsing, give 1 or 2 glasses of water to dilute the chemical and IMMEDIATELY call a hospital or poison control center. IMMEDIATELY transport the victim to a hospital. If the victim is convulsing or unconscious, do not give anything by mouth, ensure that the victim's airway is open and lay the victim on his/her side with the head lower than the body. DO NOT INDUCE VOMITING. IMMEDIATELY transport the victim to a hospital. (NTP, 1992)

OSHA/EPA Occupational Chemical Database

Chemical Identification

Chemical Name: VINYLIDENE CHLORIDE

CAS #: 75-35-4 **UN No:** 1303 **Formula:** C2H2Cl2

Synonyms: 1,1-DCE; 1,1-Dichloroethene; 1,1-Dichloroethylene; VDC; Vinylidene chloride monomer; Vinylidene chloride, inhibited; Vinylidene dichloride

Physical Properties

Physical Description: Colorless liquid or gas (above 89ºF) with a mild, sweet, chloroform-like odor.

BP: 89ºF	**MW:** 96.9	**LEL:** 6.5%	**NFPA Fire Rating:** 4
FRZ/MLT: FRZ: -189ºF	**VP:** 500 mmHg	**UEL:** 15.5%	**NFPA Health Rating:** 2
FP: -2ºF	**VD:** NA		**NFPA Reactivity Rating:** 2
Sp. GR: 1.21	**IP:** 10.00 eV		**NFPA Sp. Inst.:** NA

Exposure Limits

OSHA	NIOSH	Related Information
PEL-TWA ppm: NA	**REL-TWA ppm:** NA	**AIHA Emergency Response Planning Guidelines - ERPG-1/ERPG-2/ERPG-3:** NA
PEL-TWA mg/m3: NA	**REL-TWA mg/m3:** NA	
PEL-STEL ppm: NA	**REL-STEL ppm:** NA	
PEL-STEL mg/m3: NA	**REL-STEL mg/m3:** NA	
PEL-C ppm: NA	**REL-C ppm:** NA	
PEL-C mg/m3: NA	**REL-C mg/m3:** NA	**Carcinogen Classifications:** IARC-3, NIOSH-Ca, TLV-A4
Skin Notation: No	**Skin Notation:** No	
Notes: NA	**Notes:** CARCINOGEN (Ca); REDUCE EXPOSURE TO LOWEST FEASIBLE CONCENTRATION (LOQ 0.4 ppm)	
	IDLH ppm: NA	
	IDLH mg/m3: NA	
	IDLH Notes: Ca	

NIOSH Pocket Guide to Chemical Hazards (Current through June 2006)

Vinylidene chloride			CAS: 75-35-4
Formula: CH2=CCl2			RTECS: KV9275000
Synonyms & Trade Names: 1,1-DCE; 1,1-Dichloroethene; 1,1-Dichloroethylene; VDC; Vinylidene chloride monomer; Vinylidene dichloride			DOT ID & Guide: 1303 130P (inhibited)
Exposure Limits			
NIOSH REL: Ca See Appendix A		OSHA PEL : none	
IDLH: Ca [N.D.]		Conversion: NA	
Physical Description			
Colorless liquid or gas (above 89F) with a mild, sweet, chloroform-like odor.			
MW: 96.9	BP: 89F	FRZ: -189F	Sol: 0.04%
VP: 500 mmHg	IP: 10.00 eV	RGasD: NA	Sp.Gr: 1.21
Fl.P: -2F	UEL: 15.5%	LEL: 6.5%	MEC: NA
Class IA Flammable Liquid (See flammable and combustible liquid classes)			
Incompatibilities & Reactivities			
Aluminum, sunlight, air, copper, heat [Note: Polymerization may occur if exposed to oxidizers, chlorosulfonic acid, nitric acid, or oleum. Inhibitors such as the monomethyl ether of hydroquinone are added to prevent polymerization.]			
Measurement Methods			
NIOSH 1015; OSHA 19			
Personal Protection & Sanitation		**First Aid**	
Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam		Eye: Irr immed Skin: Soap flush immed Breath: Resp support	

Remove: When wet (flamm) Change: N.R. Provide: Eyewash, Quick drench	Swallow: Medical attention immed (See procedures)

NIOSH Respirator Recommendations

NIOSH : SCBAF:PD,PP/SAF:PD,PP:ASCBA Escape: GMFOV/SCBAE
(See symbols and codes)

Exposure Routes

Inh Abs Ing Con

Symptoms

Irrit eyes, skin, throat; dizz, head, nau, dysp; liver, kidney dysfunc; pneuitis; [carc]
(See abbreviations)

Target Organs

Eyes, skin, resp sys, CNS, liver, kidneys
(See abbreviations)

DOT Emergency Response Guidebook (ERG 2004)

Guide Number: 129P

129 Flammable Liquids (Polar/Water-Miscible/Noxious)
POTENTIAL HAZARDS
FIRE OR EXPLOSION
* HIGHLY FLAMMABLE: Will be easily ignited by heat, sparks or flames.
* Vapors may form explosive mixtures with air.
* Vapors may travel to source of ignition and flash back.
* Most vapors are heavier than air. They will spread along ground and collect in low or confined areas (sewers, basements, tanks).
* Vapor explosion hazard indoors, outdoors or in sewers.
* Those substances designated with a P may polymerize explosively when heated or involved in a fire.
* Runoff to sewer may create fire or explosion hazard.
* Containers may explode when heated.
* Many liquids are lighter than water.

HEALTH
* May cause toxic effects if inhaled or absorbed through skin.
* Inhalation or contact with material may irritate or burn skin and eyes.
* Fire will produce irritating, corrosive and/or toxic gases.
* Vapors may cause dizziness or suffocation.
* Runoff from fire control or dilution water may cause pollution.

PUBLIC SAFETY
* CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, refer to appropriate telephone number listed on the inside back cover.
* Isolate spill or leak area immediately for at least 50 to 100 meters (160 to 330 feet) in all directions.
* Keep unauthorized personnel away.
* Stay upwind.
* Keep out of low areas.
* Ventilate closed spaces before entering.

PROTECTIVE CLOTHING
* Wear positive pressure self-contained breathing apparatus (SCBA).
* Structural firefighters' protective clothing will only provide limited protection.

EVACUATION
Large Spill
* Consider initial downwind evacuation for at least 300 meters (1000 feet).

Fire
* If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions.

EMERGENCY RESPONSE
FIRE
CAUTION: All these products have a very low flash point: Use of water spray when fighting fire may be inefficient.

Small Fires
* Dry chemical, CO_2, water spray or alcohol-resistant foam.
* Do not use dry chemical extinguishers to control fires involving nitromethane or nitroethane.

Large Fires
* Water spray, fog or alcohol-resistant foam.
* Do not use straight streams.
* Move containers from fire area if you can do it without risk.

Fire involving Tanks or Car/Trailer Loads
* Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
* Cool containers with flooding quantities of water until well after fire is out.
* Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.

* ALWAYS stay away from tanks engulfed in fire.
* For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn.

SPILL OR LEAK

* ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area).
* All equipment used when handling the product must be grounded.
* Do not touch or walk through spilled material.
* Stop leak if you can do it without risk.
* Prevent entry into waterways, sewers, basements or confined areas.
* A vapor suppressing foam may be used to reduce vapors.
* Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers.
* Use clean non-sparking tools to collect absorbed material.

Large Spills

* Dike far ahead of liquid spill for later disposal.
* Water spray may reduce vapor; but may not prevent ignition in closed spaces.

FIRST AID

* Move victim to fresh air.
* Call 911 or emergency medical service.
* Apply artificial respiration if victim is not breathing.
* Administer oxygen if breathing is difficult.
* Remove and isolate contaminated clothing and shoes.
* In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
* Wash skin with soap and water.
* Keep victim warm and quiet.
* Effects of exposure (inhalation, ingestion or skin contact) to substance may be delayed.
* Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves.

The letter **P** following the guide number identifies those materials which present a polymerization hazard under certain conditions. First responders at the scene of a dangerous goods incident should seek additional specific information about any material in question as soon as possible. The information received by contacting the appropriate emergency response agency, the emergency response number on the shipping document, or by consulting the information on or accompanying the shipping document, may be more specific and accurate than this guidebook in providing guidance for the materials involved.

Additional Emergency Response Information (CAMEO Data)

Non-fire Spill Response: Keep sparks, flames, and other sources of ignition away. Keep material out of water sources and sewers. Build dikes to contain flow as necessary. Attempt to stop leak if without undue personnel hazard. Use water spray to knock-down vapors. Combustion products include corrosive or toxic vapors. Land spill: Dig a pit, pond, lagoon, holding area to contain liquid or solid material. Dike surface flow using soil, sand bags, foamed polyurethane, or foamed concrete. Absorb bulk liquid with fly ash, cement powder, or commercial sorbents. Apply approriate foam to diminish vapor and fire hazard. Water spill: Use natural deep water pockets, excavated lagoons, or sand bag barriers to trap material at bottom. Inject "universal" gelling agent to solidify encircled spill and increase effectiveness of booms. Remove trapped material with suction hoses. Use mechanical dredges or lifts to remove immobilized masses of pollutants and precipitates. (AAR, 1999)

Firefighting: Do not extinguish fire unless flow can be stopped. Use water in flooding quantities as fog. Solid streams of water may be ineffective. Cool all affected containers with flooding quantities of water. Apply water from as far a distance as possible. Use foam, dry chemical, or carbon dioxide. (AAR, 1999)

Reactivity: CHEMICAL PROFILE: Peroxidizable monomer may initiate exothermic polymerization of the bulk material (Bretherick 1979. p. 160, 187). Mixing vinylidene chloride in equal molar portions in a closed container with any of the following substances caused the temperature and pressure to increase:chlorosulfonic acid, nitric acid, or oleum (NFPA 1991). (REACTIVITY, 1999)

First Aid: EYES: First check the victim for contact lenses and remove if present. Flush victim's eyes with water or normal saline solution for 20 to 30 minutes while simultaneously calling a hospital or poison control center. Do not put any ointments, oils, or medication in the victim's eyes without specific instructions from a physician. IMMEDIATELY transport the victim after flushing eyes to a hospital even if no symptoms (such as redness or irritation) develop. SKIN: IMMEDIATELY flood affected skin with water while removing and isolating all contaminated clothing. Gently wash all affected skin areas thoroughly with soap and water. IMMEDIATELY call a hospital or poison control center even if no symptoms (such as redness or irritation) develop. IMMEDIATELY transport the victim to a hospital for treatment after washing the affected areas. INHALATION: IMMEDIATELY leave the contaminated area; take deep breaths of fresh air. IMMEDIATELY call a physician and be prepared to transport the victim to a hospital even if no symptoms (such as wheezing, coughing, shortness of Breathing, or burning in the mouth, throat, or chest) develop. Provide proper respiratory protection to rescuers entering an unknown atmosphere. Whenever possible, Self-Contained Breathing Apparatus (SCBA) should be used; if not available, use a level of protection greater than or equal to that advised under Protective Clothing. INGESTION: DO NOT INDUCE VOMITING. Volatile chemicals have a high risk of being aspirated into the victim's lungs during vomiting which increases the medical problems. If the victim is conscious and not convulsing, give 1 or 2 glasses of water to dilute the chemical and IMMEDIATELY call a hospital or poison control center. IMMEDIATELY transport the victim to a hospital. If the victim is convulsing or unconscious, do not give anything by mouth, ensure that the victim's airway is open and lay the victim on his/her side with the Headache lower than the body. DO NOT INDUCE VOMITING. IMMEDIATELY transport the victim to a hospital. OTHER: Since this chemical is a known or suspected carcinogen you should contact a physician for advice regarding the possible long term health effects and potential recommendation for medical monitoring. Recommendations from the physician will depend upon the specific compound, its chemical, physical and toxicity properties, the exposure level, length of exposure, and the route of exposure. (NTP, 1992)

U.S. Department of Labor | Occupational Safety & Health Administration | 200 Constitution Ave., NW, Washington, DC 20210
Telephone: 800-321-OSHA (6742) | TTY: 877-889-5627
www.OSHA.gov

OSHA/EPA Occupational Chemical Database

Chemical Identification

Chemical Name: 1,1-DICHLOROETHANE

CAS #: 75-34-3 **UN No:** 2362 **Formula:** C2H4Cl2

Synonyms: Asymmetrical dichloroethane; Ethylidene chloride; 1,1-Ethylidene dichloride

Physical Properties

Physical Description: Colorless, oily liquid with a chloroform-like odor.

BP: 135ºF	**MW:** 99.0	**LEL:** 5.4%	**NFPA Fire Rating:** 3
FRZ/MLT: FRZ: -143ºF	**VP:** 182 mmHg	**UEL:** 11.4%	**NFPA Health Rating:** 2
FP: 2ºF	**VD:** NA		**NFPA Reactivity Rating:** 0
Sp. GR: 1.18	**IP:** 11.06 eV		**NFPA Sp. Inst.:** NA

Exposure Limits

OSHA	NIOSH	Related Information
PEL-TWA ppm: 100	**REL-TWA ppm:** 100	**AIHA Emergency Response Planning Guidelines - ERPG-1/ERPG-2/ERPG-3:** NA
PEL-TWA mg/m3: 400	**REL-TWA mg/m3:** 400	
PEL-STEL ppm: NA	**REL-STEL ppm:** NA	
PEL-STEL mg/m3: NA	**REL-STEL mg/m3:** NA	
PEL-C ppm: NA	**REL-C ppm:** NA	
PEL-C mg/m3: NA	**REL-C mg/m3:** NA	**Carcinogen Classifications:** TLV-A4
Skin Notation: No	**Skin Notation:** No	
Notes: NA	**Notes:** NA	
	IDLH ppm: 3000	
	IDLH mg/m3: NA	
	IDLH Notes: NA	

NIOSH Pocket Guide to Chemical Hazards (Current through June 2006)

1,1-Dichloroethane			CAS: 75-34-3
Formula: CHCl2CH3			RTECS: KI0175000
Synonyms & Trade Names: Asymmetrical dichloroethane; Ethylidene chloride; 1,1-Ethylidene dichloride			DOT ID & Guide: 2362 130
Exposure Limits			
NIOSH REL: TWA 100 ppm (400 mg/m3) See Appendix C (Chloroethanes)		OSHA PEL: TWA 100 ppm (400 mg/m3)	
IDLH: 3000 ppm		Conversion: 1 ppm = 4.05 mg/m3	
Physical Description			
Colorless, oily liquid with a chloroform-like odor.			
MW: 99.0	BP: 135F	FRZ: -143F	Sol: 0.6%
VP: 182 mmHg	IP: 11.06 eV	RGasD: NA	Sp.Gr: 1.18
Fl.P: 2F	UEL: 11.4%	LEL: 5.4%	MEC: NA
Class IB Flammable Liquid (See flammable and combustible liquid classes)			
Incompatibilities & Reactivities			
Strong oxidizers, strong caustics			
Measurement Methods			
NIOSH 1003; OSHA 7			
Personal Protection & Sanitation		**First Aid**	
Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet (flamm) Change: N.R.		Eye: Irr immed Skin: Soap flush prompt Breath: Resp support Swallow: Medical attention immed (See procedures)	

NIOSH Respirator Recommendations

NIOSH/OSHA 1000 ppm: SA 2500 ppm: SA:CF 3000 ppm: SCBAF/SAF : SCBAF:PD,PP/SAF:PD,PP:ASCBA Escape: GMFOV/SCBAE
(See symbols and codes)

Exposure Routes

Inh Ing Con

Symptoms

Irrit skin; CNS depres; liver, kidney, lung damage
(See abbreviations)

Target Organs

Skin, liver, kidneys, lungs, CNS
(See abbreviations)

DOT Emergency Response Guidebook (ERG 2004)

Guide Number: 130

130 Flammable Liquids (Non-Polar/Water-Immiscible/Noxious)
POTENTIAL HAZARDS
FIRE OR EXPLOSION
* HIGHLY FLAMMABLE: Will be easily ignited by heat, sparks or flames.
* Vapors may form explosive mixtures with air.
* Vapors may travel to source of ignition and flash back.
* Most vapors are heavier than air. They will spread along ground and collect in low or confined areas (sewers, basements, tanks).
* Vapor explosion hazard indoors, outdoors or in sewers.
* Those substances designated with a P may polymerize explosively when heated or involved in a fire.
* Runoff to sewer may create fire or explosion hazard.
* Containers may explode when heated.
* Many liquids are lighter than water.

HEALTH
* May cause toxic effects if inhaled or absorbed through skin.
* Inhalation or contact with material may irritate or burn skin and eyes.
* Fire will produce irritating, corrosive and/or toxic gases.
* Vapors may cause dizziness or suffocation.
* Runoff from fire control or dilution water may cause pollution.

PUBLIC SAFETY
* CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, refer to appropriate telephone number listed on the inside back cover.
* Isolate spill or leak area immediately for at least 50 to 100 meters (160 to 330 feet) in all directions.
* Keep unauthorized personnel away.
* Stay upwind.
* Keep out of low areas.
* Ventilate closed spaces before entering.

PROTECTIVE CLOTHING
* Wear positive pressure self-contained breathing apparatus (SCBA).
* Structural firefighters' protective clothing will only provide limited protection.

EVACUATION
Large Spill
* Consider initial downwind evacuation for at least 300 meters (1000 feet).

Fire
* If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions.

EMERGENCY RESPONSE
FIRE
CAUTION: All these products have a very low flash point: Use of water spray when fighting fire may be inefficient.
Small Fires
* Dry chemical, CO2, water spray or regular foam.

Large Fires
* Water spray, fog or regular foam.
* Do not use straight streams.
* Move containers from fire area if you can do it without risk.

Fire involving Tanks or Car/Trailer Loads
* Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
* Cool containers with flooding quantities of water until well after fire is out.
* Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.
* ALWAYS stay away from tanks engulfed in fire.
* For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn.

SPILL OR LEAK
* ELIMINATE all ignition sources (no smoking, flares, sparks or flames

in immediate area).
* All equipment used when handling the product must be grounded.
* Do not touch or walk through spilled material.
* Stop leak if you can do it without risk.
* Prevent entry into waterways, sewers, basements or confined areas.
* A vapor suppressing foam may be used to reduce vapors.
* Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers.
* Use clean non-sparking tools to collect absorbed material.

Large Spills
* Dike far ahead of liquid spill for later disposal.
* Water spray may reduce vapor; but may not prevent ignition in closed spaces.

FIRST AID
* Move victim to fresh air.
* Call 911 or emergency medical service.
* Apply artificial respiration if victim is not breathing.
* Administer oxygen if breathing is difficult.
* Remove and isolate contaminated clothing and shoes.
* In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
* Wash skin with soap and water.
* Keep victim warm and quiet.
* Effects of exposure (inhalation, ingestion or skin contact) to substance may be delayed.
* Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves.

Additional Emergency Response Information (CAMEO Data)

Non-fire Spill Response: Keep sparks, flames, and other sources of ignition away. Keep material out of water sources and sewers. Build dikes to contain flow as necessary. Attempt to stop leak if without undue personnel hazard. Use water spray to knock-down vapors. (AAR, 1999)

Firefighting: Do not extinguish fire unless flow can be stopped. Use water in flooding quantities as fog. Solid streams of water may be ineffective. Cool all affected containers with flooding quantities of water. Use "alcohol" foam, dry chemical or carbon dioxide. Keep run-off water out of sewers and water sources. (AAR, 1999)

Reactivity: STABILITY: This compound is heat sensitive. Solutions of this chemical in water, DMSO, 95% ethanol or acetone should be stable for 24 hours under normal lab conditions.REACTIVITY: This chemical can react vigorously with oxidizing materials. It is incompatible with strong bases. Contact with strong caustics will cause formation of flammable and toxic gas. It will attack some forms of plastics, rubber and coatings. (NTP, 1992)

First Aid: EYES: First check the victim for contact lenses and remove if present. Flush victim's eyes with water or normal saline solution for 20 to 30 minutes while simultaneously calling a hospital or poison control center. Do not put any ointments, oils, or medication in the victim's eyes without specific instructions from a physician. IMMEDIATELY transport the victim after flushing eyes to a hospital even if no symptoms (such as redness or irritation) develop. SKIN: IMMEDIATELY flood affected skin with water while removing and isolating all contaminated clothing. Gently wash all affected skin areas thoroughly with soap and water. If symptoms such as redness or irritation develop, IMMEDIATELY call a physician and be prepared to transport the victim to a hospital for treatment. INHALATION: IMMEDIATELY leave the contaminated area; take deep breaths of fresh air. If symptoms (such as wheezing, coughing, shortness of breath, or burning in the mouth, throat, or chest) develop, call a physician and be prepared to transport the victim to a hospital. Provide proper respiratory protection to rescuers entering an unknown atmosphere. Whenever possible, Self-Contained Breathing Apparatus (SCBA) should be used; if not available, use a level of protection greater than or equal to that advised under Protective Clothing. INGESTION: DO NOT INDUCE VOMITING. Volatile chemicals have a high risk of being aspirated into the victim's lungs during vomiting which increases the medical problems. If the victim is conscious and not convulsing, give 1 or 2 glasses of water to dilute the chemical and IMMEDIATELY call a hospital or poison control center. IMMEDIATELY transport the victim to a hospital. If the victim is convulsing or unconscious, do not give anything by mouth, ensure that the victim's airway is open and lay the victim on his/her side with the head lower than the body. DO NOT INDUCE VOMITING. IMMEDIATELY transport the victim to a hospital. (NTP, 1992)

OSHA/EPA Occupational Chemical Database

Chemical Identification

Chemical Name: 1,1,1-TRICHLOROETHANE

CAS #: 71-55-6 **UN No:** 2831 **Formula:** C2H3Cl3

Synonyms: Chlorothene; 1,1,1-Trichloroethane; 1,1,1-Trichloroethane (stabilized)

Physical Properties

Physical Description: Colorless liquid with a mild, chloroform-like odor.

BP: 165ºF	**MW:** 133.4	**LEL:** 7.5%	**NFPA Fire Rating:** 1
FRZ/MLT: FRZ: -23ºF	**VP:** 100 mmHg	**UEL:** 12.5%	**NFPA Health Rating:** 2
FP: NA	**VD:** NA		**NFPA Reactivity Rating:** 0
Sp. GR: 1.34	**IP:** 11.00 eV		**NFPA Sp. Inst.:** NA

Exposure Limits

OSHA	NIOSH	Related Information
PEL-TWA ppm: 350	**REL-TWA ppm:** NA	**AIHA Emergency Response Planning Guidelines - ERPG-1/ERPG-2/ERPG-3:** 350 ppm / 700 ppm / 3500 ppm
PEL-TWA mg/m3: 1900	**REL-TWA mg/m3:** NA	
PEL-STEL ppm: NA	**REL-STEL ppm:** NA	
PEL-STEL mg/m3: NA	**REL-STEL mg/m3:** NA	
PEL-C ppm: NA	**REL-C ppm:** 350	
PEL-C mg/m3: NA	**REL-C mg/m3:** 1900	**Carcinogen Classifications:** IARC-3, TLV-A4
Skin Notation: No	**Skin Notation:** No	
Notes: NA	**Notes:** 15 MINUTE CEILING	
	IDLH ppm: 700	
	IDLH mg/m3: NA	
	IDLH Notes: NA	

NIOSH Pocket Guide to Chemical Hazards (Current through June 2006)

Methyl chloroform			CAS: 71-55-6
Formula: CH3CCl3			RTECS: KJ2975000
Synonyms & Trade Names: Chlorothene; 1,1,1-Trichloroethane; 1,1,1-Trichloroethane (stabilized)			DOT ID & Guide: 2831 160
Exposure Limits			
NIOSH REL: C 350 ppm (1900 mg/m3) [15-minute] See Appendix C (Chloroethanes)		OSHA PEL : TWA 350 ppm (1900 mg/m3)	
IDLH: 700 ppm		Conversion: 1 ppm = 5.46 mg/m3	
Physical Description			
Colorless liquid with a mild, chloroform-like odor.			
MW: 133.4	BP: 165F	FRZ: -23F	Sol: 0.4%
VP: 100 mmHg	IP: 11.00 eV	RGasD: NA	Sp.Gr: 1.34
Fl.P: ?	UEL: 12.5%	LEL: 7.5%	MEC: NA
Combustible Liquid, but burns with difficulty. (See flammable and combustible liquid classes)			
Incompatibilities & Reactivities			
Strong caustics; strong oxidizers; chemically-active metals such as zinc, aluminum, magnesium powders, sodium & potassium; water [Note: Reacts slowly with water to form hydrochloric acid.]			
Measurement Methods			
NIOSH 1003			
Personal Protection & Sanitation		**First Aid**	
Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet or contam Change: N.R.		Eye: Irr immed Skin: Soap wash prompt Breath: Resp support Swallow: Medical attention immed (See procedures)	

NIOSH Respirator Recommendations

NIOSH/OSHA 700 ppm: SA*/SCBAF : SCBAF:PD,PP/SAF:PD,PP:ASCBA Escape: GMFOV/SCBAE
(See symbols and codes)

Exposure Routes

Inh Ing Con

Symptoms

Irrit eyes, skin; head, lass, CNS depres, poor equi; derm; card arrhy; liver damage
(See abbreviations)

Target Organs

Eyes, skin, CNS, CVS, liver
(See abbreviations)

DOT Emergency Response Guidebook (ERG 2004)

Guide Number: 160

160 Halogenated Solvents
POTENTIAL HAZARDS
HEALTH
* Vapors may cause dizziness or suffocation.
* Exposure in an enclosed area may be very harmful.
* Contact may irritate or burn skin and eyes.
* Fire may produce irritating and/or toxic gases.
* Runoff from fire control or dilution water may cause pollution.

FIRE OR EXPLOSION
* Some of these materials may burn, but none ignite readily.
* Most vapors are heavier than air.
* Air/vapor mixtures may explode when ignited.
* Container may explode in heat of fire.

PUBLIC SAFETY
* CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, refer to appropriate telephone number listed on the inside back cover.
* Isolate spill or leak area immediately for at least 25 to 50 meters (80 to 160 feet) in all directions.
* Keep unauthorized personnel away.
* Stay upwind.
* Many gases are heavier than air and will spread along ground and collect in low or confined areas (sewers, basements, tanks).
* Keep out of low areas.
* Ventilate closed spaces before entering.

PROTECTIVE CLOTHING
* Wear positive pressure self-contained breathing apparatus (SCBA).
* Structural firefighters' protective clothing will only provide limited protection.

EVACUATION
Large Spill
* Consider initial downwind evacuation for at least 100 meters (330 feet).

Fire
* If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions.

EMERGENCY RESPONSE
FIRE
Small Fires
* Dry chemical, CO2 or water spray.

Large Fires
* Dry chemical, CO2, alcohol-resistant foam or water spray.
* Move containers from fire area if you can do it without risk.
* Dike fire control water for later disposal; do not scatter the material.

Fire involving Tanks or Car/Trailer Loads
* Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
* Cool containers with flooding quantities of water until well after fire is out.
* Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.
* ALWAYS stay away from tanks engulfed in fire.

SPILL OR LEAK
* ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area).
* Stop leak if you can do it without risk.

Small Liquid Spills
* Take up with sand, earth or other noncombustible absorbent material.

Large Spills
* Dike far ahead of liquid spill for later disposal.
* Prevent entry into waterways, sewers, basements or confined areas.

FIRST AID

* Move victim to fresh air.
* Call 911 or emergency medical service.
* Apply artificial respiration if victim is not breathing.
* Administer oxygen if breathing is difficult.
* Remove and isolate contaminated clothing and shoes.
* In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
* For minor skin contact, avoid spreading material on unaffected skin.
* Wash skin with soap and water.
* Keep victim warm and quiet.
* Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves.

Additional Emergency Response Information (CAMEO Data)

Non-fire Spill Response: Keep material out of water sources and sewers. Attempt to stop leak if without undue personnel hazard. Use water spray to knock-down vapors. Land spill: Dig a pit, pond, lagoon, holding area to contain liquid or solid material. Dike surface flow using soil, sand bags, foamed polyurethane, or foamed concrete. Absorb bulk liquid with fly ash, cement powder, or commercial sorbents. Water spill: Use natural barriers or oil spill control booms to limit spill travel. Use natural deep water pockets, excavated lagoons, or sand bag barriers to trap material at bottom. Remove trapped material with suction hoses. (AAR, 1999)

Firefighting: Cool all affected containers with flooding quantities of water. Apply water from as far a distance as possible. Extinguish fire using agent suitable for type of surrounding fire. (Material itself does not burn or burns with difficulty.) Keep run-off water out of sewers and water sources. (AAR, 1999)

Reactivity: STABILITY: This chemical is hygroscopic. It is oxidized by atmospheric oxygen at high temperatures. It is reactive to sunlight at high altitudes. Solutions of this chemical in anhydrous DMSO or ethanol should be stable for 24 hours under normal lab conditions.REACTIVITY: This chemical decomposes in the presence of chemically active metals. This includes aluminum, magnesium and their alloys. It will react violently with dinitrogen tetraoxide, oxygen, liquid oxygen, sodium and sodium-potassium alloys. It will also react violently with acetone, zinc and nitrates. It can react with sodium hydroxide. It is incompatible with strong oxidizers and strong bases. Mixtures with potassium or its alloys are shock-sensitive and may explode on light impact. This chemical can react with an aqueous suspension of calcium hydroxide, and with chlorine in sunlight. It will attack some forms of plastics, rubber and coatings. Upon contact with hot metal or on exposure to ultraviolet radiation, it will decompose to form irritant gases. A cobalt/molybdenum-alumina catalyst will generate a substantial exotherm on contact with its vapor at ambient temperatures. Hazardous reactions also occur with (aluminum oxide + heavy metals). (NTP, 1992)

First Aid: EYES: First check the victim for contact lenses and remove if present. Flush victim's eyes with water or normal saline solution for 20 to 30 minutes while simultaneously calling a hospital or poison control center. Do not put any ointments, oils, or medication in the victim's eyes without specific instructions from a physician. IMMEDIATELY transport the victim after flushing eyes to a hospital even if no symptoms (such as redness or irritation) develop. SKIN: IMMEDIATELY flood affected skin with water while removing and isolating all contaminated clothing. Gently wash all affected skin areas thoroughly with soap and water. If symptoms such as redness or irritation develop, IMMEDIATELY call a physician and be prepared to transport the victim to a hospital for treatment. INHALATION: IMMEDIATELY leave the contaminated area; take deep breaths of fresh air. If symptoms (such as wheezing, coughing, shortness of breath, or burning in the mouth, throat, or chest) develop, call a physician and be prepared to transport the victim to a hospital. Provide proper respiratory protection to rescuers entering an unknown atmosphere. Whenever possible, Self-Contained Breathing Apparatus (SCBA) should be used; if not available, use a level of protection greater than or equal to that advised under Protective Clothing. INGESTION: DO NOT INDUCE VOMITING. Volatile chemicals have a high risk of being aspirated into the victim's lungs during vomiting which increases the medical problems. If the victim is conscious and not convulsing, give 1 or 2 glasses of water to dilute the chemical and IMMEDIATELY call a hospital or poison control center. IMMEDIATELY transport the victim to a hospital. If the victim is convulsing or unconscious, do not give anything by mouth, ensure that the victim's airway is open and lay the victim on his/her side with the head lower than the body. DO NOT INDUCE VOMITING. IMMEDIATELY transport the victim to a hospital. (NTP, 1992)

Attachment D

Air Monitoring Form

ISTR Program
Solvents Recovery Service of New England

Air Monitoring Report Form

Date:

Activities:

Equipment:

Sample Location	Time	Background	Results

Conducted by: _____

Attachment E

Health and Safety Plan Pre-Entry Briefing Attendance Form

Health and Safety Plan Pre-Entry Briefing Attendance Form

ISTR Program
Solvents Recovery Service of New England

Briefing Conducted By: _____

Date Performed: _____

Printed Name	Signature	Representing

Attachment F

Incident Report Form

Incident Report # IR-_____

TerraTherm Incident Report Form

Background

Date of Incident: _____ **Time of Incident:** _____ AM / PM

Type of Incident (Check One): ☐ Near Miss ☐ First Aid ☐ Medical Treatment ☐ Property Damage ☐ Accident ☐ Other

If Hospitalized, Name of Institution: _____ **Transported By:** _____

If transported by ambulance, list company name; if transported by individual, list individual's name.

Name of Person Injured: _____ **Injured Part of Body:** _____

Type of Injury (Check One):

☐ Strain/Sprain ☐ Bruising ☐ Burn/Scald ☐ Foreign Body
☐ Fracture ☐ Scratch/Abrasion ☐ Dislocation ☐ Chemical Reaction
☐ Laceration/Cut ☐ Amputation ☐ Internal ☐ Other (Specify): _____

The Incident

Description

Describe the events leading up to the incident. Identify any equipment/materials involved.

Causes

Identify any possible causes of the incident (e.g., malfunction of equipment, misuse of materials).

Prevention

What action has or will be taken to prevent a recurrence?

Investigation

Report Completed By: _____ **Date:** _____
Print Name Signature

Witness(es) to Accident:

_____ **Date:** _____
Print Name Signature

_____ **Date:** _____
Print Name Signature

ALL INCIDENTS MUST BE REPORTED IMMEDIATELY TO COMPANY SAFETY MANAGER
THIS FORM MUST BE FORWARDED TO FITCHBURG OFFICE NO LATER THAN 24 HOURS AFTER THE INCIDENT