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NAS JACKSONVILLE
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SITE SPECIFIC HEALTH AND SAFETY PLAN FOR OPERABLE UNIT 3 (OU 3) NAS JACKSONVILLE FL

10/1/1994

ABB ENVIRONMENTAL

OU-3 SITE SPECIFIC HEALTH AND SAFETY PLAN

FOR

NAVAL AIR STATION
JACKSONVILLE, FLORIDA

JULY 1993

Prepared by:

ABB ENVIRONMENTAL SERVICES, INC.
WASHINGTON, DC

Prepared for:

U.S. DEPARTMENT OF THE NAVY
SOUTHERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
CHARLESTON, SOUTH CAROLINA

APPENDIX B

SITE-SPECIFIC
HEALTH AND SAFETY PLAN

NAS Jacksonville, FL

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NAS Jacksonville, FL

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1.0 GENERAL

1.1 SCOPE AND PURPOSE. This Health and Safety Plan (HASP) has been prepared in conformance with the ABB Environmental Services Inc. (ABB-ES) Generic HASP developed under the Comprehensive Long-Term Environmental Action - Navy (CLEAN) District I Contract (CLEAN HASP) and is intended to meet the requirements of 29 Code of Federal Regulations (CFR) 1910.120. As such, the HASP addresses those activities associated with field operations for this project and is supplemental to the NAS Jacksonville HASP. Compliance with this HASP is required for all ABB-ES personnel, contractor personnel, or third parties entering the Site.

1.2 PROJECT PERSONNEL.

1.2.1 Task Order Manager The Task Order Manager (TOM), is the individual with overall project management responsibilities. Those responsibilities as they relate to health and safety include provision for the development of this site-specific HASP, the necessary resources to meet requirements of this HASP, the coordination of staff assignments to ensure that personnel assigned to the project meet medical and training requirements, and the means and materials necessary to resolve any health and safety issues that are identified or that develop on the project.

1.2.2 Field Operations Leader The Field Operations Leader has vested authority from the TOM to carry out day-to-day site operations.

1.2.3 Health and Safety Officer The Health and Safety Officer (HSO) will have at least an indirect line of reporting to the Health and Safety Manager (HSM) through the Health and Safety Supervisor (HSS) for the duration of his assignment as project HSO. The HSO is responsible for developing and implementing this site-specific HASP in accordance with the CLEAN HASP. The HSO will investigate all accidents, illnesses, and incidents occurring on site. The HSO will also conduct safety briefings and site-specific training for on-site personnel. As necessary, the HSO will accompany all USEPA, Occupational Safety and Health Administration (OSHA), or other governmental agency personnel visiting an ABB-ES site in response to health and safety issues. The HSO, in consultation with the HSS or HSM, is responsible for updating and modifying this HASP as site or environmental conditions change. Additional description of the duties of the HSM, HSS and HSO are provided in Section 1 of the ABB-ES generic HASP.

1.2.4 Field Engineer/Scientist This category includes engineers, scientist, and technicians who will perform site reconnaissance, drilling supervision, soil sampling, groundwater sampling and ecological surveys.

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OU-3 Site-Specific Health and Safety Plan
NAS Jacksonville, FL

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1.3 TRAINING. Training is defined in Chapter 3.0 of the CLEAN HASP. All personnel entering potentially contaminated areas at this site must meet the requirements of 29 CFR 1910.120. Personnel without the required training **will not be permitted** in any area with potential for exposure to toxic substances or harmful physical agents (i.e., downrange). The ABB-ES training program is described in Section 3.0 of the ABB-ES generic HASP.

1.4 MEDICAL SURVEILLANCE. All personnel entering potentially contaminated areas of this site will be medically qualified for site assignment through a medical surveillance program outlined in the ABB-ES Generic HASP. Personnel who have not received medical clearance **will not be permitted** in any area with potential for exposure to toxic substances or harmful physical agents (i.e., downrange). Chapter 4.0 of the CLEAN HASP contains further information on Medical Surveillance Programs. ABB-ES' Medical Surveillance Program is described in Section 2.0 of the ABB-ES generic HASP.

2.0 TASK ANALYSIS

2.1 SITE NAME, LOCATION, AND SIZE. Naval Air Station, Jacksonville, FL is located in the southern portion of Duval County approximately nine miles south of downtown Jacksonville. NAS Jacksonville covers approximately 3,800 acres on the west bank of the St. Johns River, upriver from downtown Jacksonville.

This Hasp has be developed for use while investigating Operable Unit 3 (OU-3) at NAS Jacksonville, FL. OU-3 is the primary site on base that supports a Naval Aviation Depot (NADEP). NADEP is one of the five major tenants of NAS Jacksonville and occupies approximately fifty buildings along the northeastern side of the facility. The activities carried out at OU-3 include stripping, testing, and retrofitting long-range submarine and ground support aircraft. Work includes removal of propellers, control surfaces, and engines. After removal of these items, the airframe is stripped and sprayed with corrosion inhibitors before inspection and repainting. Engines are disassembled, inspected, and moving parts are inspected for cracks and, if necessary, electroplated before assembly and installation on the airframe.

Field work at OU-3 will include the following tasks:

- site walkovers
- locational surveys
- ecological inventories
- subsurface soil sampling
- collection of geotechnical information with piezometric cone penetrometer testing (PCPT) equipment
- groundwater sampling using PCPT equipment
- piezometer well installation

The hazardous substances, risks, and protective measures identified and described in the following subsections apply to all these tasks.

2.2 HAZARDOUS SUBSTANCES. Based on available data, the contaminants of concern known or suspected to be present on site, along with any established exposure limits for those substances, are listed in Table 2-1.

2.3 SITE RISKS. The following are the health hazards and safety hazards that are anticipated to be encountered at the site.

TABLE 2-1
CONTAMINANTS OF CONCERN

OU-3 SITE SPECIFIC HEALTH AND SAFETY PLAN
NAS JACKSONVILLE, FL

CONSTITUENT	MAX.[1] REP. CONC.	PEL/TLV[2]	MEDIA[3]
Volatiles			
Benzene	.001	1	GW
1,1-Dichloroethane	1.1	300	GW
1,1-Dichloroethene	1.3	1	GW
1,2-Dichloroethane	5.7	1	GW
Trans 1,2-Dichloroethene	3.5	200	GW
1,1,1-Trichloroethane	6500	350	GW
1,1,2-Trichloroethane	170	10	GW
Trichloroethene	9.6	50	GW
Bromodichloromethane	7	-	GW
Toluene	66	100	GW
Carbon Tetrachloride	2	2	GW
Chloroform	2	2	GW
Ethyl benzene	4	100	GW
Semi-Volatiles			
2,4-dimethyl phenol	5.1	-	GW

Notes:

1.Maximum reported concentration ug/l (water).
2.Permissible exposure limit/threshold limit value (parts per million).
3.Ground water, surface, water, soil, or air.

2.3.1 Health Hazards Personnel may be exposed to volatile and/or semi-volatile contaminants. Hazardous substance information forms (Chemical Hazards Response Information System, CHRIS) for the contaminants of concern are contained in Appendix B.1 of this HASP. All activities at this site will be conducted in unconfined areas. This will help minimize the chances of exposure of on-site personnel to high vapor concentrations of any contaminants.

2.3.2 Safety Hazards Safety Hazards include those hazards that personnel may be exposed to that are unrelated to hazardous wastes. These include hazards such as heat stress, operation of and presence around heavy equipment, lifting of objects, and vehicle traffic. Extreme caution should be exhibited by all personnel while conducting work around drill rigs, DPT rigs, and other heavy equipment. During hot days, personnel should take time to drink fluids and cool off to avoid overheating and symptoms related to heat stress. Lifting of heavy objects should be done with caution. Personnel should assist one another with moving heavy objects or use the appropriate equipment to accomplish these tasks.

Power substations, powerlines, underground utilities, and underground pipelines are to be avoided during drilling operations. Necessary work permits for activities will be obtained from the Public Works Department or the appropriate department (e.g., fire department, etc.).

2.3.3 Health and Safety Assessment Based on the available information (nature of the work, potential on-site chemicals and their properties, exposure limits, etc.), hazards associated with conducting the described field work are considered to be low, assuming appropriate health and safety practices are maintained.

2.4 PROTECTIVE MEASURES. The following are the protective measures that will be used at the site.

2.4.1 Engineering Controls Whenever needed, engineering controls (e.g., fans to blow volatilized chemicals away from the work area) will be used. Engineering controls are described in more detail in Section 7.4 of the ABB-ES generic HASP, however it is anticipated that engineering controls will not be necessary during the scoping field work.

2.4.2 Levels of Protection Level D Protection will only be used when the atmosphere contains no known hazard, all potential airborne contaminants can be monitored for, and work functions preclude splash, immersion, or the potential for unexpected inhalation or contact with hazardous levels of any chemical. It is anticipated that work at OU-3 may require limited modified

Level D protection. Modified Level D is Level D protection with the addition of chemical protective clothing. Modified Level D does not include respiratory protection.

Higher levels of personal protection will be used as dictated by conditions discovered in the field and as directed by the HSO. Guidance on selection of the level of personal protection is provided in Subsection 2.5.1 of this HASP and Section 6.0 of the ABB-ES generic HASP.

2.5 MONITORING. It is intended that real time monitoring instrumentation will be used to monitor the work environment in order to ensure the appropriate level of protection for the site team.

2.5.1 Air Sampling To the extent feasible, the presence of airborne contaminants will be evaluated through the use of direct reading instrumentation. Information gathered will be used to ensure the adequacy of the levels of protection being used at the site, and may be used as the basis for upgrading or downgrading the levels of protection in conformance with action levels provided in this HASP and at the direction of the site HSO.

A respirable dust monitor will be used at the site in areas where semivolatile contamination and dry dusty conditions exists. If the monitor reads ≥ 5 mg/m^3, the field team will withdraw from the site.

A Foxboro Organic Vapor Analyzer 128 (OVA) and draeger tubes will be used at the site. Start work at modified D. If heat stress is a factor, the HSO may decide to start work at level D. If the FID or draeger tube reading exceed background, modified level D will be required.

Monitor the breathing zone continuously with an FID. If the FID reads greater than background, monitor with a vinyl chloride 0.5/a draeger tube. If vinyl chloride levels are equal to or greater than 0.5 ppm, upgrade to level B. If vinyl chloride remains less than 0.5 ppm, continue at modified level D until the FID reads 5 ppm, upgrade to level C until the FID reads greater than or equal to 70 ppm then upgrade to level B.

Level D or (modified) is acceptable if:

- FID < 5 ppm; or
- vinyl chloride 0.5/a draeger tube < 0.5 ppm.

Level C required if:

- FID reads between 5 and 70 ppm, and /or
- vinyl chloride reads <0.5 ppm.

Level b required if:

- FID reads ≥ 70 ppm, and
- vinyl chloride reads ≥ 0.5 ppm

Refer to Chapter 7.0 of the CLEAN HASP for information on the calibration and maintenance of the equipment.

No intrusive work will be started on this site without first clearing the area of proposed work with a radiation meter to verify that no radiation danger exists.

Additional monitoring equipment that may be utilized at the site are described in Section 7.3 of the ABB-ES generic HASP.

2.5.2 Personal Monitoring Personal monitoring will be undertaken to characterize the personal exposure of high risk employees to the hazardous substances they may encounter on-site. Personal monitoring will be conducted on a representative basis. Personnel who conduct a high risk work task will be noted in field logs. Thermoluminescent dosimetry body badges will be used by all workers at the site.

3.0 SITE CONTROL

3.1 ZONATION. The general zonation protocols that should be employed at hazardous waste sites are described in Chapter 8.0 of the CLEAN HASP. The site-specific zonation that will be used for this project is described as follows:

Due to the nature of the work (multiple soil borings and DPT groundwater sampling throughout the study area) and the properties of the potential chemicals found on-site, typical exclusion, contamination reduction, and support zones are not necessary or practical at all locations, especially because the surface of the area is primarily covered by concrete pavement. Therefore, where appropriate, a "floating" exclusion zone in the perimeter of the sampling site will be established to eliminate access to the area by individuals not working on the project or involved in the assessment work. The perimeter will be at least 30 feet in radius and moved accordingly as the assessment points are moved.

Zonation of waste sites and "floating" decontamination stations are described in the ABB-ES generic HASP in Section 5.0 Site Control and Section 8.0 Decontamination. The purpose of the decontamination pad is to provide a central area for the decon of field sampling and equipment, vehicles and large field equipment (tractors, drill rigs, trucks, etc).

3.2 COMMUNICATIONS. When radio communication is not used, the following air horn signals will be employed:

HELP	three short blasts	(. . .)
EVACUATION	three long blasts	(_ _ _)
ALL CLEAR	alternating long and short blasts	(_ . _ .)

The air horn will be kept in the Exclusion Zone or Support Zone. Site communication and work practices are discussed in more detail in Section 7 of the ABB-ES generic HASP.

3.3 WORK PRACTICES. General work practices to be used during ABB-ES projects are described in Chapter 9.0 of the CLEAN HASP. Work at the Site will be conducted according to these established protocol and guidelines for the safety and health of all involved. Specific work practices necessary for this project or those that are of significant concern are described as follows.

- Work and sampling will be conducted in Level D clothing and equipment, unless site specific conditions are discovered that

require a higher level of personal protection. Zonation of site work areas, typical work practices and levels of personal protection are discussed in the ABB-ES generic HASP in Section 5.0 Site Control Section 7.0 Work Practices and Section 8.0 Decontamination.

4.0 DECONTAMINATION AND DISPOSAL

All personnel and/or equipment leaving contaminated areas of the Site will be subject to decontamination, which will take place in the contamination reduction zone. The decontamination areas will consist of either a "fixed" decontamination station (Figure 3-1) located at OU-1 and "floating" decontamination stations for consisting of each work site. General decontamination practices are described in Chapter 13.0 of the CLEAN HASP and in Section 8 of the ABB-ES generic HASP.

4.1 PERSONNEL DECONTAMINATION. All personnel leaving the study area are subject to decontamination (as necessary). The decontamination procedure required will be determined by the nature and level of contamination found at the sites. At a minimum, site personnel will remove loose soils from boots and clothing before leaving the site. More thorough decontamination procedures will be observed as dictated by site conditions.

4.1.1 Small Equipment Decontamination Small equipment will be protected from contamination as much as possible by keeping the equipment covered when at the site and placing the equipment on plastic sheeting, not the ground. Sampling equipment used at the site will be used only once or will be field cleaned between samples. Small equipment (e.g. split spoons etc.) will be decontaminated at each work site. Small equipment decontamination is described in more detail Section 8.3 of the ABB-ES generic HASP.

4.1.2 Heavy Equipment Decontamination Drilling equipment will be protected from contamination as much as possible by placing the equipment on plastic sheeting, not the ground. The drill rig and associated drilling equipment will be cleaned with high pressure water or high pressure steam followed by a soap and water wash and rinse at a centalized decontamination station located in OU-1. Loose material will be removed by brush. The person performing this activity will be at the level of protection used during the field investigation. Heavy equipment decontamination is described in more detail in Section 8.4 of the ABB-ES generic HASP.

4.2 COLLECTION AND DISPOSAL OF DECONTAMINATION PRODUCTS. All disposable protective gear, decontamination fluids (for both personnel and equipment), and other disposable materials will be disposed at the site. Disposable material (e.g., gloves and any Tyveks if required) will be bagged and disposed of properly. Collection and disposal of decontamination products is described in more detail Section 8.5 of the ABB-ES generic HASP.

5.0 EMERGENCY AND CONTINGENCY PLAN

This section identifies emergency and contingency planning that has been undertaken for operations at this site. Most sections of the HASP provide information that would be used under emergency conditions. General emergency planning information is addressed in Chapter 14.0 of the CLEAN HASP and Chapter 9 of teh generic ABB-ES HASP. The following subsections present site-specific emergency and contingency planning information.

5.1 PERSONNEL ROLES, LINES OF AUTHORITY, AND COMMUNICATION. The site HSO or the Health and Safety designee is the primary authority for directing operations at the site under emergency conditions. All communications both on- and off-site will be directed through the HSO or designee.

5.2 EVACUATION. Evacuation procedures at the site will follow those procedures discussed in Chapter 14.5 of the CLEAN HASP for upwind withdrawal, site evacuation, and evacuation of the surrounding area.

Upon determining that conditions warrant site evacuation, the work party will proceed upwind of the work site and notify the security force, HSO, and the field office of site conditions. If the decontamination area is upwind and greater than 500 feet from the work site, the crew will pass quickly through decontamination to remove contaminated gloves, monitoring equipment etc.. If the hazard is toxic gas, respirators will be retained. The crew will proceed to the field office, only if upwind, or the designated rally point to assess the situation. There the respirators may be removed (if instrumentation indicates an acceptable condition). As more facts are determined from the field crew, these will be relayed to the appropriate agencies. The advisability and type of further response action will be coordinated and carried out by the HSO.

5.3 EMERGENCY MEDICAL TREATMENT AND FIRST AID. Any personnel injured on-site will be rendered first aid as appropriate and transported to competent medical facilities for further examination and/or treatment. The preferred method of transport would be through professional emergency transportation means; however, when this is not readily available or would result in excessive delay, other transport will be authorized. Under no circumstances will injured persons transport themselves to a medical facility for emergency treatment.

6.0 ADMINISTRATION

6.1 PERSONNEL AUTHORIZED DOWNRANGE. Personnel authorized to participate in downrange activities at this site have been reviewed and certified for site operations by the Project Manager and the HSS. Certification involves the completion of appropriate training, a medical examination, and a review of this site-specific HASP. All persons entering the site must use the buddy system, and check in with the Site Manager and/or HSO before going downrange.

CERTIFIED ABB ENVIRONMENTAL TEAM PERSONNEL:

Wayne Britton	Technical Lead
Mark Joop	Field Operations Leader
Mark Cheyne	Associate Engineer
Doug Von Bushberger	Civil Engineer
Patrick Craine *+	Sr. Technician (HSO)

* FIRST-AID-TRAINED
\+ CPR-TRAINED

6.2 HEALTH AND SAFETY PLAN (HASP) APPROVALS. By their signatures, the undersigned certify that this HASP will be used for the protection of the health and safety of all persons entering this site.

Health and Safety Officer	Date
Project Manager	Date
Mic MacLeod Health and Safety Manager/Supervisor	7/22/93 Date

6.3 **FIELD TEAM REVIEW**. I have read and reviewed the health and safety information in the HASP. I understand the information and will comply with the requirements of the HASP.

NAME: _____

DATE: _____

SITE/PROJECT: _____

NOTE: THIS REVIEW VERIFICATION MUST BE SIGNED BY ALL FIELD PERSONNEL PRIOR TO WOKING ON SITE.

6.4 MEDICAL DATA SHEET. This Medical Data Sheet will be completed by all on-site personnel and kept in the Support Zone during site operations. It is not a substitute for the Medical Surveillance Program requirements consistent with the CLEAN HASP. This data sheet will accompany any personnel when medical assistance or transport to hospital facilities is required. If more space is required, use the back of this sheet.

Project: _____

Name: _____

Address: _____

Home Telephone: Area Code (___) _____

Age: _____ Height: _____ Weight: _____

In case of emergency, contact: _____

Address: _____

Telephone: Area Code (___) _____

Do you wear contact lenses? Yes ( ) No ( )

Allergies: _____

List medication(s) taken regularly: _____

Particular sensitivities: _____

Previous/current medical conditions or exposures to hazardous chemicals:

_____

Name of Personal Physician: _____

Telephone: Area Code (___) _____

6.5 EMERGENCY TELEPHONE NUMBERS.

NAS Jacksonville

Police Department	911
Rescue Service	911
St. Vincents Hospital	(904) 387-7395
Riverside Hospital	(904) 387-7070

Other Contacts

National Poison Control Center	(800) 492-2414
Maine Poison Control Center	(207) 871-2950
National Response Center	(800) 424-8802
Regional USEPA Emergency Response	(800) 414-8802
Chemical Manufacturers Association	
Chemical Referral Center	(800) 262-8200
Site HSO: Pat Craine	(904) 269-7012
Task Order Manager: Peter Redfern	(904) 269-7012
Regional HSS: Jack Davis	(904) 656-1293
ABB Environmental HSM: Cindy Sundquist	(800) 341-0460 ext. 2657

EMERGENCY CONTACTS

Dr. Frank Lawrence	(207) 871-2617
Bruce Campbell, RPh	(207) 871-2449
Florida Poison Control Center	(800) 282-3171
ABB-ES (Maine)	(800) 476-0460
ABB-ES (Orange Park, Florida)	(904) 269-7012
USEPA Emergency Response	(800) 414-8802

6.6 ROUTES TO EMERGENCY MEDICAL FACILITIES.

The primary source of medical assistance for the site is:

Facility Name: Saint Vincents Hospital

Address: 1800 Barrs St., Jacksonville, FL

Telephone Number: (904) 387-7395

Directions to primary source of medical assistance: (attach map)

Exit NAS via the main gate and take a right onto Roosevelt Blvd. (Hwy 17)

heading north. Proceed north to Park Street and take a right (east) onto Park

Street. Proceed on Park to Barrs St. and take a right. At the end of Barrs St. on the

right is St. Vincents.

Alternative source of medical assistance:

Facility Name: Riverside Hospital

Address: 2033 Riverside Avenue, Jacksonville, FL

Telephone Number: (904) 387-7070

Directions to alternate source of medical assistance: (attach map)

Exit NAS via the main gate and take a right onto Roosevelt Blvd. (Hwy 17)

heading north. Proceed north to Park Street and take a right (east) onto Park

Street. Proceed on Park Street to Margaret Street and take a right. At the corner

of Margaret Street and Riverside is Riverside Hospital on the right.

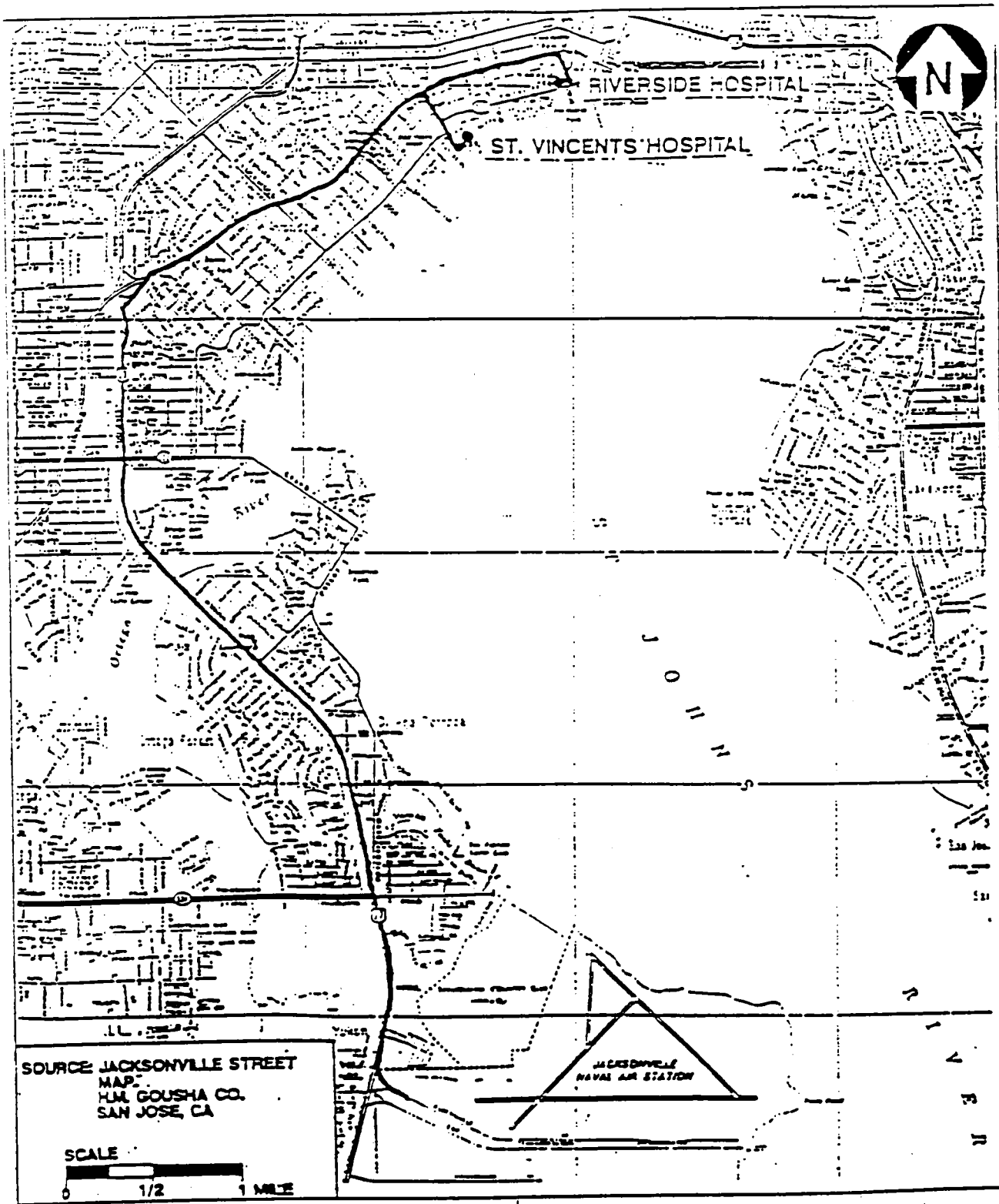

FIGURE 7-1

ROUTE TO HOSPITALS

HEALTH AND SAFETY PLAN

NAVAL SUPPLY CENTER
JACKSONVILLE, FLORIDA

APPENDIX B.1

CHEMICAL HAZARDS RESPONSE INFORMATION SYSTEM DATA SHEETS

BENZENE

BNZ

Common Synonyms	Watery liquid	Colorless	Gasoline-like odor
Benzol Benzole	Floats on water. Flammable, irritating vapor is produced. Freezing point is 42°F.		

Avoid contact with liquid and vapor. Keep people away.
Wear goggles and self-contained breathing apparatus.
Shut off ignition sources and call fire department.
Stop discharge if possible.
Stay upwind and use water spray to "knock down" vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

FLAMMABLE.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
Wear goggles and self-contained breathing apparatus.
Extinguish with dry chemical, foam, or carbon dioxide.
Water may be ineffective on fire.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID.

VAPOR
Irritating to eyes, nose and throat.
If inhaled, will cause headache, difficult breathing, or loss of consciousness.
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Irritating to skin and eyes.
Harmful if swallowed.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook)

Issue warning-high flammability
Restrict access

2. LABEL

2.1 Category: Flammable liquid
2.2 Class: 3

3. CHEMICAL DESIGNATIONS

3.1 CG Compatibility Class: Aromatic Hydrocarbon
3.2 Formula: C_6H_6
3.3 IMO/UN Designation: 3.2/1114
3.4 DOT ID No.: 1114
3.5 CAS Registry No.: 71-43-2

4. OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped): Liquid
4.2 Color: Colorless
4.3 Odor: Aromatic; rather pleasant aromatic odor; characteristic odor

5. HEALTH HAZARDS

5.1 Personal Protective Equipment: Hydrocarbon vapor canister, supplied air or a hose mask; hydrocarbon-insoluble rubber or plastic gloves; chemical goggles or face splash shield; hydrocarbon-insoluble apron such as neoprene.
5.2 Symptoms Following Exposure: Dizziness, excitation, pallor, followed by flushing, weakness, headache, breathlessness, chest constriction. Coma and possible death.
5.3 Treatment of Exposure: SKIN: flush with water followed by soap and water; remove contaminated clothing and wash skin. EYES: flush with plenty of water until irritation subsides. INHALATION: remove from exposure immediately. Call a physician. IF breathing is irregular or stopped, start resuscitation, administer oxygen.
5.4 Threshold Limit Value: 10 ppm
5.5 Short Term Inhalation Limits: 75 ppm for 30 min.
5.6 Toxicity by Ingestion: Grade 3; LD_{50} = 50 to 500 mg/kg
5.7 Late Toxicity: Leukemia
5.8 Vapor (Gas) Irritant Characteristics: If present in high concentrations, vapors may cause irritation of eyes or respiratory system. The effect is temporary.
5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
5.10 Odor Threshold: 4.68 ppm
5.11 IDLH Value: 2,000 ppm

6. FIRE HAZARDS

6.1 Flash Point: 12°F C.C.
6.2 Flammable Limits in Air: 1.3%-7.9%
6.3 Fire Extinguishing Agents: Dry chemical, foam, or carbon dioxide
6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective
6.5 Special Hazards of Combustion Products: Not pertinent
6.6 Behavior in Fire: Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back
6.7 Ignition Temperature: 1097°F
6.8 Electrical Hazard: Class I, Group D
6.9 Burning Rate: 6.0 mm/min.
6.10 Adiabatic Flame Temperature: Data not available
6.11 Stoichiometric Air to Fuel Ratio: Data not available
6.12 Flame Temperature: Data not available

7. CHEMICAL REACTIVITY

7.1 Reactivity With Water: No reaction
7.2 Reactivity with Common Materials: No reaction
7.3 Stability During Transport: Stable
7.4 Neutralizing Agents for Acids and Caustics: Not pertinent
7.5 Polymerization: Not pertinent
7.6 Inhibitor of Polymerization: Not pertinent
7.7 Molar Ratio (Reactant to Product): Data not available
7.8 Reactivity Group: 32

8. WATER POLLUTION

8.1 Aquatic Toxicity:
5 ppm/6 hr/minnow/lethal/distilled water
20 ppm/24 hr/sunfish/TL_m/tap water
8.2 Waterfowl Toxicity: Data not available
8.3 Biological Oxygen Demand (BOD): 1.2 lb/lb, 10 days
8.4 Food Chain Concentration Potential: None

9. SHIPPING INFORMATION

9.1 Grades of Purity:
Industrial pure .....99 + %
Thiophene-free .....99 + %
Nitration .....99 + %
Industrial 90% .....85 + %
Reagent .....99 + %
9.2 Storage Temperature: Open
9.3 Inert Atmosphere: No requirement
9.4 Venting: Pressure-vacuum

10. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook)

A-T-U-V-W

11. HAZARD CLASSIFICATIONS

11.1 Code of Federal Regulations:
Flammable liquid
11.2 NAS Hazard Rating for Bulk Water Transportation:

Category	Rating
Fire	3
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	3
Water Pollution	
Human Toxicity	3
Aquatic Toxicity	1
Aesthetic Effect	3
Reactivity	
Other Chemicals	2
Water	1
Self Reaction	0

11.3 NFPA Hazard Classification:

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	3
Reactivity (Yellow)	0

12. PHYSICAL AND CHEMICAL PROPERTIES

12.1 Physical State at 15°C and 1 atm: Liquid
12.2 Molecular Weight: 78.11
12.3 Boiling Point at 1 atm: 176°F = 80.1°C = 353.3°K
12.4 Freezing Point: 42.0°F = 5.5°C = 278.7°K
12.5 Critical Temperature: 552.0°F = 288.9°C = 562.1°K
12.6 Critical Pressure: 710 psia = 48.3 atm = 4.89 MN/m²
12.7 Specific Gravity: 0.879 at 20°C (liquid)
12.8 Liquid Surface Tension: 28.9 dynes/cm = 0.0289 N/m at 20°C
12.9 Liquid Water Interfacial Tension: 35.0 dynes/cm = 0.035 N/m at 20°C
12.10 Vapor (Gas) Specific Gravity: 2.7
12.11 Ratio of Specific Heats of Vapor (Gas): 1.061
12.12 Latent Heat of Vaporization: 169 Btu/lb = 94.1 cal/g = 3.94 X 10^5 J/kg
12.13 Heat of Combustion: —17,460 Btu/lb = —9698 cal/g = —406.0 X 10^5 J/kg
12.14 Heat of Decomposition: Not pertinent
12.15 Heat of Solution: Not pertinent
12.16 Heat of Polymerization: Not pertinent
12.25 Heat of Fusion: 30.45 cal/g
12.26 Limiting Value: Data not available
12.27 Reid Vapor Pressure: 3.22 psia

NOTES

BENZENE

12.17 SATURATED LIQUID DENSITY		12.18 LIQUID HEAT CAPACITY		12.19 LIQUID THERMAL CONDUCTIVITY		12.20 LIQUID VISCOSITY	
emperature degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit-inch per hour-square foot-F	Temperature (degrees F)	Centipoise
55	55.330	45	.394	75	.988	55	.724
60	55.140	50	.396	80	.981	60	.693
65	54.960	55	.398	85	.975	65	.665
70	54.770	60	.400	90	.969	70	.638
75	54.580	65	.403	95	.962	75	.612
80	54.400	70	.405	100	.956	80	.588
85	54.210	75	.407	105	.950	85	.566
90	54.030	80	.409	110	.944	90	.544
95	53.840	85	.411	115	.937	95	.524
100	53.660	90	.414	120	.931	100	.505
105	53.470	95	.416	125	.925	105	.487
110	53.290	100	.418	130	.919	110	.470
115	53.100			135	.912	115	.453
120	52.920			140	.906	120	.438
125	52.730			145	.900		
130	52.540			150	.893		
135	52.360			155	.887		
140	52.170			160	.881		
145	51.990			165	.875		
150	51.800			170	.868		
155	51.620						
160	51.430						
165	51.250						
170	51.060						
175	50.870						

12.21 SOLUBILITY IN WATER		12.22 SATURATED VAPOR PRESSURE		12.23 SATURATED VAPOR DENSITY		12.24 IDEAL GAS HEAT CAPACITY	
emperature degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
77.02	.180	50	.881	50	.01258	0	.204
		60	1.171	60	.01639	25	.219
		70	1.535	70	.02109	50	.234
		80	1.989	80	.02681	75	.248
		90	2.547	90	.03371	100	.261
		100	3.227	100	.04196	125	.275
		110	4.049	110	.05172	150	.288
		120	5.033	120	.06317	175	.301
		130	6.201	130	.07652	200	.313
		140	7.577	140	.09194	225	.325
		150	9.187	150	.10960	250	.337
		160	11.060	160	.12980	275	.349
		170	13.220	170	.15270	300	.360
		180	15.700	180	.17850	325	.371
		190	18.520	190	.20750	350	.381
		200	21.740	200	.23970	375	.392
		210	25.360	210	.27560	400	.402
						425	.412
						450	.421
						475	.431
						500	.440
						525	.449
						550	.457
						575	.465
						600	.474

CARBON TETRACHLORIDE

CBT

Common Synonyms
Carbon Tet
Tetrachloromethane
Benzinoform
Necatorina
Perchloromethane

Watery liquid | Colorless | Sweet odor

Sinks in water. Poisonous vapor is produced.

Avoid contact with liquid and vapor. Keep people away.
Wear goggles and self-contained breathing apparatus.
Stop discharge if possible.
Stay upwind and use water spray to "knock down" vapor.
Notify local health and pollution control agencies.

Fire

Not flammable.
POISONOUS AND IRRITATING GASES ARE PRODUCED WHEN HEATED.
Wear goggles and self-contained breathing apparatus.

Exposure

CALL FOR MEDICAL AID.

VAPOR
POISONOUS IF INHALED.
Irritating to eyes.
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
POISONOUS IF SWALLOWED.
Irritating to skin and eyes.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting.
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.
Notify local health and pollution control officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook)
Issue warning-poison
Restrict access
Should be removed

2. LABEL

2.1 **Category:** None
2.2 **Class:** Not pertinent

3. CHEMICAL DESIGNATIONS

3.1 **CG Compatibility Class:** Halogenated hydrocarbon
3.2 **Formula:** CCl_4
3.3 **IMO/UN Designation:** 6.1/1846
3.4 **DOT ID No.:** 1846
3.5 **CAS Registry No.:** 56-23-5

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Sweetish, aromatic; moderately strong ethereal; somewhat resembling that of chloroform.

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Organic vapor canister with full face mask; protective clothing; rubber gloves.
5.2 **Symptoms Following Exposure:** Dizziness, incoordination, anesthesia; may be accompanied by nausea and liver damage. Kidney damage also occurs, often producing decrease or stopping of urinary output.
5.3 **Treatment of Exposure:** EYES AND SKIN: flush with plenty of water; for eyes, get medical attention. Remove contaminated clothing and wash before reuse. INHALATION: immediately remove to fresh air, keep patient warm and quiet and get medical attention promptly. Start artificial respiration if breathing stops. INGESTION: induce vomiting and get medical attention promptly. No specific antidote known.
5.4 **Threshold Limit Value:** 5 ppm
5.5 **Short Term Inhalation Limits:** 25 ppm for 30 min.
5.6 **Toxicity by Ingestion:** Grade 2; LD_{50}: 0.5 to 5 g/kg (rat)
5.7 **Late Toxicity:** Causes severe liver damage and death if ingested.
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.
5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
5.10 **Odor Threshold:** Greater than 10 ppm
5.11 **IDLH Value:** 300 ppm

6. FIRE HAZARDS

6.1 **Flash Point:** Not flammable
6.2 **Flammable Limits in Air:** Not flammable
6.3 **Fire Extinguishing Agents:** Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Forms poisonous phosgene gas when exposed to open flames.
6.6 **Behavior in Fire:** Decomposes to form chlorine and phosgene
6.7 **Ignition Temperature:** Not flammable
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not flammable
6.10 **Adiabatic Flame Temperature:** Data not available
6.11 **Stoichiometric Air to Fuel Ratio:** Data not available
6.12 **Flame Temperature:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity With Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent
7.7 **Molar Ratio (Reactant to Product):** Data not available
7.8 **Reactivity Group:** 36

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** None
8.4 **Food Chain Concentration Potential:** None

9. SHIPPING INFORMATION

9.1 **Grades of Purity:** Commercial; technical; USP
9.2 **Storage Temperature:** Ambient
9.3 **Inert Atmosphere:** No requirement
9.4 **Venting:** Pressure-vacuum

10. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook)
A-X

11. HAZARD CLASSIFICATIONS

11.1 **Code of Federal Regulations:** ORM-A
11.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	0
Health	
Vapor Irritant	2
Liquid or Solid Irritant	1
Poisons	4
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	2
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

11.3 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	0
Reactivity (Yellow)	0

12. PHYSICAL AND CHEMICAL PROPERTIES

12.1 **Physical State at 15°C and 1 atm:** Liquid
12.2 **Molecular Weight:** 153.83
12.3 **Boiling Point at 1 atm:** 170°F = 76.5°C = 349.7°K
12.4 **Freezing Point:** −9.4°F = −23.0°C = 250.2°K
12.5 **Critical Temperature:** 541°F = 283°C = 556°K
12.6 **Critical Pressure:** 660 psia = 45 atm = 4.6 MN/m^2
12.7 **Specific Gravity:** 1.59 at 20°C (liquid)
12.8 **Liquid Surface Tension:** 27.0 dynes/cm = 0.027 N/m at 20°C
12.9 **Liquid Water Interfacial Tension:** 45.0 dynes/cm = 0.045 N/m at 20°C
12.10 **Vapor (Gas) Specific Gravity:** 5.3
12.11 **Ratio of Specific Heats of Vapor (Gas):** 1.111
12.12 **Latent Heat of Vaporization:** 84.2 Btu/lb = 46.8 cal/g = 1.959×10^5 J/kg
12.13 **Heat of Combustion:** Not pertinent
12.14 **Heat of Decomposition:** Not pertinent
12.15 **Heat of Solution:** Not pertinent
12.16 **Heat of Polymerization:** Not pertinent
12.25 **Heat of Fusion:** 5.09 cal/g
12.26 **Limiting Value:** Data not available
12.27 **Reid Vapor Pressure:** 3.8 psia

NOTES

CBT

CARBON TETRACHLORIDE

12.17 SATURATED LIQUID DENSITY

Temperature (degrees F)	Pounds per cubic foot
35	101.700
40	101.400
45	101.099
50	100.700
55	100.400
60	100.099
65	99.750
70	99.410
75	99.080
80	98.740
85	98.410
90	98.070
95	97.730
100	97.389
105	97.059
110	96.719
115	96.379
120	96.040

12.18 LIQUID HEAT CAPACITY

Temperature (degrees F)	British thermal unit per pound-F
35	.201
40	.203
45	.206
50	.208
55	.210
60	.212
65	.215
70	.217
75	.219
80	.221
85	.223
90	.226
95	.228
100	.230
105	.232
110	.235
115	.237
120	.239
125	.241
130	.243
135	.246
140	.248

12.19 LIQUID THERMAL CONDUCTIVITY

Temperature (degrees F)	British thermal unit-inch per hour-square foot-F
30	.724
40	.715
50	.707
60	.698
70	.690
80	.682
90	.673
100	.665
110	.656
120	.648
130	.640
140	.631
150	.623
160	.615
170	.606

12.20 LIQUID VISCOSITY

Temperature (degrees F)	Centipoise
35	1.307
40	1.247
45	1.192
50	1.140
55	1.091
60	1.045
65	1.001
70	.961
75	.922
80	.886
85	.852
90	.820
95	.790
100	.761
105	.734
110	.708
115	.683
120	.660
125	.638
130	.617
135	.597
140	.578

12.21 SOLUBILITY IN WATER

Temperature (degrees F)	Pounds per 100 pounds of water
77.02	.080

12.22 SATURATED VAPOR PRESSURE

Temperature (degrees F)	Pounds per square inch
40	.815
50	1.088
60	1.435
70	1.874
80	2.422
90	3.102
100	3.937
110	4.956
120	6.190
130	7.672
140	9.442
150	11.540
160	14.010
170	16.910
180	20.300
190	24.210
200	28.740
210	33.930

12.23 SATURATED VAPOR DENSITY

Temperature (degrees F)	Pounds per cubic foot
40	.02339
50	.03059
60	.03958
70	.05069
80	.06431
90	.08087
100	.10080
110	.12470
120	.15300
130	.18650
140	.22560
150	.27130
160	.32410
170	.38500
180	.45470
190	.53410
200	.62430
210	.72610

12.24 IDEAL GAS HEAT CAPACITY

Temperature (degrees F)	British thermal unit per pound-F
0	.123
25	.126
50	.128
75	.130
100	.132
125	.134
150	.136
175	.138
200	.139
225	.141
250	.143
275	.144
300	.145
325	.147
350	.148
375	.149
400	.150
425	.151
450	.152
475	.152
500	.153
525	.153
550	.154
575	.154
600	.155

CHLOROFORM

CRF

Common Synonyms	Watery liquid	Colorless	Sweet odor
Trichloromethane	Sinks in water. Irritating vapor is produced.		

Avoid contact with liquid and vapor. Stay upwind.
Wear goggles and self-contained breathing apparatus.
Stop discharge if possible. Keep people away.
Notify local health and pollution control agencies.

Fire

Not flammable.
POISONOUS AND IRRITATING GASES ARE PRODUCED WHEN HEATED.
Wear goggles and self-contained breathing apparatus.

Exposure

CALL FOR MEDICAL AID.

VAPOR
Irritating to eyes, nose and throat.
If inhaled, will cause headache, nausea, dizziness, or loss of consciousness.
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Irritating to skin and eyes.
Harmful if swallowed.
Remove contaminated clothing.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting.
IF SWALLOWED and victim is UNCONSCIOUS AND HAVING CONVULSIONS, do nothing except keep victim warm.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.
Notify local health and pollution control officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook)

Issue warning-air contaminant
Restrict access
Should be removed

2. LABEL

2.1 Category: None
2.2 Class: Not pertinent

3. CHEMICAL DESIGNATIONS

3.1 CG Compatibility Class: Halogenated hydrocarbon
3.2 Formula: $CHCl_3$
3.3 IMO/UN Designation: 9.0/1888
3.4 DOT ID No.: 1888
3.5 CAS Registry No.: 67-66-3

4. OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped): Liquid
4.2 Color: Colorless
4.3 Odor: Pleasant, sweet; ethereal

5. HEALTH HAZARDS

5.1 Personal Protective Equipment: Chemical goggles, 50 ppm to 2%; suitable full-face gas mask. Above 2%; suitable self-contained system.
5.2 Symptoms Following Exposure: Headache, nausea, dizziness, drunkenness, narcosis.
5.3 Treatment of Exposure: INHALATION: if ill effects develop, get victim to fresh air, keep him warm and quiet, and get medical attention. If breathing stops, start artificial respiration. INGESTION: induce vomiting and get medical attention. No known antidote; treat symptoms. EYES: flush with plenty of water for at least 15 minutes and get medical attention. SKIN: wash with soap and water, remove contaminated clothing and free of chemical.
5.4 Threshold Limit Value: 10 ppm
5.5 Short Term Inhalation Limits: 50 ppm for 10 min.
5.6 Toxicity by Ingestion: Grade 2: LD_{50} = 0.5 to 5 g/kg
5.7 Late Toxicity: None
5.8 Vapor (Gas) Irritant Characteristics: Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.
5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
5.10 Odor Threshold: 205-307 ppm
5.11 IDLH Value: 1,000 ppm

6. FIRE HAZARDS

6.1 Flash Point: Not flammable
6.2 Flammable Limits in Air: Not flammable
6.3 Fire Extinguishing Agents: Not pertinent
6.4 Fire Extinguishing Agents Not to be Used: Not pertinent
6.5 Special Hazards of Combustion Products: Poisonous and irritating gases are produced when heated.
6.6 Behavior in Fire: Decomposes, producing toxic gases
6.7 Ignition Temperature: Not flammable
6.8 Electrical Hazard: Not pertinent
6.9 Burning Rate: Not flammable
6.10 Adiabatic Flame Temperature: Data not available
6.11 Stoichiometric Air to Fuel Ratio: Data not available
6.12 Flame Temperature: Data not available

7. CHEMICAL REACTIVITY

7.1 Reactivity With Water: No reaction
7.2 Reactivity with Common Materials: No reaction
7.3 Stability During Transport: Stable
7.4 Neutralizing Agents for Acids and Caustics: Not pertinent
7.5 Polymerization: Not pertinent
7.6 Inhibitor of Polymerization: Not pertinent
7.7 Molar Ratio (Reactant to Product): Data not available
7.8 Reactivity Group: 36

8. WATER POLLUTION

8.1 Aquatic Toxicity: Data not available
8.2 Waterfowl Toxicity: Data not available
8.3 Biological Oxygen Demand (BOD): None
8.4 Food Chain Concentration Potential: None

9. SHIPPING INFORMATION

9.1 Grades of Purity: Technical, USP
9.2 Storage Temperature: Ambient
9.3 Inert Atmosphere: No requirement
9.4 Venting: Open

10. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook)

A-X

11. HAZARD CLASSIFICATIONS

11.1 Code of Federal Regulations: ORM-A
11.2 NAS Hazard Rating for Bulk Water
Transportation:

Category	Rating
Fire	1
Health	
Vapor Irritant	2
Liquid or Solid Irritant	1
Poisons	2
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	2
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

11.3 NFPA Hazard Classification:

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	0
Reactivity (Yellow)	0

12. PHYSICAL AND CHEMICAL PROPERTIES

12.1 Physical State at 15°C and 1 atm: Liquid
12.2 Molecular Weight: 119.39
12.3 Boiling Point at 1 atm: 142°F = 61.2°C = 334.4°K
12.4 Freezing Point: —82.3°F = —63.5°C = 209.7°K
12.5 Critical Temperature: 506°F = 263.2°C = 536.4°K
12.6 Critical Pressure: 790 psia = 54 atm = 5.5 MN/m^2
12.7 Specific Gravity: 1.49 at 20°C (liquid)
12.8 Liquid Surface Tension: 27.1 dynes/cm = 0.0271 N/m at 20°C
12.9 Liquid Water Interfacial Tension: 32.8 dynes/cm = 0.0328 N/m at 20°C
12.10 Vapor (Gas) Specific Gravity: 4.1
12.11 Ratio of Specific Heats of Vapor (Gas): 1.146
12.12 Latent Heat of Vaporization: 106.7 Btu/lb = 59.3 cal/g = 2.483×10^5 J/kg
12.13 Heat of Combustion: Not pertinent
12.14 Heat of Decomposition: Not pertinent
12.15 Heat of Solution: Not pertinent
12.16 Heat of Polymerization: Not pertinent
12.25 Heat of Fusion: 17.62 cal/g
12.26 Limiting Value: Data not available
12.27 Reid Vapor Pressure: 6.39 psia

NOTES

CHLOROFORM

12.17 ATURATED LIQUID DENSITY

emperature degrees F)	Pounds per cubic foot
—50	100.799
—40	100.200
—30	99.549
—20	98.910
—10	98.259
0	97.610
10	96.950
20	96.299
30	95.639
40	94.980
50	94.320
60	93.650
70	92.990
80	92.320
90	91.650
100	90.980
110	90.309
120	89.629
130	88.950
140	88.270

12.18 LIQUID HEAT CAPACITY

Temperature (degrees F)	British thermal unit per pound-F
0	.216
10	.217
20	.219
30	.221
40	.222
50	.224
60	.226
70	.227
80	.229
90	.231
100	.232
110	.234
120	.236
130	.237
140	.239

12.19 LIQUID THERMAL CONDUCTIVITY

Temperature (degrees F)	British thermal unit-inch per hour-square foot-F
—70	.938
—60	.929
—50	.920
—40	.911
—30	.902
—20	.893
—10	.884
0	.875
10	.866
20	.857
30	.848
40	.839
50	.830
60	.821
70	.812
80	.804
90	.795
100	.786
110	.777
120	.768
130	.759
140	.750

12.20 LIQUID VISCOSITY

Temperature (degrees F)	Centipoise
0	.847
10	.791
20	.741
30	.697
40	.656
50	.620
60	.586
70	.556
80	.528
90	.503
100	.479
110	.458
120	.438
130	.420
140	.403

12.21 SOLUBILITY IN WATER

Temperature (degrees F)	Pounds per 100 pounds of water
77.02	.800

12.22 SATURATED VAPOR PRESSURE

Temperature (degrees F)	Pounds per square inch
—30	.150
—20	.217
—10	.309
0	.433
10	.598
20	.816
30	1.099
40	1.462
50	1.924
60	2.505
70	3.229
80	4.124
90	5.220
100	6.551
110	8.157
120	10.080

12.23 SATURATED VAPOR DENSITY

Temperature (degrees F)	Pounds per cubic foot
—30	.00387
—20	.00548
—10	.00763
0	.01047
10	.01417
20	.01892
30	.02496
40	.03255
50	.04198
60	.05361
70	.06781
80	.08499
90	.10560
100	.13020
110	.15930
120	.19340

12.24 IDEAL GAS HEAT CAPACITY

Temperature (degrees F)	British thermal unit per pound-F
0	.123
25	.126
50	.129
75	.131
100	.134
125	.137
150	.139
175	.142
200	.144
225	.146
250	.148
275	.150
300	.152
325	.154
350	.156
375	.158
400	.160
425	.161
450	.162
475	.164
500	.165
525	.166
550	.167
575	.168
600	.169

1,1-DICHLOROETHANE

DCH

Common Synonyms	Oily liquid	Colorless	Chloroform like ethereal
Ethylidene chloride Ethylidene dichloride Chlorinated hydrochloric ether	Sinks and mixes with water.		

Wear goggles, self-contained breathing apparatus, and rubber overclothing
Stop discharge if possible. Keep people away.
Shut off ignition sources and call fire department.
Avoid contact with liquid.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Flammable.
POISONOUS GAS MAY BE PRODUCED IN FIRE OR WHEN HEATED.
Containers may explode in fire.
Wear goggles and self-contained breathing apparatus.
Extinguish with alcohol foam, carbon dioxide, or dry chemical.
Water may be ineffective on fire.

Exposure

CALL FOR MEDICAL AID.

LIQUID
If swallowed may cause nausea, vomiting and faintness.
Irritating to skin and eyes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS have victim drink water or milk and induce vomiting.

Water Pollution

Dangerous to aquatic life in high concentrations.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook)

Issue warning-high flammability.
Restrict access.
Chemical and physical treatment.

2. LABEL

2.1 Category: None
2.2 Class: Not pertinent

3. CHEMICAL DESIGNATIONS

3.1 CG Compatibility Class: Halogenated hydrocarbon
3.2 Formula: $C_2H_4Cl_2$
3.3 IMO/UN Designation: Not listed
3.4 DOT ID No.: 2362
3.5 CAS Registry No.: 75-34-3

4. OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped): Oily liquid
4.2 Color: Colorless
4.3 Odor: Chloroform

5. HEALTH HAZARDS

5.1 Personal Protective Equipment: In areas of poor ventilation or high concentration, a self-contained breathing apparatus with full face mask should be worn. Chemical workers goggles, rubber gloves, and protective clothing should be worn.

5.2 Symptoms Following Exposure: INHALATION: Irritation of respiratory tract. Salivation, sneezing, coughing, dizziness, nausea, and vomiting. EYES: Irritation, lacrimation, and reddening of conjunctiva. SKIN: Irritation. Prolonged or repeated skin contact can produce a slight burn. INGESTION: Ingestion incidental to industrial handling is not considered to be a problem. Swallowing of substantial amounts could cause nausea, vomiting, faintness, drowsiness, cyanosis, and circulatory failure.

5.3 Treatment of Exposure: Call a doctor. INHALATION: Remove from contaminated area; keep warm and quiet. If breathing has stopped, give artificial respiration. Administer oxygen. EYES: Flush with large amounts of water or weak bicarbonate of soda solution. SKIN: Dilute with large amounts of water. Remove contaminated clothing. INGESTION: Attempt to empty stomach; dilute by administering fluids (tap water, soapy water, salt water, or milk).

5.4 Threshold Limit Value: 200 ppm.
5.5 Short Term Inhalation Limits: 250 ppm.
5.6 Toxicity by Ingestion: Grade 2; LD_{50} = 0.5 to 5 g/kg (rat).
5.7 Late Toxicity: Chronic exposure may cause liver damage and dermatitis. Animal experimentation has shown this compound to be slightly embryo-toxic and to retard fetal development.
5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin.
5.10 Odor Threshold: Data not available
5.11 IDLH Value: 4,000 ppm

6. FIRE HAZARDS

6.1 Flash Point: 57°F O.C. = 22°F C.C.
6.2 Flammable Limits in Air: 5.6% to 11.4%
6.3 Fire Extinguishing Agents: Alcohol foam, water, foam, CO_2, dry chemical, carbon tetrachloride
6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective
6.5 Special Hazards of Combustion Products: When heated to decomposition emits highly toxic fumes to phosgene.
6.6 Behavior in Fire: Explosion hazard
6.7 Ignition Temperature: 856°F
6.8 Electrical Hazard: Data not available
6.9 Burning Rate: Data not available
6.10 Adiabatic Flame Temperature: Data not available
6.11 Stoichiometric Air to Fuel Ratio: Data not available
6.12 Flame Temperature: Data not available

7. CHEMICAL REACTIVITY

7.1 Reactivity With Water: No reaction
7.2 Reactivity with Common Materials: Data not available
7.3 Stability During Transport: Data not available
7.4 Neutralizing Agents for Acids and Caustics: Data not available
7.5 Polymerization: Data not available
7.6 Inhibitor of Polymerization: Iable Data not available
7.7 Molar Ratio (Reactant to Product): Data not available
7.8 Reactivity Group: 36

8. WATER POLLUTION

8.1 Aquatic Toxicity: TL_m (Marine pinperch) 250 to 275 mg/l
24-hour TL_m Brine shrimp: 320 mg/l
24-hour TL_m Pinperch: 160 mg/l
8.2 Waterfowl Toxicity: Data not available
8.3 Biological Oxygen Demand (BOD): Percent, 0.05 g/g for 10 days Percent, 0.002 g/g for 5 days
8.4 Food Chain Concentration Potential: Data not available

9. SHIPPING INFORMATION

9.1 Grades of Purity: Data not available
9.2 Storage Temperature: Cool
9.3 Inert Atmosphere: Data not available
9.4 Venting: Data not available

10. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook)

A-P-Q-R-S

11. HAZARD CLASSIFICATIONS

11.1 Code of Federal Regulations: Not listed
11.2 NAS Hazard Rating for Bulk Water Transportation: Not listed
11.3 NFPA Hazard Classification:

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	3
Reactivity (Yellow)	0

12. PHYSICAL AND CHEMICAL PROPERTIES

12.1 Physical State at 15°C and 1 atm: Liquid
12.2 Molecular Weight: 98.97
12.3 Boiling Point at 1 atm: 135.14°F = 57.3°C = 330.5°K
12.4 Freezing Point: —143.32°F = —97.4°C = 175.75°K
12.5 Critical Temperature: 502.7°F = 261.5°C = 534.65°K
12.6 Critical Pressure: 734.8 psia = 50 atm = 5.065 MN/m^2
12.7 Specific Gravity: 1.174 at 20°C
12.8 Liquid Surface Tension: 24.75 dynes/cm = 0.02475 N/m at 20°C
12.9 Liquid Water Interfacial Tension: Data not available
12.10 Vapor (Gas) Specific Gravity: 3.42
12.11 Ratio of Specific Heats of Vapor (Gas): 1.136 at 20°C (68°F)
12.12 Latent Heat of Vaporization: 131.6 Btu/lb = 73.1 cal/g = 3.06×10^5 J/kg
12.13 Heat of Combustion: —4,774 Btu/lb = —2,652 cal/g = -111×10^3 J/kg
12.14 Heat of Decomposition: Data not available
12.15 Heat of Solution: Data not available
12.16 Heat of Polymerization: Data not available
12.25 Heat of Fusion: Data not available
12.26 Limiting Value: Data not available
12.27 Reid Vapor Pressure: 7.35 psia

NOTES

DCH

DICHLOROETHANE

12.17 SATURATED LIQUID DENSITY

Temperature (degrees F)	Pounds per cubic foot
35	75.198
40	74.929
45	74.660
50	74.389
55	74.120
60	73.851
65	73.580
70	73.311
75	73.042
80	72.771
85	72.502

12.18 LIQUID HEAT CAPACITY

Temperature (degrees F)	British thermal unit per pound-F
	DATA NOT AVAILABLE

12.19 LIQUID THERMAL CONDUCTIVITY

Temperature (degrees F)	British thermal unit-inch per hour-square foot-F
35	.804
40	.799
45	.795
50	.791
55	.786
60	.782
65	.778
70	.773
75	.769
80	.765
85	.760
90	.756
95	.752
100	.747
105	.743
110	.739

12.20 LIQUID VISCOSITY

Temperature (degrees F)	Centipoise
35	.617
40	.595
45	.574
50	.555
55	.537
60	.520
65	.504
70	.489
75	.475
80	.462
85	.449
90	.437
95	.426
100	.415
105	.405
110	.395
115	.386
120	.377

12.21 SOLUBILITY IN WATER

Temperature (degrees F)	Pounds per 100 pounds of water
68	.500

12.22 SATURATED VAPOR PRESSURE

Temperature (degrees F)	Pounds per square inch
—70	—1.334
—60	—1.944
—50	—.555
—40	.835
—30	.225
—20	.386
—10	.996
0	1.607
10	2.217
20	2.827
30	3.438
40	4.048
50	4.658
60	5.269
70	5.879
80	6.489
90	7.100
100	7.710
110	8.321
120	8.931
130	9.541

12.23 SATURATED VAPOR DENSITY

Temperature (degrees F)	Pounds per cubic foot
—100	.07407
—80	.05000
—60	.02594
—40	.00187
—20	.02219
0	.04626
20	.07032
40	.09439
60	.11845
80	.14252
100	.16658
120	.19065
140	.21471
160	.23878

12.24 IDEAL GAS HEAT CAPACITY

Temperature (degrees F)	British thermal unit per pound-F
	DATA NOT AVAILABLE

TOLUENE

TOL

Common Synonyms	Watery liquid	Colorless	Pleasant odor
Toluol Methylbenzene Methylbenzol	Floats on water. Flammable, irritating vapor is produced.		

Stop discharge if possible. Keep people away.
Shut off ignition sources and call fire department.
Stay upwind and use water spray to "knock down" vapor.
Avoid contact with liquid and vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

FLAMMABLE.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
Wear goggles and self-contained breathing apparatus.
Extinguish with dry chemical, foam, or carbon dioxide.
Water may be ineffective on fire.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID.

VAPOR
Irritating to eyes, nose and throat.
If inhaled, will cause nausea, vomiting, headache, dizziness, difficult breathing, or loss of consciousness.
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing difficult, give oxygen.

LIQUID
Irritating to skin and eyes.
If swallowed, will cause nausea, vomiting or loss of consciousness.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
DO NOT INDUCE VOMITING.

Water Pollution

Dangerous to aquatic life in high concentrations.
Fouling to shoreline.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook)
Issue warning-high flammability
Evacuate area

2. LABEL

2.1 **Category:** Flammable liquid
2.2 **Class:** 3

3. CHEMICAL DESIGNATIONS

3.1 **CG Compatibility Class:** Aromatic Hydrocarbon
3.2 **Formula:** $C_6H_5CH_3$
3.3 **IMO/UN Designation:** 3.2/1294
3.4 **DOT ID No.:** 1294
3.5 **CAS Registry No.:** 108-88-3

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Pungent; aromatic, benzene-like; distinct, pleasant

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Air-supplied mask; goggles or face shield; plastic gloves.
5.2 **Symptoms Following Exposure:** Vapors irritate eyes and upper respiratory tract; cause dizziness, headache, anesthesia, respiratory arrest. Liquid irritates eyes and causes drying of skin. If aspirated, causes coughing, gagging, distress, and rapidly developing pulmonary edema. If ingested causes vomiting, griping, diarrhea, depressed respiration.
5.3 **Treatment of Exposure:** INHALATION: remove to fresh air, give artificial respiration and oxygen if needed; call a doctor. INGESTION: do NOT induce vomiting; call a doctor. EYES: flush with water for at least 15 min. SKIN: wipe off, wash with soap and water.
5.4 **Threshold Limit Value:** 100 ppm
5.5 **Short Term Inhalation Limits:** 600 ppm for 30 min.
5.6 **Toxicity by Ingestion:** Grade 2; LD_{50} = 0.5 to 5 g/kg
5.7 **Late Toxicity:** Kidney and liver damage may follow ingestion.
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
5.10 **Odor Threshold:** 0.17 ppm
5.11 **IDLH Value:** 2,000 ppm

6. FIRE HAZARDS

6.1 **Flash Point:** 40°F C.C.; 55°F O.C.
6.2 **Flammable Limits in Air:** 1.27%-7%
6.3 **Fire Extinguishing Agents:** Carbon dioxide or dry chemical for small fires, ordinary foam for large fires.
6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6.5 **Special Hazards of Combustion Products:** Not pertinent
6.6 **Behavior in Fire:** Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back.
6.7 **Ignition Temperature:** 997°F
6.8 **Electrical Hazard:** Class I, Group D
6.9 **Burning Rate:** 5.7 mm/min.
6.10 **Adiabatic Flame Temperature:** Data not available

(Continued)

7. CHEMICAL REACTIVITY

7.1 **Reactivity With Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent
7.7 **Molar Ratio (Reactant to Product):** Data not available
7.8 **Reactivity Group:** 32

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 1180 mg/l/96 hr/sunfish/TL_m/fresh water
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** 0%, 5 days; 38% (theor), 8 days
8.4 **Food Chain Concentration Potential:** None

9. SHIPPING INFORMATION

9.1 **Grades of Purity:** Research, reagent, nitration-all 99.8 + %; industrial: contains 94 + %, with 5% xylene and small amounts of benzene and nonaromatic hydrocarbons; 90/120: less pure than industrial.
9.2 **Storage Temperature:** Ambient
9.3 **Inert Atmosphere:** No requirement
9.4 **Venting:** Open (flame arrester) or pressure-vacuum

10. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook)
A-T-U

11. HAZARD CLASSIFICATIONS

11.1 **Code of Federal Regulations:** Flammable liquid
11.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	2
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	3
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

11.3 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	3
Reactivity (Yellow)	0

12. PHYSICAL AND CHEMICAL PROPERTIES

12.1 **Physical State at 15°C and 1 atm:** Liquid
12.2 **Molecular Weight:** 92.14
12.3 **Boiling Point at 1 atm:** 231.1°F = 110.6°C = 383.8°K
12.4 **Freezing Point:** −139°F = −95.0°C = 178.2°K
12.5 **Critical Temperature:** 605.4°F = 318.6°C = 591.8°K
12.6 **Critical Pressure:** 596.1 psia = 40.55 atm = 4.108 MN/m^2
12.7 **Specific Gravity:** 0.867 at 20°C (liquid)
12.8 **Liquid Surface Tension:** 29.0 dynes/cm = 0.0290 N/m at 20°C
12.9 **Liquid Water Interfacial Tension:** 36.1 dynes/cm = 0.0361 N/m at 25°C
12.10 **Vapor (Gas) Specific Gravity:** Not pertinent
12.11 **Ratio of Specific Heats of Vapor (Gas):** 1.089
12.12 **Latent Heat of Vaporization:** 155 Btu/lb = 86.1 cal/g = 3.61×10^5 J/kg
12.13 **Heat of Combustion:** −17,430 Btu/lb = −9686 cal/g = -405.5×10^5 J/kg
12.14 **Heat of Decomposition:** Not pertinent
12.15 **Heat of Solution:** Not pertinent
12.16 **Heat of Polymerization:** Not pertinent
12.25 **Heat of Fusion:** 17.17 cal/g
12.26 **Limiting Value:** Data not available
12.27 **Reid Vapor Pressure:** 1.1 psia

6. FIRE HAZARDS (Continued)

6.11 **Stoichiometric Air to Fuel Ratio:** Data not available
6.12 **Flame Temperature:** Data not available

TOLUENE

12.17 SATURATED LIQUID DENSITY	
Temperature (degrees F)	Pounds per cubic foot
−30	57.180
−20	56.870
−10	56.550
0	56.240
10	55.930
20	55.620
30	55.310
40	54.990
50	54.680
60	54.370
70	54.060
80	53.750
90	53.430
100	53.120
110	52.810
120	52.500

12.18 LIQUID HEAT CAPACITY	
Temperature (degrees F)	British thermal unit per pound-F
0	.396
5	.397
10	.399
15	.400
20	.402
25	.403
30	.404
35	.406
40	.407
45	.409
50	.410
55	.411
60	.413
65	.414
70	.415
75	.417
80	.418
85	.420
90	.421
95	.422
100	.424
105	.425
110	.427
115	.428
120	.429
125	.431

12.19 LIQUID THERMAL CONDUCTIVITY	
Temperature (degrees F)	British thermal unit-inch per hour-square foot-F
0	1.026
10	1.015
20	1.005
30	.994
40	.983
50	.972
60	.962
70	.951
80	.940
90	.929
100	.919
110	.908
120	.897
130	.886
140	.876
150	.865
160	.854
170	.843
180	.833
190	.822
200	.811
210	.800

12.20 LIQUID VISCOSITY	
Temperature (degrees F)	Centipoise
0	1.024
5	.978
10	.935
15	.894
20	.857
25	.821
30	.788
35	.757
40	.727
45	.700
50	.673
55	.649
60	.625
65	.603
70	.582
75	.562
80	.544
85	.526
90	.509
95	.493
100	.477

12.21 SOLUBILITY IN WATER	
Temperature (degrees F)	Pounds per 100 pounds of water
68.02	.050

12.22 SATURATED VAPOR PRESSURE	
Temperature (degrees F)	Pounds per square inch
0	.038
10	.057
20	.084
30	.121
40	.172
50	.241
60	.331
70	.449
80	.600
90	.792
100	1.033
110	1.332
120	1.700
130	2.148
140	2.690
150	3.338
160	4.109
170	5.018
180	6.083
190	7.323
200	8.758
210	10.410

12.23 SATURATED VAPOR DENSITY	
Temperature (degrees F)	Pounds per cubic foot
0	.00070
10	.00103
20	.00150
30	.00212
40	.00296
50	.00405
60	.00547
70	.00727
80	.00954
90	.01237
100	.01584
110	.02007
120	.02518
130	.03127
140	.03850
150	.04700
160	.05691
170	.06840
180	.08162
190	.09675
200	.11400
210	.13340

12.24 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	British thermal unit per pound-F
0	.228
25	.241
50	.255
75	.268
100	.281
125	.294
150	.306
175	.319
200	.331
225	.343
250	.355
275	.367
300	.378
325	.389
350	.400
375	.411
400	.422
425	.432
450	.443
475	.453
500	.462
525	.472
550	.482
575	.491
600	.500

TRICHLOROETHANE

TCE

Common Synonyms	Watery liquid	Colorless	Sweet odor
1,1,1-Trichloroethane Methylchloroform Aerothene Chlorothene	Sinks in water. Irritating vapor is produced.		

Stop discharge if possible. Keep people away.
Avoid contact with liquid and vapor.
Call fire department.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Combustible.
POISONOUS GASES ARE PRODUCED IN FIRE.
Wear goggles and self-contained breathing apparatus.
Extinguish with dry chemical, carbon dioxide, or foam.

Exposure

CALL FOR MEDICAL AID.

VAPOR
Irritating to eyes, nose and throat.
If inhaled, will cause dizziness or difficult breathing.
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Irritating to skin and eyes.
If swallowed, may produce nausea.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting.
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook)

Should be removed
Chemical and physical treatment

2. LABEL

2.1 **Category:** None
2.2 **Class:** Not pertinent

3. CHEMICAL DESIGNATIONS

3.1 **CG Compatibility Class:** Halogenated hydrocarbon
3.2 **Formula:** CH_3CCl_3
3.3 **IMO/UN Designation:** Not listed
3.4 **DOT ID No.:** 2831
3.5 **CAS Registry No.:** 71-55-6

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Chloroform-like; sweetish

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Organic vapor-acid gas canister; self-contained breathing apparatus for emergencies; neoprene or polyvinyl-alcohol-type gloves; chemical safety goggles and face shield; neoprene safety shoes (or leather safety shoes plus neoprene footwear); neoprene or polyvinyl alcohol suit or apron for splash protection.

5.2 **Symptoms Following Exposure:** INHALATION: symptoms range from loss of equilibrium and incoordination to loss of consciousness; high concentration can be fatal due to simple asphyxiation combined with loss of consciousness. INGESTION: produces effects similar to inhalation and may cause some feeling of nausea. EYES: slightly irritating and lachrymatory. SKIN: defatting action may cause dermatitis.

5.3 **Treatment of Exposure:** Get medical attention for all eye exposures and any other serious overexposures. Do NOT administer adrenalin or epinephrine; otherwise, treatment is symptomatic. INHALATION: remove victim to fresh air; if necessary, apply artificial respiration and/or administer oxygen. INGESTION: have victim drink water and induce vomiting. EYES: flush thoroughly with water. SKIN: remove contaminated clothing and wash exposed area thoroughly with soap and warm water.

5.4 **Threshold Limit Value:** 350 ppm

5.5 **Short Term Inhalation Limits:** 1,000 ppm for 60 min. in man

5.6 **Toxicity by Ingestion:** Grade 1: LD_{50} = 5 to 15 g/kg (rat, mouse, rabbit, guinea pig)

5.7 **Late Toxicity:** Data not available

5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.

5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.

5.10 **Odor Threshold:** 100 ppm

5.11 **IDLH Value:** 1,000 ppm

6. FIRE HAZARDS

6.1 **Flash Point:** Data not available
6.2 **Flammable Limits in Air:** 7%-16%
6.3 **Fire Extinguishing Agents:** Dry chemical, foam, or carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Toxic and irritating gases are generated in fires.
6.6 **Behavior in Fire:** Not pertinent
6.7 **Ignition Temperature:** 932°F
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** (est.) 2.9 mm/min.
6.10 **Adiabatic Flame Temperature:** Data not available
6.11 **Stoichiometric Air to Fuel Ratio:** Data not available
6.12 **Flame Temperature:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity With Water:** Reacts slowly, releasing corrosive hydrochloric acid.
7.2 **Reactivity with Common Materials:** Corrodes aluminum, but reaction is not hazardous.
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent
7.7 **Molar Ratio (Reactant to Product):** Data not available
7.8 **Reactivity Group:** 36

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 75-150 ppm/*/pinfish/TL_m/salt water
*Time period not specified.
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** None

9. SHIPPING INFORMATION

9.1 **Grades of Purity:** Uninhibited; inhibited; industrial inhibited; white room; cold cleaning
9.2 **Storage Temperature:** Ambient
9.3 **Inert Atmosphere:** No requirement
9.4 **Venting:** Pressure-vacuum

10. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook)

A-X-Y

11. HAZARD CLASSIFICATIONS

11.1 **Code of Federal Regulations:** ORM-A

11.2 **NAS Hazard Rating for Bulk Water**

Transportation:

Category	Rating
Fire	1
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	2
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	3
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

11.3 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	1
Reactivity (Yellow)	0

12. PHYSICAL AND CHEMICAL PROPERTIES

12.1 **Physical State at 15°C and 1 atm:** Liquid
12.2 **Molecular Weight:** 133.41
12.3 **Boiling Point at 1 atm:** 165°F = 74°C = 347°K
12.4 **Freezing Point:** <—36°F = <—39°C = <234°K
12.5 **Critical Temperature:** Not pertinent
12.6 **Critical Pressure:** Not pertinent
12.7 **Specific Gravity:** 1.31 at 20°C (liquid)
12.8 **Liquid Surface Tension:** 25.4 dynes/cm = 0.0254 N/m at 20°C
12.9 **Liquid Water Interfacial Tension:** (est.) 45 dynes/cm = 0.045 N/m at 20°C
12.10 **Vapor (Gas) Specific Gravity:** 4.6
12.11 **Ratio of Specific Heats of Vapor (Gas):** 1.104
12.12 **Latent Heat of Vaporization:** 100 Btu/lb = 56 cal/g = 2.4×10^5 J/kg
12.13 **Heat of Combustion:** (est.) 4700 Btu/lb = 2600 cal/g = 110×10^5 J/kg
12.14 **Heat of Decomposition:** Not pertinent
12.15 **Heat of Solution:** Not pertinent
12.16 **Heat of Polymerization:** Not pertinent
12.25 **Heat of Fusion:** Data not available
12.26 **Limiting Value:** Data not available
12.27 **Reid Vapor Pressure:** 4.0 psia

NOTES

TCE TRICHLOROETHANE

12.17 SATURATED LIQUID DENSITY	
Temperature (degrees F)	Pounds per cubic foot
0	85.419
10	84.870
20	84.309
30	83.759
40	83.200
50	82.650
60	82.089
70	81.540
80	80.981
90	80.429
100	79.870
110	79.320
120	78.759
130	78.209
140	77.650
150	77.099
160	76.540

12.18 LIQUID HEAT CAPACITY	
Temperature (degrees F)	British thermal unit per pound-F
55	.240
60	.242
65	.244
70	.246
75	.248
80	.250
85	.252
90	.254
95	.256
100	.258
105	.260
110	.262
115	.264
120	.266
125	.268
130	.270
135	.272
140	.274

12.19 LIQUID THERMAL CONDUCTIVITY	
Temperature (degrees F)	British thermal unit-inch per hour-square foot-F
	N
	O
	T
	P
	E
	R
	T
	I
	N
	E
	N
	T

12.20 LIQUID VISCOSITY	
Temperature (degrees F)	Centipoise
15	1.363
20	1.295
25	1.231
30	1.172
35	1.117
40	1.065
45	1.017
50	.972
55	.929
60	.889
65	.852
70	.817
75	.784
80	.753
85	.723

12.21 SOLUBILITY IN WATER	
Temperature (degrees F)	Pounds per 100 pounds of water
68.02	.070

12.22 SATURATED VAPOR PRESSURE	
Temperature (degrees F)	Pounds per square inch
70	2.099
75	2.364
80	2.657
85	2.980
90	3.335
95	3.725
100	4.152
105	4.619
110	5.130
115	5.686
120	6.292
125	6.950
130	7.663
135	8.437
140	9.273
145	10.180
150	11.150
155	12.200
160	13.330
165	14.540
170	15.840
175	17.240
180	18.730
185	20.330
190	22.030

12.23 SATURATED VAPOR DENSITY	
Temperature (degrees F)	Pounds per cubic foot
70	.04925
75	.05495
80	.06119
85	.06799
90	.07540
95	.08346
100	.09220
105	.10170
110	.11190
115	.12300
120	.13490
125	.14770
130	.16150
135	.17630
140	.19220
145	.20920
150	.22730
155	.24670
160	.26730
165	.28930
170	.31270
175	.33760
180	.36390
185	.39180
190	.42140

12.24 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	British thermal unit per pound-F
0	.146
25	.150
50	.155
75	.159
100	.163
125	.167
150	.171
175	.175
200	.179
225	.183
250	.186
275	.190
300	.193
325	.196
350	.199
375	.202
400	.205
425	.208
450	.210
475	.213
500	.215
525	.217
550	.219
575	.222
600	.223

1,1,2-TRICHLOROETHANE

TCM

Common Synonyms	Liquid	Colorless	Sweet, chloroform like odor
Ethane, 1,1,2-trichloro- beta-Trichloroethane Vinyl trichloride	Sinks in water.		

AVOID CONTACT WITH LIQUID AND VAPOR. KEEP PEOPLE AWAY.
Wear self-contained positive pressure breathing apparatus and full protective clothing.
Stop discharge if possible.
Shut off sources, call fire department.
Evacuate area in case of large discharge.
Stay upwind and use water spray to "knock down" vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

POISONOUS GASES ARE PRODUCED IN FIRE.
Container may explode in fire.
Wear self-contained positive pressure breathing apparatus.
Impervious clothing and gloves.
Extinguish fires with water spray, fog or foam, carbon dioxide, or dry chemical.

Exposure

CALL FOR MEDICAL AID.

VAPOR
Irritating to eyes, nose, throat, lungs and skin; may cause defatting dermatitis.
Highly toxic; death may result from respiratory failure.
If inhaled, anesthetic or narcotic effect may occur.
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Irritating to skin and eyes; severe irritant to gastrointestinal tract. Highly toxic.
If swallowed, may cause liver or kidney damage and may increase myocardial irritability.
May cause chemical pneumonia if aspirated into lungs.
IF IN EYES OR ON SKIN, hold eyelids open and flush with water for at least 15 minutes; hold eyelids open if necessary.
Remove and isolate contaminated clothing and shoes at the site.
IF SWALLOWED, and victim is CONSCIOUS, have victim drink water and induce vomiting.
IF SWALLOWED AND VICTIM UNCONSCIOUS OR HAVING CONVULSIONS, just keep victim warm.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook)

Should be removed.
Chemical and physical treatment.

2. LABEL

2.1 **Category:** Not listed
2.2 **Class:** Not pertinent

3. CHEMICAL DESIGNATIONS

3.1 **CG Compatibility Class:** Halogenated hydrocarbon
3.2 **Formula:** $CHCl_2CH_2Cl$
3.3 **IMO/UN Designation:** Data not available
3.4 **DOT ID No.:** Data not available
3.5 **CAS Registry No.:** 79-00-5

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Sweet chloroform-like odor

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Self-contained positive pressure breathing apparatus and full protective clothing.
5.2 **Symptoms Following Exposure:** Inhalation causes irritation of the nose, throat, and lungs. High concentrations may cause death by respiratory failure. Highly toxic by ingestion; may cause liver or kidney damage or myocardial irritability. Causes severe irritation of the gastrointestinal tract. Vapor may produce superficial skin burns or defatting type dermatitis and may irritate the eyes.
5.3 **Treatment of Exposure:** INHALATION: Move to fresh air; call emergency medical care. If breathing stops, give artificial respiration. If breathing is difficult, give oxygen. INGESTION: If victim is conscious get victim to induce vomiting by touching the back of the throat with his finger or by taking syrup of ipecac. If victim is unconscious or having convulsions, do nothing except keep victim warm. EYES OR SKIN: Flush with running water for at least 15 minutes; hold eyelids open if necessary. Clean skin with soap or mild detergent. Remove and isolate contaminated clothing and shoes at the site.
5.4 **Threshold Limit Value:** Data not available
5.5 **Short Term Inhalation Limits:** Data not available
5.6 **Toxicity by Ingestion:** Grade 2; LD_{50} = 580 mg/kg (rat)
5.7 **Late Toxicity:** Causes liver and kidney damage; may increase myocardial irritability. It is a central nervous system depressant. It is carcinogenic. May cause chemical pneumonia if aspirated into the lungs.
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will not tolerate moderate or high concentrations.
5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on skin and allowed to remain, may cause smarting and reddening of the skin.
5.10 **Odor Threshold:** Data not available
5.11 **IDLH Value:** 500 ppm

6. FIRE HAZARDS

6.1 **Flash Point:** None.
6.2 **Flammable Limits in Air:** 8.4% - 13.3%
6.3 **Fire Extinguishing Agents:** Small fires: dry chemical or CO_2. Large fires: water spray, fog or foam.
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Toxic gases including hydrogen chloride and very small amounts of phosgene and chlorine are produced.
6.6 **Behavior in Fire:** Forms a flammable vapor-air mixture at 109°F and higher.
6.7 **Ignition Temperature:** Not pertinent
6.8 **Electrical Hazard:** Data not available
6.9 **Burning Rate:** Data not available
6.10 **Adiabatic Flame Temperature:** Data not available

(Continued)

7. CHEMICAL REACTIVITY

7.1 **Reactivity With Water:** No reaction
7.2 **Reactivity with Common Materials:** Incompatible with oxidizing material or aluminum. Will attack some forms of plastics, rubber and coatings.
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent
7.7 **Molar Ratio (Reactant to Product):** Data not available
7.8 **Reactivity Group:** 36

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 18 mg/l/48 hr/daphnia magna/LC_{50}/fresh water.
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** Data not available

9. SHIPPING INFORMATION

9.1 **Grades of Purity:** Technical grade; stabilized: 95%
9.2 **Storage Temperature:** Data not available
9.3 **Inert Atmosphere:** Data not available
9.4 **Venting:** Data not available

10. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook)

A-X

11. HAZARD CLASSIFICATIONS

11.1 **Code of Federal Regulations:** Not listed
11.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
11.3 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	1
Reactivity (Yellow)	0

12. PHYSICAL AND CHEMICAL PROPERTIES

12.1 **Physical State at 15°C and 1 atm:** Liquid
12.2 **Molecular Weight:** 133.41
12.3 **Boiling Point at 1 atm:** 236.6°F = 113.7°C = 386.9°K
12.4 **Freezing Point:** —31/—34.1°F = —35/—36.7°C = 238.2/236.5°K
12.5 **Critical Temperature:** Data not available
12.6 **Critical Pressure:** Data not available
12.7 **Specific Gravity:** 1.44 at 20°C (liquid)
12.8 **Liquid Surface Tension:** 33.75 dynes/cm = 0.0338 N/m at 20°C
12.9 **Liquid Water Interfacial Tension:** Data not available
12.10 **Vapor (Gas) Specific Gravity:** 4.6
12.11 **Ratio of Specific Heats of Vapor (Gas):** Data not available
12.12 **Latent Heat of Vaporization:** Data not available
12.13 **Heat of Combustion:** Data not available
12.14 **Heat of Decomposition:** Not pertinent
12.15 **Heat of Solution:** Not pertinent
12.16 **Heat of Polymerization:** Not pertinent
12.25 **Heat of Fusion:** Data not available
12.26 **Limiting Value:** Data not available
12.27 **Reid Vapor Pressure:** Data not available

6. FIRE HAZARDS (Continued)

6.11 **Stoichiometric Air to Fuel Ratio:** Data not available
6.12 **Flame Temperature:** Data not available

TCM	1,1,2-TRICHLOROETHANE

12.17 SATURATED LIQUID DENSITY		12.18 LIQUID HEAT CAPACITY		12.19 LIQUID THERMAL CONDUCTIVITY		12.20 LIQUID VISCOSITY	
Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F	Temperature (degrees F)	British thermal unit-inch per hour-square foot-F	Temperature (degrees F)	Centipoise
68	89.900		D A T A N O T A V A I L A B L E		D A T A N O T A V A I L A B L E		D A T A N O T A V A I L A B L E

12.21 SOLUBILITY IN WATER		12.22 SATURATED VAPOR PRESSURE		12.23 SATURATED VAPOR DENSITY		12.24 IDEAL GAS HEAT CAPACITY	
Temperature (degrees F)	Pounds per 100 pounds of water	Temperature (degrees F)	Pounds per square inch	Temperature (degrees F)	Pounds per cubic foot	Temperature (degrees F)	British thermal unit per pound-F
	I N S O L U B L E	0 25 50 75 100 125 150 175 200	0.049 0.093 0.179 0.344 0.660 1.265 2.427 4.656 8.933	0 25 50 75 100 125 150 175 200	0.00130 0.00239 0.00439 0.00805 0.01478 0.02712 0.04976 0.09130 0.16753		D A T A N O T A V A I L A B L E

OHS06860

SECTION 1 CHEMICAL PRODUCTS & COMPANY IDENTIFICATION

OCCUPATIONAL HEALTH SERVICES, INC.
11 WEST 42ND STREET, 12TH FLOOR
NEW YORK, NEW YORK 10036
1-800-445-MSDS (1-800-445-6737) OR
1-212-789-3535

FOR EMERGENCY SOURCE INFORMATION
CONTACT: 1-615-366-2000

CAS NUMBER: 75-27-4
RTECS NUMBER: PA5310000

SUBSTANCE: DICHLOROBROMOMETHANE

TRADE NAMES/SYNONYMS:
BROMODICHLOROMETHANE; METHANE, BROMODICHLORO-; DICHLOROMONOBROMOMETHANE;
MONOBROMODICHLOROMETHANE; CHBRCL2; OHS06860

CHEMICAL FAMILY:
HALOGEN COMPOUND, ALIPHATIC

CREATION DATE: 04/23/85 REVISION DATE: 03/24/93

SECTION 2 COMPOSITION/INFORMATION ON INGREDIENTS

COMPONENT : DICHLOROBROMOMETHANE
CAS NUMBER: 75-27-4
PERCENTAGE: 100.0

OTHER CONTAMINANTS: NONE.

SECTION 3 HAZARDS IDENTIFICATION

CERCLA RATINGS (SCALE 0-3): HEALTH=3 FIRE=1 REACTIVITY=0 PERSISTENCE=2
NFPA RATINGS (SCALE 0-4): HEALTH=1 FIRE=1 REACTIVITY=0

EMERGENCY OVERVIEW:
DICHLOROBROMOMETHANE IS A COLORLESS LIQUID WITH A MILD, SWEET ODOR.
SUSPECT CANCER HAZARD (CONTAINS MATERIAL WHICH CAN CAUSE CANCER IN ANIMALS).
RISK OF CANCER DEPENDS ON DURATION AND LEVEL OF EXPOSURE. MAY AFFECT THE
CENTRAL NERVOUS SYSTEM. CAUSES RESPIRATORY TRACT IRRITATION.
AVOID BREATHING VAPOR OR MIST. AVOID CONTACT WITH EYES, SKIN AND CLOTHING.
KEEP CONTAINER TIGHTLY CLOSED. WASH THOROUGHLY AFTER HANDLING. USE ONLY WITH
ADEQUATE VENTILATION.

POTENTIAL HEALTH EFFECTS:
INHALATION:
SHORT TERM EXPOSURE: MAY CAUSE IRRITATION. ADDITIONAL EFFECTS MAY INCLUDE
DRUNKENESS, EXCITATION AND HEART FAILURE.
LONG TERM EFFECTS: MAY CAUSE NAUSEA, HEADACHE, DISORIENTATION, TWITCHING,

VISUAL DISTURBANCES, LIVER AND KIDNEY DAMAGE, PARALYSIS AND CONVULSIONS.

SKIN CONTACT:

SHORT TERM EXPOSURE: MAY CAUSE IRRITATION.

LONG TERM EFFECTS: NO INFORMATION AVAILABLE ON SIGNIFICANT ADVERSE EFFECTS

EYE CONTACT:

SHORT TERM EXPOSURE: NO INFORMATION AVAILABLE ON SIGNIFICANT ADVERSE EFFECTS.

LONG TERM EFFECTS: NO INFORMATION AVAILABLE ON SIGNIFICANT ADVERSE EFFECTS

INGESTION:

SHORT TERM EXPOSURE: MAY CAUSE DRUNKENESS, DIFFICULTY BREATHING AND WEAKNESS.

LONG TERM EFFECTS: IN ADDITION TO EFFECTS FROM SHORT TERM EXPOSURE, MUCOUS MEMBRANE GROWTHS, HYPERACTIVITY AND LIVER DAMAGE MAY OCCUR. MAY ALSO CAUSE CANCER.

CARCINOGEN STATUS:

OSHA: N

NTP: N

IARC: Y

SECTION 4 FIRST AID MEASURES

INHALATION:

FIRST AID- REMOVE FROM EXPOSURE AREA TO FRESH AIR IMMEDIATELY. IF BREATHING HAS STOPPED, GIVE ARTIFICIAL RESPIRATION. MAINTAIN AIRWAY AND BLOOD PRESSURE AND ADMINISTER OXYGEN IF AVAILABLE. KEEP AFFECTED PERSON WARM AND AT REST. TREAT SYMPTOMATICALLY AND SUPPORTIVELY. ADMINISTRATION OF OXYGEN SHOULD BE PERFORMED BY QUALIFIED PERSONNEL. GET MEDICAL ATTENTION IMMEDIATELY.

SKIN CONTACT:

FIRST AID- REMOVE CONTAMINATED CLOTHING AND SHOES IMMEDIATELY. WASH AFFECTED AREA WITH SOAP OR MILD DETERGENT AND LARGE AMOUNTS OF WATER UNTIL NO EVIDENCE OF CHEMICAL REMAINS (APPROXIMATELY 15-20 MINUTES). GET MEDICAL ATTENTION IMMEDIATELY.

EYE CONTACT:

FIRST AID- WASH EYES IMMEDIATELY WITH LARGE AMOUNTS OF WATER OR NORMAL SALINE OCCASIONALLY LIFTING UPPER AND LOWER LIDS, UNTIL NO EVIDENCE OF CHEMICAL REMAINS (APPROXIMATELY 15-20 MINUTES). GET MEDICAL ATTENTION IMMEDIATELY.

INGESTION:

FIRST AID- REMOVE BY GASTRIC LAVAGE OR EMESIS. MAINTAIN BLOOD PRESSURE AND AIRWAY. DO NOT PERFORM GASTRIC LAVAGE OR EMESIS IF VICTIM IS UNCONSCIOUS DO NOT GIVE STIMULANTS WHICH MAY INDUCE VENTRICULAR FIBRILLATION. GET MEDICAL ATTENTION IMMEDIATELY. (DREISBACH, HANDBOOK OF POISONING, 11TH EDITION) ADMINISTRATION OF GASTRIC LAVAGE SHOULD BE PERFORMED BY QUALIFIED MEDICAL PERSONNEL.

NOTE TO PHYSICIAN

ANTIDOTE:

NO SPECIFIC ANTIDOTE. TREAT SYMPTOMATICALLY AND SUPPORTIVELY.

SECTION 5 FIRE FIGHTING MEASURES

FIRE AND EXPLOSION HAZARD:
SLIGHT FIRE HAZARD WHEN EXPOSED TO HEAT OR FLAME.

EXTINGUISHING MEDIA:
DRY CHEMICAL, CARBON DIOXIDE, WATER SPRAY OR REGULAR FOAM (1990 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.5).

FOR LARGER FIRES, USE WATER SPRAY, FOG OR REGULAR FOAM (1990 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.5).

FIREFIGHTING:
MOVE CONTAINER 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 (1990 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.5, GUIDE PAGE 31).

USE AGENTS SUITABLE FOR TYPE OF SURROUNDING FIRE. AVOID BREATHING HAZARDOUS VAPORS, KEEP UPWIND.

HAZARDOUS COMBUSTION PRODUCTS:
THERMAL DECOMPOSITION PRODUCTS MAY INCLUDE TOXIC AND CORROSIVE FUMES OF CHLORIDES AND BROMIDES AND TOXIC OXIDES OF CARBON.

SECTION 6 ACCIDENTAL RELEASE MEASURES

OCCUPATIONAL SPILL:
STOP LEAK IF YOU CAN DO IT WITHOUT RISK. FOR SMALL SPILLS, TAKE UP WITH SAND OR OTHER ABSORBENT MATERIAL AND PLACE INTO CLEAN, DRY CONTAINERS FOR LATER DISPOSAL. KEEP UNNECESSARY PEOPLE AWAY, ISOLATE HAZARD AREA AND DENY ENTRY.

REPORTABLE QUANTITY (RQ): 5000 POUNDS
THE SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT (SARA) SECTION 304 REQUIRES THAT A RELEASE EQUAL TO OR GREATER THAN THE REPORTABLE QUANTITY FOR THIS SUBSTANCE BE IMMEDIATELY REPORTED TO THE LOCAL EMERGENCY PLANNING COMMITTEE AND THE STATE EMERGENCY RESPONSE COMMISSION (40 CFR 355.40). IF THE RELEASE OF THIS SUBSTANCE IS REPORTABLE UNDER CERCLA SECTION 103, THE NATIONAL RESPONSE CENTER MUST BE NOTIFIED IMMEDIATELY AT (800) 424-8802 OR (202) 426-2675 IN THE METROPOLITAN WASHINGTON, D.C. AREA (40 CFR 302.6).

WATER SPILL:
THE CALIFORNIA SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT OF 1986 (PROPOSITION 65) PROHIBITS CONTAMINATING ANY KNOWN SOURCE OF DRINKING WATER WITH SUBSTANCES KNOWN TO CAUSE CANCER AND/OR REPRODUCTIVE TOXICITY.

SECTION 7 HANDLING AND STORAGE

OBSERVE ALL FEDERAL, STATE AND LOCAL REGULATIONS WHEN STORING THIS SUBSTANCE.

STORE AWAY FROM INCOMPATIBLE SUBSTANCES.

SECTION 8 EXPOSURE CONTROLS/PERSONAL PROTECTION

EXPOSURE LIMITS:
NO OCCUPATIONAL EXPOSURE LIMITS ESTABLISHED BY OSHA, ACGIH, OR NIOSH.

DICHLOROBROMOMETHANE:
5000 POUNDS CERCLA SECTION 103 REPORTABLE QUANTITY
SUBJECT TO SARA SECTION 313 ANNUAL TOXIC CHEMICAL RELEASE REPORTING
SUBJECT TO CALIFORNIA PROPOSITION 65 CANCER AND/OR REPRODUCTIVE TOXICITY WARNING AND RELEASE REQUIREMENTS- (JANUARY 1, 1990)

VENTILATION:
PROVIDE LOCAL EXHAUST OR PROCESS ENCLOSURE VENTILATION SYSTEM.

EYE PROTECTION:
EMPLOYEE MUST WEAR SPLASH-PROOF OR DUST-RESISTANT SAFETY GOGGLES TO PREVENT EYE CONTACT WITH THIS SUBSTANCE.

EMERGENCY EYE WASH: WHERE THERE IS ANY POSSIBILITY THAT AN EMPLOYEE'S EYES M BE EXPOSED TO THIS SUBSTANCE, THE EMPLOYER SHOULD PROVIDE AN EYE WASH FOUNTAIN WITHIN THE IMMEDIATE WORK AREA FOR EMERGENCY USE.

CLOTHING:
EMPLOYEE MUST WEAR APPROPRIATE PROTECTIVE (IMPERVIOUS) CLOTHING AND EQUIPME TO PREVENT REPEATED OR PROLONGED SKIN CONTACT WITH THIS SUBSTANCE.

GLOVES:
EMPLOYEE MUST WEAR APPROPRIATE PROTECTIVE GLOVES TO PREVENT CONTACT WITH TH SUBSTANCE.

RESPIRATOR:
THE FOLLOWING RESPIRATORS ARE RECOMMENDED BASED ON INFORMATION FOUND IN THE PHYSICAL DATA, TOXICITY AND HEALTH EFFECTS SECTIONS. THEY ARE RANKED IN ORDER FROM MINIMUM TO MAXIMUM RESPIRATORY PROTECTION.
THE SPECIFIC RESPIRATOR SELECTED MUST BE BASED ON CONTAMINATION LEVELS FOUNI IN THE WORK PLACE, MUST BE BASED ON THE SPECIFIC OPERATION, MUST NOT EXCE THE WORKING LIMITS OF THE RESPIRATOR AND MUST BE JOINTLY APPROVED BY THE NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH AND THE MINE SAFETY AND HEALTH ADMINISTRATION (NIOSH-MSHA).

ANY TYPE 'C' SUPPLIED-AIR RESPIRATOR WITH A FULL FACEPIECE OPERATED IN PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE MODE OR WITH A FULL FACEPIEC HELMET OR HOOD OPERATED IN CONTINUOUS-FLOW MODE.

ANY SELF-CONTAINED BREATHING APPARATUS WITH A FULL FACEPIECE OPERATED IN PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE MODE.

FOR FIREFIGHTING AND OTHER IMMEDIATELY DANGEROUS TO LIFE OR HEALTH CONDITION

ANY SELF-CONTAINED BREATHING APPARATUS THAT HAS A FULL FACEPIECE AND IS

OPERATED IN A PRESSURE-DEMAND OR OTHER POSITIVE-PRESSURE MODE.

ANY SUPPLIED-AIR RESPIRATOR THAT HAS A FULL FACEPIECE AND IS OPERATED IN A PRESSURE-DEMAND OR OTHER POSITIVE-PRESSURE MODE IN COMBINATION WITH AN AUXILIARY SELF-CONTAINED BREATHING APPARATUS OPERATED IN PRESSURE-DEMAND OR OTHER POSITIVE-PRESSURE MODE.

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

DESCRIPTION: COLORLESS LIQUID WITH A MILD, SWEET ODOR.
MOLECULAR WEIGHT: 163.83
MOLECULAR FORMULA: C-H-BR-CL2
BOILING POINT: 194 F (90 C)
MELTING POINT: -71 F (-57 C)
VAPOR PRESSURE: 50 MM HG @ 20 C
SPECIFIC GRAVITY: 1.980
WATER SOLUBILITY: 0.45%
SOLVENT SOLUBILITY: SOLUBLE IN ALCOHOL, ETHER, ACETONE, CHLOROFORM, BENZENE, COMMOM ORGANIC SOLVENTS.

SECTION 10 STABILITY AND REACTIVITY

REACTIVITY:
STABLE UNDER NORMAL TEMPERATURES AND PRESSURES.

CONDITIONS TO AVOID:
MAY BURN BUT DOES NOT IGNITE READILY. AVOID CONTACT WITH STRONG OXIDIZERS, EXCESSIVE HEAT, SPARKS, OR OPEN FLAME.

INCOMPATIBILITIES:
DICHLOROBROMOMETHANE:
OXIDIZERS (STRONG): FIRE AND EXPLOSION HAZARD.

HAZARDOUS DECOMPOSITION:
THERMAL DECOMPOSITION PRODUCTS MAY INCLUDE TOXIC AND CORROSIVE FUMES OF CHLORIDES AND BROMIDES AND TOXIC OXIDES OF CARBON.

POLYMERIZATION:
HAZARDOUS POLYMERIZATION HAS NOT BEEN REPORTED TO OCCUR UNDER NORMAL TEMPERATURES AND PRESSURES.

SECTION 11 TOXICOLOGY INFORMATION

DICHLOROBROMOMETHANE:
TOXICITY DATA: 916 MG/KG ORAL-RAT LD50: 450 MG/KG ORAL-MOUSE LD50: 430 MG/KG SUBCUTANEOUS-RAT LD50: MUTAGENIC DATA (RTECS); TUMORIGENIC DATA (RTECS).
CARCINOGEN STATUS: HUMAN INADEQUATE EVIDENCE, ANIMAL SUFFICIENT EVIDENCE (IARC GROUP-2B). TWO YEAR ORAL GAVAGE STUDIES WERE DONE ON MALE AND FEMALE MICE AND RATS. LIFE-SPAN STUDIES WERE DONE ON MALE AND FEMALE RATS AND MICE BY ADMINISTRATION IN DRINKING WATER. INCREASED INCIDENCES OF ADENOMATOUS POLYPS AND ADENOCARCINOMAS OF THE LARGE INTESTINE AND OF TUBULAR-CELL

ADENOMAS AND ADENOCARCINOMAS OF THE KIDNEY WERE SEEN IN MALE AND FEMALE RATS. INCREASED INCIDENCES OF TUBULAR-CELL ADENOMAS AND ADENOCARCINOMAS OF THE KIDNEY WERE SEEN IN MALE MICE AND HEPATOCELLULAR ADENOMAS AND CARCINOMAS WERE SEEN IN FEMALE MICE. THE STUDY BY ADMINISTRATION IN DRINKING-WATER SHOWED THE DEVELOPMENT OF NEOPLASTIC NODULES AND ADENOFIBROSIS OF THE LIVER IN RATS WITH NO INCREASED INCIDENCE OF TUMORS MICE. THERE WAS NO INCREASE IN THE INCIDENCE OF LUNG TUMORS IN MICE INJE INTRAPERITONEALLY AS A SCREEN TEST FOR LUNG ADENOMAS.

LOCAL EFFECTS: IRRITANT- INHALATION.

ACUTE TOXICITY LEVEL: MODERATELY TOXIC BY INGESTION.

TARGET EFFECTS: CENTRAL NERVOUS SYSTEM DEPRESSANT. POISONING MAY ALSO AFFECT THE KIDNEYS AND LIVER.

HEALTH EFFECTS

INHALATION:

DICHLOROBROMOMETHANE:

IRRITANT/NARCOTIC.

ACUTE EXPOSURE- INHALATION MAY CAUSE MUCOUS MEMBRANE AND LUNG IRRITATION. CENTRAL NERVOUS SYSTEM DEPRESSION MAY OCCUR AT HIGH CONCENTRATIONS. IN ADDITION, SOME HALOGENATED HYDROCARBONS MAY CAUSE INEBRIATION AND EXCITATION PRIOR TO NARCOSIS. DEATH MAY OCCUR DUE TO RESPIRATORY FAILURE OR CARDIAC ARREST.

CHRONIC EXPOSURE- SOME HALOGENATED HYDROCARBONS MAY CAUSE HEADACHE, NAUSI ATAXIA, TREMORS, DIFFICULTY IN SPEECH AND VISUAL DISTURBANCES POSSIBLY PROGRESSING TO CONVULSIONS, PARALYSIS, DELIRIUM, MANIA OR APATHY. RECOVERY IS SLOW AND PERMANENT BRAIN CHANGES MAY BE PRESENT. LIVER AND KIDNEY DAMAGE MAY OCCUR.

SKIN CONTACT:

DICHLOROBROMOMETHANE:

ACUTE EXPOSURE- CONTACT MAY CAUSE IRRITATION. LIKE SIMILAR COMPOUNDS, DICHLOROBROMOMETHANE MAY BE ABSORBED THROUGH THE SKIN.

CHRONIC EXPOSURE- REPEATED AND PROLONGED CONTACT TO THE HALOGENATED HYDROCARBONS MAY DEGREASE THE SKIN CAUSING DRYING AND CRACKING.

EYE CONTACT:

DICHLOROBROMOMETHANE:

ACUTE EXPOSURE- CONTACT MAY CAUSE CORNEAL IRRITATION. DIRECT CONTACT WITH SOME HALOGENATED HYDROCARBONS MAY CAUSE REVERSIBLE INJURY.

CHRONIC EXPOSURE- PROLONGED EXPOSURE OF THE CORNEA TO SOME HALOGENATED HYDROCARBONS MAY RESULT IN PERSISTENT INJURY.

INGESTION:

DICHLOROBROMOMETHANE:

NARCOTIC/CARCINOGEN.

ACUTE EXPOSURE- ADMINISTRATION IN RATS AND MICE AT OR ABOVE THE LETHAL DOSE HAS CAUSED PILOERECTION, LETHARGY, SEDATION, LABORED BREATHING, FLACCID MUSCLE TONE, INCOORDINATION, ATAXIA, PROSTRATION, ENLARGEMENT AN CONGESTION OF THE LIVER AND KIDNEYS, FATTY INFILTRATION OF THE LIVER, AN HEMORRHAGIC LESIONS IN THE KIDNEYS, ADRENALS, LUNG, AND BRAIN. DEATH H S BEEN REPORTED FROM ACUTE EXPOSURE. A SINGLE ORAL DOSE OF 390 MG/KG CAUSE REDUCED HEMOGLOBIN AND HEMATOCRIT IN MALE RATS.

CHRONIC EXPOSURE- REPEATED ADMINISTRATION HAS RESULTED IN CENTRILOBULAR DEGENERATION IN THE LIVER AND DEGENERATION AND NECROSIS OF THE KIDNEYS I

RATS AND MICE. IN ADDITION, FOLLICULAR CELL HYPERPLASIA OF THE THYROID GLAND HAS BEEN REPORTED IN MICE. AT HIGH DOSES, HYPERACTIVITY IN RATS AND LETHARGY IN MICE WERE NOTED. DEATH OCCURRED IN MICE FROM REPEATED DOSES. CHRONIC ADMINISTRATION RESULTED IN AN INCREASED INCIDENCE OF TUBULAR CELL ADENOMAS AND ADENOCARCINOMAS OF THE KIDNEY IN RATS AND MICE, HEPATIC ADENOFIBROSIS, ADENOCARCINOMAS AND ADENOMATOUS POLYPS OF THE LARGE INTESTINE IN RATS, AND HEPATOCELLULAR ADENOMAS AND CARCINOMAS IN MICE. AN INCREASED INCIDENCE OF STERNEBRAL AND INTERPARIETAL ANOMALIES IN FETUSES FROM RATS FED 50 MG/KG/DAY ON DAYS 6-15 OF GESTATION HAVE BEEN REPORTED. THESE DOSES ALSO RESULTED IN SIGNIFICANT MATERNAL TOXICITY.

SECTION 12 ECOLOGICAL INFORMATION

ENVIRONMENTAL IMPACT RATING (0-4): NO DATA AVAILABLE

ACUTE AQUATIC TOXICITY: NO DATA AVAILABLE

DEGRADABILITY: NO DATA AVAILABLE

LOG BIOCONCENTRATION FACTOR (BCF): NO DATA AVAILABLE

LOG OCTANOL/WATER PARTITION COEFFICIENT: NO DATA AVAILABLE

SECTION 13 DISPOSAL INFORMATION

OBSERVE ALL FEDERAL, STATE AND LOCAL REGULATIONS WHEN DISPOSING OF THIS SUBSTANCE.

SECTION 14 TRANSPORTATION INFORMATION

NO CLASSIFICATION CURRENTLY ASSIGNED

SECTION 15 REGULATORY INFORMATION

TSCA STATUS: Y

CERCLA SECTION 103 (40CFR302.4):	Y	5000 POUNDS RQ
SARA SECTION 302 (40CFR355.30):	N	
SARA SECTION 304 (40CFR355.40):	N	
SARA SECTION 313 (40CFR372.65):	Y	
OSHA PROCESS SAFETY (29CFR1910.119):	N	
CALIFORNIA PROPOSITION 65:	Y	

SARA HAZARD CATEGORIES, SARA SECTIONS 311/312 (40 CFR 370.21)

ACUTE HAZARD:	Y
CHRONIC HAZARD:	Y
FIRE HAZARD:	N
REACTIVITY HAZARD:	N
SUDDEN RELEASE HAZARD:	N

SECTION 16 OTHER

1,1-DICHLOROETHANE

DCH

Common Synonyms	Oily liquid	Colorless	Chloroform like ethereal
Ethylidene chloride Ethylidene dichloride Chlorinated hydrochloric ether	Sinks and mixes with water.		

Wear goggles, self-contained breathing apparatus, and rubber overclothing
Stop discharge if possible. Keep people away.
Shut off ignition sources and call fire department.
Avoid contact with liquid.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Flammable.
POISONOUS GAS MAY BE PRODUCED IN FIRE OR WHEN HEATED.
Containers may explode in fire.
Wear goggles and self-contained breathing apparatus.
Extinguish with alcohol foam, carbon dioxide, or dry chemical.
Water may be ineffective on fire.

Exposure

CALL FOR MEDICAL AID.

LIQUID
If swallowed may cause nausea, vomiting and faintness.
Irritating to skin and eyes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS have victim drink water or milk and induce vomiting.

Water Pollution

Dangerous to aquatic life in high concentrations.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook)

Issue warning-high flammability.
Restrict access.
Chemical and physical treatment.

2. LABEL

2.1 **Category:** None
2.2 **Class:** Not pertinent

3. CHEMICAL DESIGNATIONS

3.1 **CG Compatibility Class:** Halogenated hydrocarbon
3.2 **Formula:** $C_2H_4Cl_2$
3.3 **IMO/UN Designation:** Not listed
3.4 **DOT ID No.:** 2362
3.5 **CAS Registry No.:** 75-34-3

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Oily liquid
4.2 **Color:** Colorless
4.3 **Odor:** Chloroform

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** In areas of poor ventilation or high concentration, a self-contained breathing apparatus with full face mask should be worn. Chemical workers goggles, rubber gloves, and protective clothing should be worn.
5.2 **Symptoms Following Exposure:** INHALATION: Irritation of respiratory tract. Salivation, sneezing, coughing, dizziness, nausea, and vomiting. EYES: Irritation, lacrimation, and reddening of conjunctiva. SKIN: Irritation. Prolonged or repeated skin contact can produce a slight burn. INGESTION: Ingestion incidental to industrial handling is not considered to be a problem. Swallowing of substantial amounts could cause nausea, vomiting, faintness, drowsiness, cyanosis, and circulatory failure.
5.3 **Treatment of Exposure:** Call a doctor. INHALATION: Remove from contaminated area; keep warm and quiet. If breathing has stopped, give artificial respiration. Administer oxygen. EYES: Flush with large amounts of water or weak bicarbonate of soda solution. SKIN: Dilute with large amounts of water. Remove contaminated clothing. INGESTION: Attempt to empty stomach; dilute by administering fluids (tap water, soapy water, salt water, or milk).
5.4 **Threshold Limit Value:** 200 ppm.
5.5 **Short Term Inhalation Limits:** 250 ppm.
5.6 **Toxicity by Ingestion:** Grade 2; LD_{50} = 0.5 to 5 g/kg (rat).
5.7 **Late Toxicity:** Chronic exposure may cause liver damage and dermatitis. Animal experimentation has shown this compound to be slightly embryo-toxic and to retard fetal development.
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin.
5.10 **Odor Threshold:** Data not available
5.11 **IDLH Value:** 4,000 ppm

6. FIRE HAZARDS

6.1 **Flash Point:** 57°F O.C. = 22°F C.C.
6.2 **Flammable Limits in Air:** 5.6% to 11.4%
6.3 **Fire Extinguishing Agents:** Alcohol foam, water, foam, CO_2, dry chemical, carbon tetrachloride
6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6.5 **Special Hazards of Combustion Products:** When heated to decomposition emits highly toxic fumes to phosgene.
6.6 **Behavior in Fire:** Explosion hazard
6.7 **Ignition Temperature:** 856°F
6.8 **Electrical Hazard:** Data not available
6.9 **Burning Rate:** Data not available
6.10 **Adiabatic Flame Temperature:** Data not available
6.11 **Stoichiometric Air to Fuel Ratio:** Data not available
6.12 **Flame Temperature:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity With Water:** No reaction
7.2 **Reactivity with Common Materials:** Data not available
7.3 **Stability During Transport:** Data not available
7.4 **Neutralizing Agents for Acids and Caustics:** Data not available
7.5 **Polymerization:** Data not available
7.6 **Inhibitor of Polymerization:** Iable Data not available
7.7 **Molar Ratio (Reactant to Product):** Data not available
7.8 **Reactivity Group:** 36

8. WATER POLLUTION

8.1 **Aquatic Toxicity:**
TL_m (Marine pinperch) 250 to 275 mg/l
24-hour TL_m Brine shrimp: 320 mg/l
24-hour TL_m Pinperch: 160 mg/l
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Percent, 0.05 g/g for 10 days Percent, 0.002 g/g for 5 days
8.4 **Food Chain Concentration Potential:** Data not available

9. SHIPPING INFORMATION

9.1 **Grades of Purity:** Data not available
9.2 **Storage Temperature:** Cool
9.3 **Inert Atmosphere:** Data not available
9.4 **Venting:** Data not available

10. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook)

A-P-Q-R-S

11. HAZARD CLASSIFICATIONS

11.1 **Code of Federal Regulations:** Not listed
11.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
11.3 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	3
Reactivity (Yellow)	0

12. PHYSICAL AND CHEMICAL PROPERTIES

12.1 **Physical State at 15°C and 1 atm:** Liquid
12.2 **Molecular Weight:** 98.97
12.3 **Boiling Point at 1 atm:** 135.14°F = 57.3°C = 330.5°K
12.4 **Freezing Point:** −143.32°F = −97.4°C = 175.75°K
12.5 **Critical Temperature:** 502.7°F = 261.5°C = 534.65°K
12.6 **Critical Pressure:** 734.8 psia = 50 atm = 5.065 MN/m²
12.7 **Specific Gravity:** 1.174 at 20°C
12.8 **Liquid Surface Tension:** 24.75 dynes/cm = 0.02475 N/m at 20°C
12.9 **Liquid Water Interfacial Tension:** Data not available
12.10 **Vapor (Gas) Specific Gravity:** 3.42
12.11 **Ratio of Specific Heats of Vapor (Gas):** 1.136 at 20°C (68°F)
12.12 **Latent Heat of Vaporization:** 131.6 Btu/lb = 73.1 cal/g = 3.06 X 10^5 J/kg
12.13 **Heat of Combustion:** −4,774 Btu/lb = −2,652 cal/g = −111 X 10^5 J/kg
12.14 **Heat of Decomposition:** Data not available
12.15 **Heat of Solution:** Data not available
12.16 **Heat of Polymerization:** Data not available
12.25 **Heat of Fusion:** Data not available
12.26 **Limiting Value:** Data not available
12.27 **Reid Vapor Pressure:** 7.35 psia

NOTES

TRICHLOROETHYLENE

TCL

Common Synonyms	Watery liquid	Colorless	Sweet odor
Trichloroethylene Trichlene; Algylen Chlorylen Gemalgene Trethylene Trichloran; Trilene	Sinks in water. Irritating vapor is produced.		

Stop discharge if possible. Keep people away.
Avoid contact with liquid and vapor.
Call fire department.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Combustible.
POISONOUS GASES ARE PRODUCED IN FIRE.
Wear goggles and self-contained breathing apparatus.
Extinguish with dry chemical, carbon dioxide, or foam.

Exposure

CALL FOR MEDICAL AID.

VAPOR
Irritating to eyes, nose and throat.
If inhaled, will cause nausea, vomiting, difficult breathing, or loss of consciousness.
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Irritating to skin and eyes.
If swallowed, will cause nausea, vomiting, difficult breathing, or loss of consciousness.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting.
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook)
Should be removed
Chemical and physical treatment

2. LABEL

2.1 **Category:** None
2.2 **Class:** Not pertinent

3. CHEMICAL DESIGNATIONS

3.1 **CG Compatibility Class:** Halogenated hydrocarbon
3.2 **Formula:** $CHCl=CCl_2$
3.3 **IMO/UN Designation:** 9.0/1710
3.4 **DOT ID No.:** 1710
3.5 **CAS Registry No.:** 79-01-6

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Chloroform-like; ethereal

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Organic vapor-acid gas canister; self-contained breathing apparatus for emergencies; neoprene or vinyl gloves; chemical safety goggles; face-shield; neoprene safety shoes; neoprene suit or apron for splash protection.
5.2 **Symptoms Following Exposure:** INHALATION: symptoms range from irritation of the nose and throat to nausea, an attitude of irresponsibility, blurred vision, and finally disturbance of central nervous system resulting in cardiac failure. Chronic exposure may cause organic injury. INGESTION: symptoms similar to inhalation. SKIN: defatting action can cause dermatitis. EYES: slightly irritating sensation and lachrymation.
5.3 **Treatment of Exposure:** Do NOT administer adrenalin or epinephrine; get medical attention for all cases of overexposure. INHALATION: remove victim to fresh air; if necessary, apply artificial respiration and/or administer oxygen. INGESTION: have victim drink water and induce vomiting; repeat three times; then give 1 tablespoon epsom salts in water. EYES: flush thoroughly with water. SKIN: wash thoroughly with soap and warm water.
5.4 **Threshold Limit Value:** 50 ppm
5.5 **Short Term Inhalation Limits:** 200 ppm for 30 min.
5.6 **Toxicity by Ingestion:** Grade 3; LD_{50} = 50 to 500 mg/kg
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
5.9 **Liquid or Solid Irritant Characteristics:** Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
5.10 **Odor Threshold:** 50 ppm
5.11 **IDLH Value:** 1,000 ppm

6. FIRE HAZARDS

6.1 **Flash Point:** 90°F C.C.; practically nonflammable
6.2 **Flammable Limits in Air:** 8.0%-10.5%
6.3 **Fire Extinguishing Agents:** Water fog
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Toxic and irritating gases are produced in fire situations.
6.6 **Behavior in Fire:** Not pertinent
6.7 **Ignition Temperature:** 770°F
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not pertinent
6.10 **Adiabatic Flame Temperature:** Data not available
6.11 **Stoichiometric Air to Fuel Ratio:** Data not available
6.12 **Flame Temperature:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity With Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent
7.7 **Molar Ratio (Reactant to Product):** Data not available
7.8 **Reactivity Group:** 36

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 660 mg/l/40 hr/daphnia/kill/fresh water
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** None

9. SHIPPING INFORMATION

9.1 **Grades of Purity:** Technical; dry cleaning; degreasing; extraction
9.2 **Storage Temperature:** Ambient
9.3 **Inert Atmosphere:** No requirement
9.4 **Venting:** Pressure-vacuum

10. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook)
A-X-Y

11. HAZARD CLASSIFICATIONS

11.1 **Code of Federal Regulations:** ORM-A
11.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	2
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	2
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	1

11.3 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	1
Reactivity (Yellow)	0

12. PHYSICAL AND CHEMICAL PROPERTIES

12.1 **Physical State at 15°C and 1 atm:** Liquid
12.2 **Molecular Weight:** 131.39
12.3 **Boiling Point at 1 atm:** 189°F = 87°C = 360°K
12.4 **Freezing Point:** −123.5°F = −86.4°C = 186.8°K
12.5 **Critical Temperature:** Not pertinent
12.6 **Critical Pressure:** Not pertinent
12.7 **Specific Gravity:** 1.46 at 20°C (liquid)
12.8 **Liquid Surface Tension:** 29.3 dynes/cm = 0.0293 N/m at 20°C
12.9 **Liquid Water Interfacial Tension:** 34.5 dynes/cm = 0.0345 N/m at 24°C
12.10 **Vapor (Gas) Specific Gravity:** 4.5
12.11 **Ratio of Specific Heats of Vapor (Gas):** 1.116
12.12 **Latent Heat of Vaporization:** 103 Btu/lb = 57.2 cal/g = 2.4 X 10^5 J/kg
12.13 **Heat of Combustion:** Not pertinent
12.14 **Heat of Decomposition:** Not pertinent
12.15 **Heat of Solution:** Not pertinent
12.16 **Heat of Polymerization:** Not pertinent
12.25 **Heat of Fusion:** Data not available
12.26 **Limiting Value:** Data not available
12.27 **Reid Vapor Pressure:** 2.5 psia

NOTES

TCL	TRICHLOROETHYLENE

12.17 SATURATED LIQUID DENSITY

Temperature (degrees F)	Pounds per cubic foot
0	94.669
5	94.410
10	94.150
15	93.889
20	93.629
25	93.370
30	93.110
35	92.849
40	92.589
45	92.330
50	92.070
55	91.809
60	91.549
65	91.290
70	91.030
75	90.770
80	90.509
85	90.250
90	89.990
95	89.730
100	89.469
105	89.209
110	88.950
115	88.690
120	88.429
125	88.169

12.18 LIQUID HEAT CAPACITY

Temperature (degrees F)	British thermal unit per pound-F
0	.220
10	.221
20	.223
30	.225
40	.226
50	.228
60	.230
70	.231
80	.233
90	.235
100	.236
110	.238
120	.240
130	.241
140	.243
150	.245
160	.246
170	.248

12.19 LIQUID THERMAL CONDUCTIVITY

Temperature (degrees F)	British thermal unit-inch per hour-square foot-F
	NOT PERTINENT

12.20 LIQUID VISCOSITY

Temperature (degrees F)	Centipoise
15	.800
20	.775
25	.750
30	.727
35	.705
40	.684
45	.664
50	.645
55	.627
60	.610
65	.593
70	.577
75	.562
80	.548
85	.534
90	.521
95	.508
100	.496
105	.485
110	.474
115	.463
120	.453

12.21 SOLUBILITY IN WATER

Temperature (degrees F)	Pounds per 100 pounds of water
77.02	.110

12.22 SATURATED VAPOR PRESSURE

Temperature (degrees F)	Pounds per square inch
40	.508
50	.678
60	.894
70	1.166
80	1.507
90	1.929
100	2.448
110	3.081
120	3.846
130	4.765
140	5.862
150	7.163
160	8.695
170	10.490
180	12.580
190	15.010
200	17.810
210	21.020

12.23 SATURATED VAPOR DENSITY

Temperature (degrees F)	Pounds per cubic foot
40	.01245
50	.01628
60	.02105
70	.02695
80	.03418
90	.04296
100	.05354
110	.06619
120	.08120
130	.09891
140	.11960
150	.14380
160	.17180
170	.20390
180	.24080
190	.28280
200	.33040
210	.38420

12.24 IDEAL GAS HEAT CAPACITY

Temperature (degrees F)	British thermal unit per pound-F
0	.136
25	.139
50	.143
75	.146
100	.149
125	.152
150	.155
175	.157
200	.160
225	.162
250	.165
275	.167
300	.169
325	.172
350	.174
375	.176
400	.177
425	.179
450	.181
475	.182
500	.184
525	.185
550	.186
575	.187
600	.188

OHS26500

SECTION 1 CHEMICAL PRODUCTS & COMPANY IDENTIFICATION

OCCUPATIONAL HEALTH SERVICES, INC.
11 WEST 42ND STREET, 12TH FLOOR
NEW YORK, NEW YORK 10036
1-800-445-MSDS (1-800-445-6737) OR
1-212-789-3535

FOR EMERGENCY SOURCE INFORMATION
CONTACT: 1-615-366-2000

CAS NUMBER: 540-59-0
RTECS NUMBER: KV9360000

SUBSTANCE: 1,2-DICHLOROETHYLENE

TRADE NAMES/SYNONYMS:
SYM-DICHLOROETHYLENE; DIOFORM; ACETYLENE DICHLORIDE; 1,2-DICHLOROETHENE;
ETHYLENE, 1,2-DICHLORO-; ETHENE, 1,2-DICHLORO-; U079; STCC 4909145; C2H2CL2;
OHS26500

CHEMICAL FAMILY:
HALOGEN COMPOUND, ALIPHATIC

CREATION DATE: 09/07/84 REVISION DATE: 03/24/93

SECTION 2 COMPOSITION/INFORMATION ON INGREDIENTS

COMPONENT : 1,2-DICHLOROETHYLENE
CAS NUMBER: 540-59-0
PERCENTAGE: 100.0

OTHER CONTAMINANTS: NONE.

SECTION 3 HAZARDS IDENTIFICATION

CERCLA RATINGS (SCALE 0-3): HEALTH=2 FIRE=3 REACTIVITY=2 PERSISTENCE=1
NFPA RATINGS (SCALE 0-4): HEALTH=2 FIRE=3 REACTIVITY=2

EMERGENCY OVERVIEW:
1,2-DICHLOROETHYLENE IS A COLORLESS LIQUID WITH AN ODOR.
MAY AFFECT THE CENTRAL NERVOUS SYSTEM. CAUSES RESPIRATORY TRACT, SKIN AND EYE IRRITATION. FLAMMABLE LIQUID AND VAPOR. MAY CAUSE FLASH FIRE. ELEVATED TEMPERATURES MAY VIOLENTLY RUPTURE CONTAINERS.
KEEP AWAY FROM ALL IGNITION SOURCES. AVOID BREATHING VAPOR OR MIST. AVOID CONTACT WITH EYES, SKIN AND CLOTHING. KEEP CONTAINER TIGHTLY CLOSED. WASH THOROUGHLY AFTER HANDLING. USE ONLY WITH ADEQUATE VENTILATION.

POTENTIAL HEALTH EFFECTS:
INHALATION:
SHORT TERM EXPOSURE: MAY CAUSE IRRITATION. ADDITIONAL EFFECTS MAY INCLUDE DRUNKENESS, NAUSEA, VOMITING, WEAKNESS, DROWSINESS, TWITCHING AND

UNCONSCIOUSNESS.
LONG TERM EFFECTS: MAY CAUSE LACK OF APPETITE.
SKIN CONTACT:
SHORT TERM EXPOSURE: MAY CAUSE IRRITATION.
LONG TERM EFFECTS: SAME EFFECTS AS SHORT TERM EXPOSURE.
EYE CONTACT:
SHORT TERM EXPOSURE: MAY CAUSE IRRITATION.
LONG TERM EFFECTS: SAME EFFECTS AS SHORT TERM EXPOSURE.
INGESTION:
SHORT TERM EXPOSURE: MAY CAUSE DRUNKENESS.
LONG TERM EFFECTS: NO INFORMATION AVAILABLE ON SIGNIFICANT ADVERSE EFFECTS

CARCINOGEN STATUS:
OSHA: N
NTP: N
IARC: N

SECTION 4 FIRST AID MEASURES

INHALATION:
FIRST AID- REMOVE FROM EXPOSURE AREA TO FRESH AIR IMMEDIATELY. IF BREATHING HAS STOPPED, PERFORM ARTIFICIAL RESPIRATION. KEEP PERSON WARM AND AT REST TREAT SYMPTOMATICALLY AND SUPPORTIVELY. GET MEDICAL ATTENTION IMMEDIATELY.

SKIN CONTACT:
FIRST AID- REMOVE CONTAMINATED CLOTHING AND SHOES IMMEDIATELY. WASH AFFECTED AREA WITH SOAP OR MILD DETERGENT AND LARGE AMOUNTS OF WATER UNTIL NO EVIDENCE OF CHEMICAL REMAINS (APPROXIMATELY 15-20 MINUTES). GET MEDICAL ATTENTION IMMEDIATELY.

EYE CONTACT:
FIRST AID- WASH EYES IMMEDIATELY WITH LARGE AMOUNTS OF WATER OR NORMAL SAL OCCASIONALLY LIFTING UPPER AND LOWER LIDS, UNTIL NO EVIDENCE OF CHEMICAL REMAINS (APPROXIMATELY 15-20 MINUTES). GET MEDICAL ATTENTION IMMEDIATELY

INGESTION:
FIRST AID- REMOVE BY GASTRIC LAVAGE OR EMESIS. MAINTAIN BLOOD PRESSURE AND AIRWAY. GIVE OXYGEN IF RESPIRATION IS DEPRESSED. DO NOT PERFORM GASTRIC LAVAGE OR EMESIS IF VICTIM IS UNCONSCIOUS. GET MEDICAL ATTENTION IMMEDIATELY (DREISBACH, HANDBOOK OF POISONING, 12TH ED.). ADMINISTRATION OF GASTRIC LAVAGE OR OXYGEN SHOULD BE PERFORMED BY QUALIFIED MEDICAL PERSONNEL.

NOTE TO PHYSICIAN
ANTIDOTE:
NO SPECIFIC ANTIDOTE. TREAT SYMPTOMATICALLY AND SUPPORTIVELY.

SECTION 5 FIRE FIGHTING MEASURES

FIRE AND EXPLOSION HAZARD:
DANGEROUS FIRE HAZARD WHEN EXPOSED TO HEAT OR FLAME.

VAPOR-AIR MIXTURES ARE EXPLOSIVE ABOVE FLASH POINT.

VAPORS ARE HEAVIER THAN AIR AND MAY TRAVEL A CONSIDERABLE DISTANCE TO A SOURCE OF IGNITION AND FLASH BACK.

EXTINGUISHING MEDIA:
DRY CHEMICAL, CARBON DIOXIDE, WATER SPRAY OR REGULAR FOAM
(1990 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.5).

FOR LARGER FIRES, USE WATER SPRAY, FOG OR REGULAR FOAM
(1990 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.5).

FIREFIGHTING:
MOVE CONTAINER FROM FIRE AREA IF YOU CAN DO IT WITHOUT RISK. APPLY COOLING WATER TO SIDES OF CONTAINERS THAT ARE EXPOSED TO FLAMES UNTIL WELL AFTER FIRE IS OUT. STAY AWAY FROM ENDS OF TANKS. FOR MASSIVE FIRE IN CARGO AREA, USE UNMANNED HOSE HOLDER OR MONITOR NOZZLES; IF THIS IS IMPOSSIBLE, WITHDRAW FROM AREA AND LET FIRE BURN. WITHDRAW IMMEDIATELY IN CASE OF RISING SOUND FROM VENTING SAFETY DEVICE OR ANY DISCOLORATION OF TANK DUE TO FIRE. ISOLATE FOR 1/2 MILE IN ALL DIRECTIONS IF TANK, RAIL CAR OR TANK TRUCK IS INVOLVED IN FIRE (1990 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.5, GUIDE PAGE 27).

EXTINGUISH ONLY IF FLOW CAN BE STOPPED; USE FLOODING AMOUNTS OF WATER AS A FOG, SOLID STREAMS MAY BE INEFFECTIVE. COOL CONTAINERS WITH FLOODING AMOUNTS OF WATER, APPLY FROM AS FAR A DISTANCE AS POSSIBLE. AVOID BREATHING VAPORS, KEEP UPWIND.

WATER MAY BE INEFFECTIVE EXCEPT AS A BLANKET (NFPA 325M, FIRE HAZARD PROPERTIES OF FLAMMABLE LIQUIDS, GASES, AND VOLATILE SOLIDS, 1984)

FLASH POINT: 36 F (2 C) (CC)
LOWER FLAMMABLE LIMIT: 9.7%
UPPER FLAMMABLE LIMIT: 12.8%
AUTOIGNITION: 860 F (460 C)
FLAMMABILITY CLASS(OSHA): IB

HAZARDOUS COMBUSTION PRODUCTS:
THERMAL DECOMPOSITION PRODUCTS MAY INCLUDE HIGHLY TOXIC FUMES OF PHOSGENE, TOXIC AND CORROSIVE FUMES OF CHLORIDES, AND OXIDES OF CARBON.

SECTION 6 ACCIDENTAL RELEASE MEASURES

OCCUPATIONAL SPILL:
SHUT OFF IGNITION SOURCES. STOP LEAK IF YOU CAN DO IT WITHOUT RISK. USE WATER SPRAY TO REDUCE VAPORS. FOR SMALL SPILLS, TAKE UP WITH SAND OR OTHER ABSORBENT MATERIAL AND PLACE INTO CONTAINERS FOR LATER DISPOSAL. FOR LARGER SPILLS, DIKE FAR AHEAD OF SPILL FOR LATER DISPOSAL. NO SMOKING, FLAMES OR FLARES IN HAZARD AREA. KEEP UNNECESSARY PEOPLE AWAY; ISOLATE HAZARD AREA AND RESTRICT ENTRY.

SECTION 7 HANDLING AND STORAGE

OBSERVE ALL FEDERAL, STATE AND LOCAL REGULATIONS WHEN STORING THIS SUBSTANCE

STORE IN ACCORDANCE WITH 29 CFR 1910.106.

BONDING AND GROUNDING: SUBSTANCES WITH LOW ELECTROCONDUCTIVITY, WHICH MAY BE IGNITED BY ELECTROSTATIC SPARKS, SHOULD BE STORED IN CONTAINERS WHICH MEET THE BONDING AND GROUNDING GUIDELINES SPECIFIED IN NFPA 77-1983, RECOMMENDED PRACTICE ON STATIC ELECTRICITY.

STORE IN A COOL, DRY AREA WITH PROPER VENTILATION. KEEP APART FROM AIR, LIG HEAT, STRONGOXIDIZERS MATERIALS. (NFPA 49, HAZARDOUS CHEMICALS DATA, 1991).

STORE AWAY FROM INCOMPATIBLE SUBSTANCES.

SECTION 8 EXPOSURE CONTROLS/PERSONAL PROTECTION

EXPOSURE LIMITS:
1,2-DICHLOROETHYLENE (ALL ISOMERS):
200 PPM (793 MG/M3) OSHA TWA
200 PPM (793 MG/M3) ACGIH TWA
200 PPM (793 MG/M3) NIOSH RECOMMENDED TWA
200 PPM (793 MG/M3) DFG MAK TWA;
400 PPM (1586 MG/M3) DFG MAK 30 MINUTE PEAK, AVERAGE VALUE, 4 TIMES/SHIF

MEASUREMENT METHOD: CHARCOAL TUBE/CARBON DISULFIDE; GAS CHROMATOGRAPHY WIT FLAME IONIZATION DETECTION; (NIOSH VOL. III # 1003, HALOGENATED HYDROCARBONS).

SUBJECT TO SARA SECTION 313 ANNUAL TOXIC CHEMICAL RELEASE REPORTING

VENTILATION:
PROVIDE LOCAL EXHAUST OR GENERAL DILUTION VENTILATION TO MEET PUBLISHED EXPOSURE LIMITS. VENTILATION EQUIPMENT MUST BE EXPLOSION-PROOF.

EYE PROTECTION:
EMPLOYEE MUST WEAR SPLASH-PROOF OR DUST-RESISTANT SAFETY GOGGLES AND A FACESHIELD TO PREVENT CONTACT WITH THIS SUBSTANCE.

EMERGENCY WASH FACILITIES:
WHERE THERE IS ANY POSSIBILITY THAT AN EMPLOYEE'S EYES AND/OR SKIN MAY BE EXPOSED TO THIS SUBSTANCE, THE EMPLOYER SHOULD PROVIDE AN EYE WASH FOUNTAIN AND QUICK DRENCH SHOWER WITHIN THE IMMEDIATE WORK AREA FOR EMERGENCY USE.

CLOTHING:
EMPLOYEE MUST WEAR APPROPRIATE PROTECTIVE (IMPERVIOUS) CLOTHING AND EQUIPMEN TO PREVENT REPEATED OR PROLONGED SKIN CONTACT WITH THIS SUBSTANCE.

GLOVES:
EMPLOYEE MUST WEAR APPROPRIATE PROTECTIVE GLOVES TO PREVENT CONTACT WITH TH SUBSTANCE.

RESPIRATOR:
THE FOLLOWING RESPIRATORS AND MAXIMUM USE CONCENTRATIONS ARE RECOMMENDATIO

BY THE U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES. NIOSH POCKET GUIDE TO CHEMICAL HAZARDS OR NIOSH CRITERIA DOCUMENTS; OR DEPARTMENT OF LABOR, 29CFR1910 SUBPART Z.
THE SPECIFIC RESPIRATOR SELECTED MUST BE BASED ON CONTAMINATION LEVELS FOUND IN THE WORK PLACE AND BE JOINTLY APPROVED BY THE NATIONAL INSTITUTE OF OCCUPATIONAL SAFETY AND HEALTH AND THE MINE SAFETY AND HEALTH ADMINISTRATION.

1,2-DICHLOROETHYLENE (ALL ISOMERS):

1000 PPM- ANY POWERED, AIR-PURIFYING RESPIRATOR WITH ORGANIC VAPOR CARTRIDGE(S).
ANY CHEMICAL CARTRIDGE RESPIRATOR WITH A FULL FACEPIECE AND ORGANICE VAPOR CARTRIDGE(S).

4000 PPM- ANY SUPPLIED-AIR RESPIRATOR OPERATED IN A CONTINUOUS-FLOW MODE.
ANY AIR-PURIFYING, FULL-FACEPIECE RESPIRATOR (GAS MASK) WITH A CHIN-STYLE, FRONT- OR BACK-MOUNTED ORGANIC VAPOR CANISTER.
ANY SELF-CONTAINED BREATHING APPARATUS WITH A FULL FACEPIECE.
ANY SUPPLIED-AIR RESPIRATOR WITH A FULL FACEPIECE.

ESCAPE- ANY AIR-PURIFYING, FULL-FACEPIECE RESPIRATOR (GAS MASK) WITH A CHIN-STYLE, FRONT- OR BACK-MOUNTED ORGANIC VAPOR CANISTER.
ANY APPROPRIATE ESCAPE-TYPE, SELF-CONTAINED BREATHING APPARATUS.

FOR FIREFIGHTING AND OTHER IMMEDIATELY DANGEROUS TO LIFE OR HEALTH CONDITIONS:

SELF-CONTAINED BREATHING APPARATUS WITH FULL FACEPIECE OPERATED IN PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE MODE.

SUPPLIED-AIR RESPIRATOR WITH FULL FACEPIECE AND OPERATED IN PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE MODE IN COMBINATION WITH AN AUXILIARY SELF-CONTAINED BREATHING APPARATUS OPERATED IN PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE MODE.

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

DESCRIPTION: COLORLESS LIQUID WITH ETHER-LIKE ODOR, SLIGHTLY ACRID.
MOLECULAR WEIGHT: 96.94
MOLECULAR FORMULA: C2-H2-CL2
BOILING POINT: 119 F (48 C)
MELTING POINT: -113 F (-81)
VAPOR PRESSURE: 400 MM HG @ 87 F
VAPOR DENSITY: 3.4
SPECIFIC GRAVITY: 1.282
WATER SOLUBILITY: 0.35-0.63%
ODOR THRESHOLD: 0.085 PPM
SOLVENT SOLUBILITY: ALCOHOL, ETHER AND MOST OTHER ORGANIC SOLVENTS

SECTION 10 STABILITY AND REACTIVITY

REACTIVITY:
MAY FORM EXPLOSIVE PEROXIDES IN AIR.
UNLESS INHIBITED, GRADUAL DECOMPOSITION BY AIR, LIGHT, ULTAVIOLET LIGHT AND

MOISTURE MAY RELEASE CORROSIVE HYDROGEN CHLORIDE.

CONDITIONS TO AVOID:
AVOID CONTACT WITH HEAT, SPARKS, FLAMES, OR OTHER SOURCES OF IGNITION. VAPC
MAY BE EXPLOSIVE. AVOID OVERHEATING OF CONTAINERS: CONTAINERS MAY VIOLENTLY
RUPTURE IN HEAT OF FIRE. AVOID CONTAMINATION OF WATER SOURCES.

INCOMPATIBILITIES:
1,2-DICHLOROETHYLENE (ALL ISOMERS):
CAUSTIC ALKALIES (SOLID OR CONCENTRATED SOLUTIONS): MAY FORM EXPLOSIVE, SPONTANEOUSLY FLAMMABLE CHLOROACETYLENE.
COPPER OR COPPER ALLOYS: MAY FORM EXPLOSIVE, SPONTANEOUSLY FLAMMABLE CHLOROACETYLENE.
DIFLUOROMETHYLENE DIHYPOFLUORITE (WITH TRANS-ISOMER): VIOLENT EXPLOSION A ROOM TEMPERATURE.
FREE RADICAL INITIATOR: OXIDATION FORMS CORROSIVE CHLOROACETYL CHLORIDE V EPOXIDE INTERMEDIATES.
METAL (HOT): GRADUAL DECOMPOSITION WITH RELEASE OF CORROSIVE HYDROGEN CHLORIDE.
NITROGEN TETROXIDE: EXPLOSIVE, ESPECIALLY WHEN SHOCKED.
OXIDIZERS (STRONG): FIRE AND EXPLOSION HAZARD.
OZONE: FORM EXPLOSIVE PRODUCT.
PERCHLORYL FLUORIDE: EXPLOSIVE REACTION ON HEATING.
POTASSIUM HYDROXIDE (SOLID OR CONCENTRATED SOLUTION): MAY FORM EXPLOSIVE, SPONTANEOUSLY FLAMMABLE CHLOROACETYLENE.
PLASTICS, RUBBER AND COATINGS: MAY BE ATTACKED.
SODIUM: MAY FORM EXPLOSIVE, SPONTANEOUSLY FLAMMABLE CHLOROACETYLENE.
SODIUM HYDROXIDE (SOLID OR CONCENTRATED SOLUTION): MAY FORM EXPLOSIVE, SPONTANEOUSLY FLAMMABLE CHLOROACETYLENE.
SULFURIC ACID (CONCENTRATED): OXIDATION FORMS CORROSIVE CHLOROACETYL CHLORIDE VIA EPOXIDE INTERMEDIATES.
STRONG OXIDIZERS: VIGOROUS REACTION OR POSSIBLE FIRE AND EXPLOSION HAZARD.

HAZARDOUS DECOMPOSITION:
THERMAL DECOMPOSITION PRODUCTS MAY INCLUDE HIGHLY TOXIC FUMES OF PHOSGENE, TOXIC AND CORROSIVE FUMES OF CHLORIDES, AND OXIDES OF CARBON.

POLYMERIZATION:
SLIGHTLY SUSCEPTIBLE TO POLYMERIZATION, BUT NOT LIKELY UNLESS THE MATERIAL BECOMES CONTAMINATED. BOTH ISOMERS DIMERIZE TO TETRACHLOROBUTENE IN THE PRESENCE OF ORGANIC PEROXIDES. THE POLYMERIZATION REACTION IS NOT VIGOROUS.

SECTION 11 TOXICOLOGY INFORMATION

1,2-DICHLOROETHYLENE:
IRRITATION DATA: 100 MG/24 HOURS SKIN-RABBIT MODERATE.
TOXICITY DATA: 117 MG/M3/1 HOUR INHALATION-FROG LCLO; 770 MG/KG ORAL-RAT LDJ 2 GM/KG INTRAPERITONEAL-MOUSE LD50.
CARCINOGEN STATUS: NONE.
LOCAL EFFECTS: IRRITANT- INHALATION, SKIN, EYE.
ACUTE TOXICITY LEVEL: MODERATELY TOXIC BY INGESTION.
TARGET EFFECTS: CENTRAL NERVOUS SYSTEM DEPRESSANT. POISONING MAY AFFECT THE LUNG, LIVER AND KIDNEYS.

AT INCREASED RISK FROM EXPOSURE: PERSONS WITH CHRONIC RESPIRATORY DISEASE.
ADDITIONAL DATA: STIMULANTS SUCH AS EPINEPHRINE AND EPHEDRINE MAY ENHANCE THE TOXICITY OF SOME HALOGENATED HYDROCARBONS.

HEALTH EFFECTS
INHALATION:
1,2-DICHLOROETHYLENE (ALL ISOMERS):
IRRITANT/NARCOTIC. 4000 PPM IMMEDIATELY DANGEROUS TO LIFE OR HEALTH.
ACUTE EXPOSURE- VAPOR EXPOSURE MAY CAUSE MUCOUS MEMBRANE IRRITATION, NAUSEA, VOMITING, DIZZINESS, WEAKNESS, TREMOR, AND EPIGASTRIC CRAMPS. HIGHER LEVELS MAY CAUSE CENTRAL NERVOUS SYSTEM DEPRESSION RANGING FROM DROWSINESS TO UNCONSCIOUSNESS. THE CIS- AND TRANS- ISOMERS TOGETHER HAVE BEEN USED AS AN ANESTHETIC IN MAN. A HUMAN DEATH HAS BEEN REPORTED FROM INDUSTRIAL EXPOSURE. AN 8 HOUR EXPOSURE TO THE TRANS- ISOMER AT 200 PPM LOWERED THE LEUKOCYTE COUNT IN RATS; 1000 PPM CAUSED A FALL IN THE BLOOD SERUM ALBUMIN, UREA NITROGEN, ALKALINE PHOSPHATASE ACTIVITY, AND THE NUMBER OF ERYTHROCYTES. NARCOSIS WAS NOT PRODUCED AT THESE LEVELS. 3000 PPM PRODUCED FIBROUS SWELLING OF THE CARDIAC MUSCLE AND HYPEREMIA WHICH PERSISTED FOR 14 HOURS AFTER EXPOSURE. THE CIS- ISOMER DID NOT ANESTHETIZE RATS IN 4 HOURS AT 8000 PPM, BUT AT 16,000 PPM THEY WERE ANESTHETIZED IN 8 MINUTES AND KILLED IN 4 HOURS. REVERSIBLE SUPERFICIAL CORNEAL TURBIDITY HAS BEEN OBSERVED IN SOME ANESTHETIZED DOGS.
CHRONIC EXPOSURE- VARIATIONS IN DATA EXIST ON THE CHRONIC TOXICITY OF THE CIS- AND TRANS- ISOMERS. RATS EXPOSED TO 200 PPM OF THE TRANS- ISOMER FOR 8 HOURS/DAY, 5 DAYS/WEEK FOR 16 WEEKS SHOWED HISTOLOGICAL EVIDENCE OF SLIGHT TO SEVERE FATTY DEGENERATION OF LIVER LOBULES AND KUPFFER CELLS, MARKED PULMONARY HYPEREMIA, ALVEOLAR SEPTAL DISTENSION AND FIBROUS SWELLING OF THE CARDIAC MUSCLE. SIMILAR EXPOSURES WITH RATS, GUINEA PIGS, RABBITS AND DOGS EXPOSED TO 500 PPM OR 1000 PPM 7 HOURS/DAY, 5 DAYS/WEEK FOR 6 MONTHS TO A MIXTURE OF 60% CIS- AND 40% TRANS- ISOMERS RESULTED IN NO ADVERSE EFFECTS DETECTED. CATS AND RABBITS WERE REPEATEDLY EXPOSED TO VAPOR CONCENTRATIONS OF 0.16-0.19% IN AIR. THE CIS- ISOMER CAUSED ANOREXIA, DECREASED BODY WEIGHT AND PATHOLOGICAL CHANGES IN THE LUNGS, LIVER, AND KIDNEYS. THE TRANS- ISOMER CAUSED ANOREXIA AND SOME RESPIRATORY IRRITATION, BUT NO HISTOPATHOLOGICAL CHANGES IN ORGANS.

SKIN CONTACT:
1,2-DICHLOROETHYLENE (ALL ISOMERS):
IRRITANT.
ACUTE EXPOSURE- DIRECT CONTACT MAY CAUSE IRRITATION. SKIN ABSORPTION MAY OCCUR DUE TO LIPID SOLUBILITY.
CHRONIC EXPOSURE- REPEATED OR PROLONGED CONTACT MAY CAUSE DERMATITIS.

EYE CONTACT:
1,2-DICHLOROETHYLENE (ALL ISOMERS):
IRRITANT.
ACUTE EXPOSURE- DIRECT CONTACT, OR THE VAPOR IN SUFFICIENT CONCENTRATION, MAY CAUSE IRRITATION. THE TRANS- ISOMER CAUSED BURNING OF THE EYES AT 2000 PPM. REVERSIBLE SUPERFICIAL CORNEAL TURBIDITY HAS BEEN REPORTED AS A SYSTEMIC EFFECT IN DOGS FOLLOWING INHALATION EXPOSURE.
CHRONIC EXPOSURE- REPEATED OR PROLONGED CONTACT WITH IRRITANTS MAY CAUSE CONJUNCTIVITIS.

INGESTION:

1,2-DICHLOROETHYLENE (ALL ISOMERS):
NARCOTIC.
ACUTE EXPOSURE- DEPENDING ON EXPOSURE, SYMPTOMS MAY VARY FROM SLIGHT CEN NERVOUS SYSTEM DEPRESSION TO DEEP NARCOSIS.
CHRONIC EXPOSURE- USED AS A LOW TEMPERATURE EXTRACTING AGENT FOR HEAT SENSITIVE SUBSTANCES SUCH AS CAFFEINE IN COFFEE, PERFUMES, AND OILS ANI FATS FROM FISH AND MEAT. MICE EXPOSED TO 22 MG/KG OR 220 MG/KG OF TRANS-1,2 DICHLOROETHYLENE BY GAVAGE FOR 14 CONSECUTIVE DAYS SHOWED A TREND TOWARD SUPPRESSION OF THE HUMORAL IMMUNE RESPONSE, BUT NO EFFECT THE CELL-MEDIATED IMMUNE RESPONSE.

SECTION 12 ECOLOGICAL INFORMATION

ENVIRONMENTAL IMPACT RATING (0-4): NO DATA AVAILABLE

ACUTE AQUATIC TOXICITY: NO DATA AVAILABLE

DEGRADABILITY: NO DATA AVAILABLE

LOG BIOCONCENTRATION FACTOR (BCF): NO DATA AVAILABLE

LOG OCTANOL/WATER PARTITION COEFFICIENT: NO DATA AVAILABLE

SECTION 13 DISPOSAL INFORMATION

OBSERVE ALL FEDERAL, STATE AND LOCAL REGULATIONS WHEN DISPOSING OF THIS SUBSTANCE.

DISPOSAL MUST BE IN ACCORDANCE WITH STANDARDS APPLICABLE TO GENERATORS OF HAZARDOUS WASTE, 40 CFR 262. EPA HAZARDOUS WASTE NUMBER D001.
100 POUND CERCLA SECTION 103 REPORTABLE QUANTITY.

SECTION 14 TRANSPORTATION INFORMATION

DEPARTMENT OF TRANSPORTATION HAZARD CLASSIFICATION 49-CFR 172.101:
FLAMMABLE LIQUID

DEPARTMENT OF TRANSPORTATION LABELING REQUIREMENTS 49-CFR 172.101 AND SUBPART E:
FLAMMABLE LIQUID

DEPARTMENT OF TRANSPORTATION PACKAGING REQUIREMENTS: 49-CFR 173.119
EXCEPTIONS: 49-CFR 173.118

FINAL RULE ON HAZARDOUS MATERIALS REGULATIONS (HMR, 49 CFR PARTS 171-180), DOCKET NUMBERS HM-181, HM-181A, HM-181B, HM-181C, HM-181D AND HM-204. EFFECTIVE DATE OCTOBER 1, 1991. HOWEVER, COMPLIANCE WITH THE REGULATIONS I AUTHORIZED ON AND AFTER JANUARY 1, 1991. (55 FR 52402, 12/21/90)

EXCEPT FOR EXPLOSIVES, INHALATION HAZARDS, AND INFECTIOUS SUBSTANCES, THE EFFECTIVE DATE FOR HAZARD COMMUNICATION REQUIREMENTS IS EXTENDED TO

OCTOBER 1, 1993. (56 FR 47158, 09/18/91)

U.S. DEPARTMENT OF TRANSPORTATION SHIPPING NAME-ID NUMBER, 49 CFR 172.101:
DICHLOROETHYLENE-UN 1150

U.S. DEPARTMENT OF TRANSPORTATION HAZARD CLASS OR DIVISION, 49 CFR 172.101:
3 - FLAMMABLE LIQUID

U.S. DEPARTMENT OF TRANSPORTATION PACKING GROUP, 49 CFR 172.101:
PG II

U.S. DEPARTMENT OF TRANSPORTATION LABELING REQUIREMENTS, 49 CFR 172.101
AND SUBPART E:
FLAMMABLE LIQUID

U.S. DEPARTMENT OF TRANSPORTATION PACKAGING AUTHORIZATIONS:
EXCEPTIONS: 49 CFR 173.150
NON-BULK PACKAGING: 49 CFR 173.202
BULK PACKAGING: 49 CFR 173.242

U.S. DEPARTMENT OF TRANSPORTATION QUANTITY LIMITATIONS 49 CFR 172.101:
PASSENGER AIRCRAFT OR RAILCAR: 5 L
CARGO AIRCRAFT ONLY: 60 L

SECTION 15 REGULATORY INFORMATION

TSCA STATUS: Y

CERCLA SECTION 103 (40CFR302.4):	N
SARA SECTION 302 (40CFR355.30):	N
SARA SECTION 304 (40CFR355.40):	N
SARA SECTION 313 (40CFR372.65):	Y
OSHA PROCESS SAFETY (29CFR1910.119):	N
CALIFORNIA PROPOSITION 65:	N

SARA HAZARD CATEGORIES, SARA SECTIONS 311/312 (40 CFR 370.21)

ACUTE HAZARD:	Y
CHRONIC HAZARD:	N
FIRE HAZARD:	Y
REACTIVITY HAZARD:	Y
SUDDEN RELEASE HAZARD:	N

SECTION 16 OTHER

ETHYLBENZENE

ETB

Common Synonyms	Liquid	Colorless	Sweet, gasoline-like odor
Phenylethane EB	Floats on water. Flammable, irritating vapor is produced.		

Avoid contact with liquid and vapor. Keep people away.
Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves).
Shut off ignition sources and call fire department.
Stop discharge if possible.
Stay upwind and use water spray to "knock down" vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

FLAMMABLE.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves).
Extinguish with dry chemical, foam, or carbon dioxide.
Water may be ineffective on fire.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID.

VAPOR
Irritating to eyes, nose and throat.
If inhaled, will cause dizziness or difficult breathing.
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Will burn skin and eyes.
Harmful if swallowed.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
DO NOT INDUCE VOMITING.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.
Fouling to shoreline.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook)

Mechanical containment
Should be removed
Chemical and physical treatment

2. LABEL

2.1 **Category:** Flammable liquid
2.2 **Class:** 3

3. CHEMICAL DESIGNATIONS

3.1 **CG Compatibility Class:** Aromatic hydrocarbon
3.2 **Formula:** $C_6H_5CH_5CH_3$
3.3 **IMO/UN Designation:** 3.3/1175
3.4 **DOT ID No.:** 1175
3.5 **CAS Registry No.:** 100-41-4

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Aromatic

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Self-contained breathing apparatus; safety goggles.
5.2 **Symptoms Following Exposure:** Inhalation may cause irritation of nose, dizziness, depression. Moderate irritation of eye with corneal injury possible. Irritates skin and may cause blisters.
5.3 **Treatment of Exposure:** INHALATION: if ill effects occur, remove victim to fresh air, keep him warm and quiet, and get medical help promptly; if breathing stops, give artificial respiration. INGESTION: induce vomiting only upon physician's approval; material in lung may cause chemical pneumonitis. SKIN AND EYES: promptly flush with plenty of water (15 min. for eyes) and get medical attention; remove and wash contaminated clothing before reuse.
5.4 **Threshold Limit Value:** 100 ppm
5.5 **Short Term Inhalation Limits:** 200 ppm for 30 min.
5.6 **Toxicity by Ingestion:** Grade 2; LD_{50} = 0.5 to 5 g/kg (rat)
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.
5.9 **Liquid or Solid Irritant Characteristics:** Causes smarting of the skin and first-degree burns on short exposure; may cause secondary burns on long exposure.
5.10 **Odor Threshold:** 140 ppm
5.11 **IDLH Value:** 2,000 ppm

6. FIRE HAZARDS

6.1 **Flash Point:** 80°F O.C.; 59°F C.C.
6.2 **Flammable Limits in Air:** 1.0%-6.7%
6.3 **Fire Extinguishing Agents:** Foam (most effective), water fog, carbon dioxide or dry chemical.
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Irritating vapors are generated when heated.
6.6 **Behavior in Fire:** Vapor is heavier than air and may travel considerable distance to the source of ignition and flash back.
6.7 **Ignition Temperature:** 860°F
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** 5.8 mm/min.
6.10 **Adiabatic Flame Temperature:** Data Not Available

(Continued)

7. CHEMICAL REACTIVITY

7.1 **Reactivity With Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent
7.7 **Molar Ratio (Reactant to Product):** Data Not Available
7.8 **Reactivity Group:** 32

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 29 ppm/96 hr/bluegil/TL_m/fresh water
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** 2.8% (theor.), 5 days
8.4 **Food Chain Concentration Potential:** None

9. SHIPPING INFORMATION

9.1 **Grades of Purity:** Research grade: 99.98%; pure grade: 99.5%; technical grade: 99.0%
9.2 **Storage Temperature:** Ambient
9.3 **Inert Atmosphere:** No requirement
9.4 **Venting:** Open (flame arrester) or pressure-vacuum

10. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook)

A-T-U

11. HAZARD CLASSIFICATIONS

11.1 **Code of Federal Regulations:** Flammable liquid
11.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	2
Liquid or Solid Irritant	2
Poisons	2
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	3
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

11.3 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	3
Reactivity (Yellow)	0

12. PHYSICAL AND CHEMICAL PROPERTIES

12.1 **Physical State at 15°C and 1 atm:** Liquid
12.2 **Molecular Weight:** 106.17
12.3 **Boiling Point at 1 atm:** 277.2°F = 136.2°C = 409.4°K
12.4 **Freezing Point:** —139°F = —95°C = 178°K
12.5 **Critical Temperature:** 651.0°F = 343.9°C = 617.1°K
12.6 **Critical Pressure:** 523 psia = 35.6 atm = 3.61 MN/m^2
12.7 **Specific Gravity:** 0.867 at 20°C (liquid)
12.8 **Liquid Surface Tension:** 29.2 dynes/cm = 0.0292 N/m at 20°C
12.9 **Liquid Water Interfacial Tension:** 35.48 dynes/cm = 0.03548 N/m at 20°C
12.10 **Vapor (Gas) Specific Gravity:** Not pertinent
12.11 **Ratio of Specific Heats of Vapor (Gas):** 1.071
12.12 **Latent Heat of Vaporization:** 144 Btu/lb = 80.1 cal/g = 3.35×10^5 J/kg
12.13 **Heat of Combustion:** —17,780 Btu/lb = —9877 cal/g = -413.5×10^5 J/kg
12.14 **Heat of Decomposition:** Not pertinent
12.15 **Heat of Solution:** Not pertinent
12.16 **Heat of Polymerization:** Not pertinent
12.25 **Heat of Fusion:** Data Not Available
12.26 **Limiting Value:** Data Not Available
12.27 **Reid Vapor Pressure:** 0.4 psia

6. FIRE HAZARDS (Continued)

6.11 **Stoichiometric Air to Fuel Ratio:** Data Not Available
6.12 **Flame Temperature:** Data Not Available

ETHYLENE DICHLORIDE

EDC

Common Synonyms	Liquid	Colorless	Sweet odor
1, 2-Dichloroethane Ethylene chloride EDC Brocide Dutch liquid Glycol dichloride	Sinks in water. Flammable, irritating vapor is produced.		

Avoid contact with liquid and vapor. Keep people away.
Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves).
Shut off ignition sources and call fire department.
Stop discharge if possible.
Stay upwind and use water spray to "knock down" vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

FLAMMABLE.
POISONOUS GASES ARE PRODUCED IN FIRE.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves).
Extinguish with dry chemical, foam, or carbon dioxide.
Water may be ineffective on fire.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID.

VAPOR
Irritating to eyes, nose and throat.
If inhaled, will cause nausea, dizziness or difficult breathing.
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID
Will burn skin and eyes.
Harmful if swallowed.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting.
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.

Water Pollution

Dangerous to aquatic life in high concentrations.
May be dangerous if it enters water intakes.
Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook)
Issue warning-high flammability
Disperse and flush

2. LABEL

2.1 **Category:** Flammable liquid
2.2 **Class:** 3

3. CHEMICAL DESIGNATIONS

3.1 **CG Compatibility Class:** Halogenated hydrocarbon
3.2 **Formula:** $ClCH_2CH_2Cl$
3.3 **IMO/UN Designation:** 3.2/1184
3.4 **DOT ID No.:** 1184
3.5 **CAS Registry No.:** 107-06-2

4. OBSERVABLE CHARACTERISTICS

4.1 **Physical State (as shipped):** Liquid
4.2 **Color:** Colorless
4.3 **Odor:** Ethereal; chloroform-like; ether-like

5. HEALTH HAZARDS

5.1 **Personal Protective Equipment:** Clean, body-covering clothing and safety glasses with side shields. Respiratory protection: up to 50 ppm, none; 50 ppm to 2%, 1/2 hr or less, full face mask and canister; greater than 2%, self-contained breathing apparatus.
5.2 **Symptoms Following Exposure:** Inhalation of vapors causes nausea, drunkenness, depression. Contact of liquid with eyes may produce corneal injury. Prolonged contact with skin may cause a burn.
5.3 **Treatment of Exposure:** INHALATION: If victim is overcome, remove him to fresh air, keep him quiet and warm, and get medical attention immediately; if breathing stops, give artificial respiration. INGESTION: Induce vomiting; call a physician; treat the symptoms. EYES: flush immediately with copious amounts of flowing water for at least 15 min. SKIN: remove clothing and wash skin thoroughly with soap and water; wash contaminated clothing before reuse.
5.4 **Threshold Limit Value:** 10 ppm
5.5 **Short Term Inhalation Limits:** 200 ppm for 5 min. during any 3-hour period.
5.6 **Toxicity by Ingestion:** Grade 2; LD_{50} = 0.5 to 5 g/kg (rat)
5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.
5.9 **Liquid or Solid Irritant Characteristics:** Causes smarting of the skin and first-degree burns on short exposure; may cause secondary burns on long exposure.
5.10 **Odor Threshold:** 100 ppm
5.11 **IDLH Value:** 1,000 ppm

6. FIRE HAZARDS

6.1 **Flash Point:** 60°F O.C.; 55°F C.C.
6.2 **Flammable Limits in Air:** 6.2%-15.6%
6.3 **Fire Extinguishing Agents:** Foam, carbon dioxide, dry chemical
6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective.
6.5 **Special Hazards of Combustion Products:** Toxic and irritating gases (hydrogen chloride, phosgene) are generated.
6.6 **Behavior in Fire:** Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back.
6.7 **Ignition Temperature:** 775°F
6.8 **Electrical Hazard:** Class I, group D
6.9 **Burning Rate:** 1.6 mm/min
6.10 **Adiabatic Flame Temperature:** Data Not Available

(Continued)

7. CHEMICAL REACTIVITY

7.1 **Reactivity With Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent
7.7 **Molar Ratio (Reactant to Product):** Data Not Available
7.8 **Reactivity Group:** 36

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 150 ppm/*/pin perch/TL_m/salt water
*Time period not specified.
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** 0.002 lb/lb, 5 days
8.4 **Food Chain Concentration Potential:** None

9. SHIPPING INFORMATION

9.1 **Grades of Purity:** Commercial
9.2 **Storage Temperature:** Ambient
9.3 **Inert Atmosphere:** No requirement
9.4 **Venting:** Pressure-vacuum

10. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook)
A-X

11. HAZARD CLASSIFICATIONS

11.1 **Code of Federal Regulations:** Flammable liquid
11.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	2
Liquid or Solid Irritant	2
Poisons	3
Water Pollution	
Human Toxicity	3
Aquatic Toxicity	2
Aesthetic Effect	2
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

11.3 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	3
Reactivity (Yellow)	1

12. PHYSICAL AND CHEMICAL PROPERTIES

12.1 **Physical State at 15°C and 1 atm:** Liquid
12.2 **Molecular Weight:** 98.96
12.3 **Boiling Point at 1 atm:** 182.3°F = 83.5°C = 356.7°K
12.4 **Freezing Point:** −32.3°F = −35.7°C = 237.5°K
12.5 **Critical Temperature:** 550°F = 288°C = 561°K
12.6 **Critical Pressure:** 735 psia = 50 atm = 5.1 MN/m^2
12.7 **Specific Gravity:** 1.253 at 20°C (liquid)
12.8 **Liquid Surface Tension:** 32.2 dynes/cm = 0.0322 N/m at 20°C
12.9 **Liquid Water Interfacial Tension:** (est.) 30 dynes/cm = 0.03 N/m at 25°C
12.10 **Vapor (Gas) Specific Gravity:** 3.4
12.11 **Ratio of Specific Heats of Vapor (Gas):** 1.118
12.12 **Latent Heat of Vaporization:** 138 Btu/lb = 76.4 cal/g = 3.2×10^5 J/kg
12.13 **Heat of Combustion:** (est.) 3400 Btu/lb
12.14 **Heat of Decomposition:** Not pertinent
12.15 **Heat of Solution:** Not pertinent
12.16 **Heat of Polymerization:** Not pertinent
12.25 **Heat of Fusion:** 21.12 cal/g
12.26 **Limiting Value:** Data Not Available
12.27 **Reid Vapor Pressure:** 2.7 psia

6. FIRE HAZARDS (Continued)

6.11 **Stoichiometric Air to Fuel Ratio:** Data Not Available
6.12 **Flame Temperature:** Data Not Available

APPENDIX B.2

OSHA POSTER

JOB SAFETY & HEALTH PROTECTION

The Occupational Safety and Health Act of 1970 provides job safety and health protection for workers by promoting safe and healthful working conditions throughout the Nation. Requirements of the Act include the following:

Employers

All employers must furnish to employees employment and a place of employment free from recognized hazards that are causing or are likely to cause death or serious harm or employees. Employers must comply with occupational safety and health standards issued under the Act.

Employees

Employees must comply with all occupational safety and health standards, rules, regulations and orders issued under the Act that apply to their own actions and conduct on the job

The Occupational Safety and Health Administration (OSHA) of the U.S. Department of Labor has the primary responsibility for administering the Act. OSHA issues occupational safety and health standards, and its Compliance Safety and Health Officers conduct jobsite inspections to help ensure compliance with the Act.

Inspection

The Act requires that a representative of the employer and a representative authorized by the employees be given an opportunity to accompany the OSHA inspector for the purpose of aiding the inspection.

Where there is no authorized employee representative, the OSHA Compliance Officer must consult with a reasonable number of employees concerning safety and health conditions in the workplace.

Complaint

Employees or their representatives have the right to file a complaint with the nearest OSHA office requesting an inspection if they believe unsafe or unhealthful conditions exist in their workplace. OSHA will withhold, on request, names of employees complaining.

The Act provides the employees may not be discharged or discriminated against in any way for filing safety and health complaints or for otherwise exercising their rights under the Act.

Employees who believe they have been discriminated against may file a complaint with their nearest OSHA office within 30 days of the alleged discrimination.

Citation

If upon inspection OSHA believes an employer has violated the Act, a citation alleging such violations will be issued to the employer. Each citation will specify a time period within which the alleged violation must be corrected.

The OSHA citation must be prominently displayed at or near the place of alleged violation for three days, or until it is corrected, whichever is later, to warn employees of dangers that may exist there.

Proposed Penalty

The Act provides for mandatory penalties against employers of up to $1,000 for each serious violation and for optional penalties of up to $1,000 for each nonserious violation. Penalties of up to $1,000 per day may be proposed for failure to correct violations within the proposed time period. Also, any employer who willfully or repeatedly violates the Act may be assessed penalties of up to $10,000 for each such violation.

Criminal penalties are also provided for in the Act. Any willful violation resulting in death of an employee, upon conviction, is punishable by a fine of up to $250,000 (or $500,000 if the employer is a corporation), or by imprisonment for up to six months, or by both. Conviction of an employer after a first conviction doubles these maximum penalties.

Voluntary Activity

While providing penalties for violations, the Act also encourages efforts by labor and management, before an OSHA inspection, to reduce workplace hazards voluntarily and to develop and improve safety and health programs in all workplaces and industries. OSHA's Voluntary Protection Programs recognize outstanding efforts of this nature.

OSHA has published Safety and Health Program Management Guidelines to assist employers in establishing or perfecting programs to prevent or control emplyee exposure to workplace hazards. There are many public and private organizations that can provide information and assistance in this effort, if requested. Also, your local OSHA office can proivde considerable help and advice on solving safety and health problems or can refer you to other sources for health such as training.

Consultation

Free assistance in identifying and correcting hazards and in improving safety and health management is available to employers, without citation or penalty, through OSHA-supported programs in each State. Thse programs are usually administered by the State labor or Health department or a State university.

POSTING INSTRUCTIONS

Employees in States operating OSHA approved State Plans should obtain and post the State's equivalent poster.

More Information

Additional information and copies of the Act, specific OSHA safety and health standards, and other applicable regulations may be obtained from your employer or from the nearest OSHA Regional Office in the following locations:

Atlanta, Georgia	(404) 347-3573
Boston, Massachusetts	(617) 565-7164
Chicago, Illinois	(312) 353-2220
Dallas, Texas	(214) 767-4731
Denver, Colorado	(303) 844-3061
Kansas City, Missouri	(816) 426-5861
New York, New York	(212) 337-2325
Philadelphia, Pennsylvania	(215) 596-1201
San Francisco, California	(415) 995-5672
Settle, Washington	(206) 442-5930

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Occupational Safety and Health Adminstration