



**E.C. JORDAN CO.**  
ENGINEERS & SCIENTISTS

**HEALTH AND SAFETY PLAN**

**IMPERIAL OIL CO., INC.**  
**CHAMPION CHEMICALS SITE**  
MONMOUTH COUNTY, NEW JERSEY

**NEW JERSEY**  
**DEPARTMENT OF**  
**ENVIRONMENTAL PROTECTION**

**JANUARY 1987**

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IMPERIAL OIL CO. INC./  
CHAMPION CHEMICALS  
SITE HEALTH AND SAFETY PLAN

PREPARED BY  
E.C. JORDAN CO.  
PORTLAND, MAINE

JANUARY 1987

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## 1.0 INTRODUCTION

The state of New Jersey, Department of Treasury, Division of Purchase and Property has initiated a Remedial Investigation and Feasibility Study (RI/FS) to identify and evaluate suspected problems associated with past disposal and spill sites at the Imperial Oil Company, Inc./Champion Chemicals site (Imperial Oil Site). This Health and Safety Plan (HASP) has been developed as part of Task 1 for this Imperial Oil site RI/FS. Contract Site Health and Safety Plan components as specified by the NJDEP are included in this document.

E.C. Jordan Co. (Jordan) is responsible for the coordination and completion of the Imperial Oil site RI/FS. John Mathes and Associates, Inc. will be responsible for drilling, VEP Associates will be responsible for on-site surveying, and CompuChem will provide analytical services. Jordan and Subcontractor personnel will be required to follow the Health and Safety Program outlined in this HASP.

Field activities conducted during Task 2 of the RI/FS program will be covered by this HASP. A separate HASP has been developed for the field activities conducted in Task 1.

Jordan began a formal program of site risk assessment and implementation of mitigative health and safety programs in March 1981. At that time, existing departmental policies/practices were collected and reviewed, additional needs identified and a corporate personnel health and safety plan drafted.

Currently, Jordan's seven-member Personnel Health and Safety Committee (PHSC) regularly reviews health and safety issues, updates practices as new information becomes available, oversees administration of the Health Monitoring Program and provides guidance for personnel training as appropriate. The PHSC is a corporate entity, effectively precluding any departmental and contract pressures on health and safety policy decisions.

Each project site is classified hazardous or non-hazardous by the PHSC after a review of available data. The Imperial Oil site has been classified as hazardous, therefore this site specific HASP was developed. The Imperial Oil HASP is compiled from appropriate parts of the corporate personnel health and safety plan as well as necessary site specific information. This is accomplished by a review of available information on the site to assess the potential risks and provide an initial determination of personal protection requirements. The site specific HASP is subsequently reviewed and must be approved by a member of the PHSC. The designated Site Safety Officer monitors actual site conditions and may alter these requirements after consultation with the Corporate Health and Safety Coordinator (CHSC) as needed. In all cases, personnel safety is the paramount factor in decision-making.

## 2.0 EXISTING SITE CONDITIONS

### 2.1 Site Location

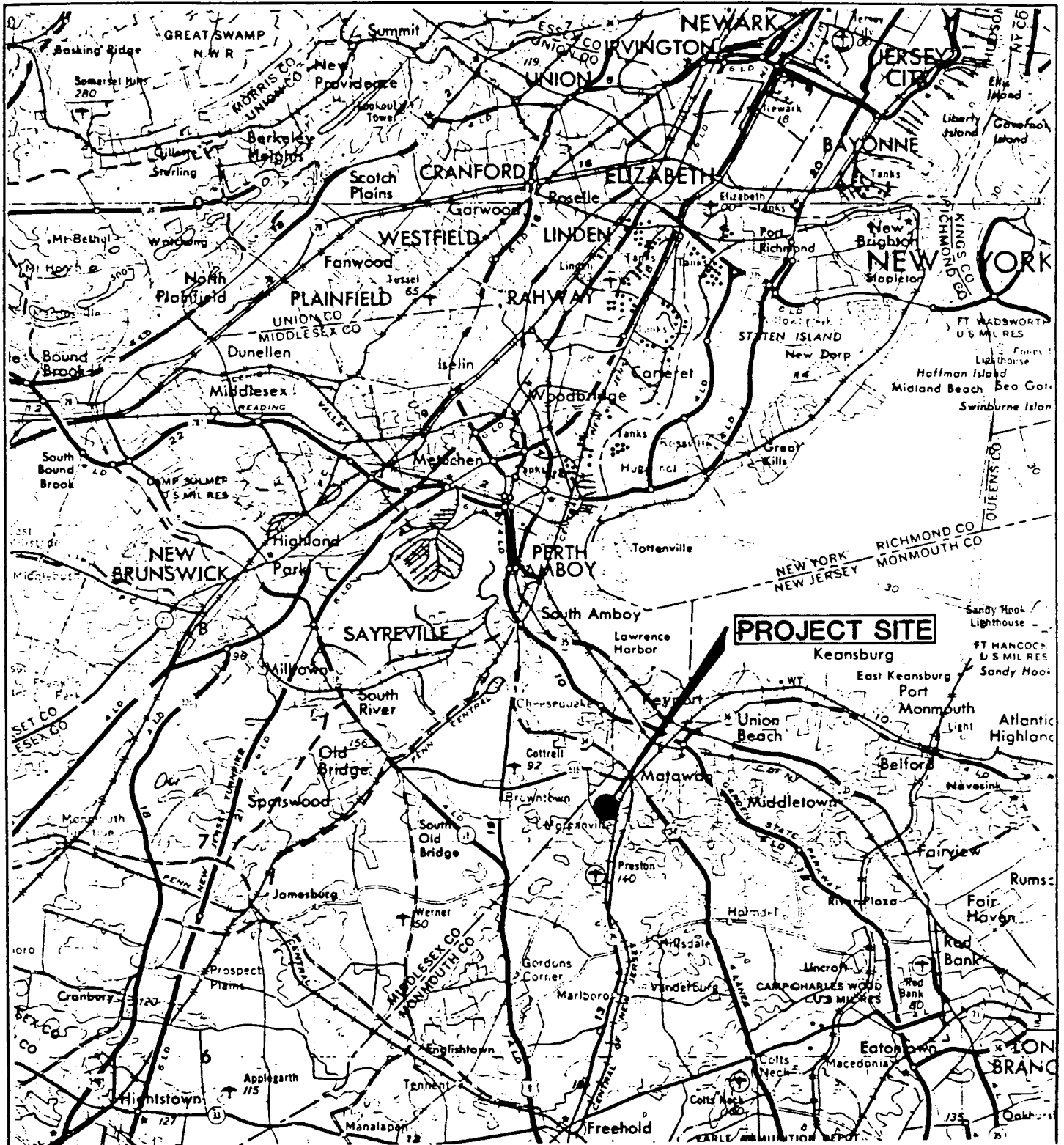
The Imperial Oil Site is located in Marlboro Township in Morganville, New Jersey, which is situated in the northwestern section of Monmouth County (Figure 2-1).

The area containing the Imperial Oil site is bounded on the south by N.J. Route 3 (Tennent Road), on the southwest by Greenwood Road, on the northeast by Texas Road and on the east by N.J. Route 79 (Figure 2-2). There are residential properties situated along these roads, while the majority of the interior portions of the site are either wooded or open grassy areas. In addition, a small commercial center is located at the junction of Routes 79 and 3 which is just southeast of the plant site. Five residential properties are located along Orchard Place between the site and Route 3.

### 2.2 Site Description

The "active" portion of the Imperial Oil Co. site is set off from the surrounding land uses by a 6-foot-high chain-link fence which is topped with 3 strands of barbed wire. Seventy-five percent of the land surface within the fenced area, according to the Remedial Action Master Plan (RAMP) prepared by Fred C. Hart Associates, is either paved or covered with structures. The remaining area is mainly unvegetated or only sparsely vegetated sandy soils. Although data supplied by the NJDEP indicates that the active portion of Imperial Oil Co. site is 4.2 acres in size, statements made by Imperial Oil Co. personnel during the site visit indicated that the overall property area is approximately 15 acres. This implies that some of the vacant wooded land surrounding the facility is also part of the Imperial Oil Co. landholdings. The western property line of the parcel abuts the tracks of the Central Railroad which is part of New Jersey's Freehold and Atlantic Highlands Branch Line. However, at the time of the site visit these tracks appeared to be no longer in use. New Jersey Central Power and Light Co.'s transmission lines are located to the northwest of the railroad and run parallel to the Imperial Oil Co. site's western property line.

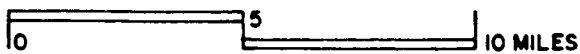
Based on the U.S. Soil Conservation Service's (SCS) mapping for Monmouth County most of the site is comprised of Keyport fine sandy loam and Berryland sand soils. The Keyport soils are moderately well-drained and are characterized by sands overlying clay substratums, while the Berryland soils are deep, very poorly drained sands. The Berryland soils are mapped mainly in the area surrounding the fire pond and the unnamed intermittent stream which is located near the northeast side of the site. According to Imperial Oil Co. personnel, the surface area adjacent to the fire pond was at one point covered with dredge soils which were removed from the pond during this past year. A small stream flows northwesterly along the site and then turns north along the powerline Right of Way and eventually discharges into Lake Lefferts, approximately 1.3 miles downstream. Two 1-acre offsite study areas, alleged to be waste oil disposal sites, are located along the stream in the powerline ROW near the point where the stream begins to turn northward. The SCS has mapped the soils in the area as alluvial sand. These soils are characterized by their poorly



SOURCE : U.S. ATLAS



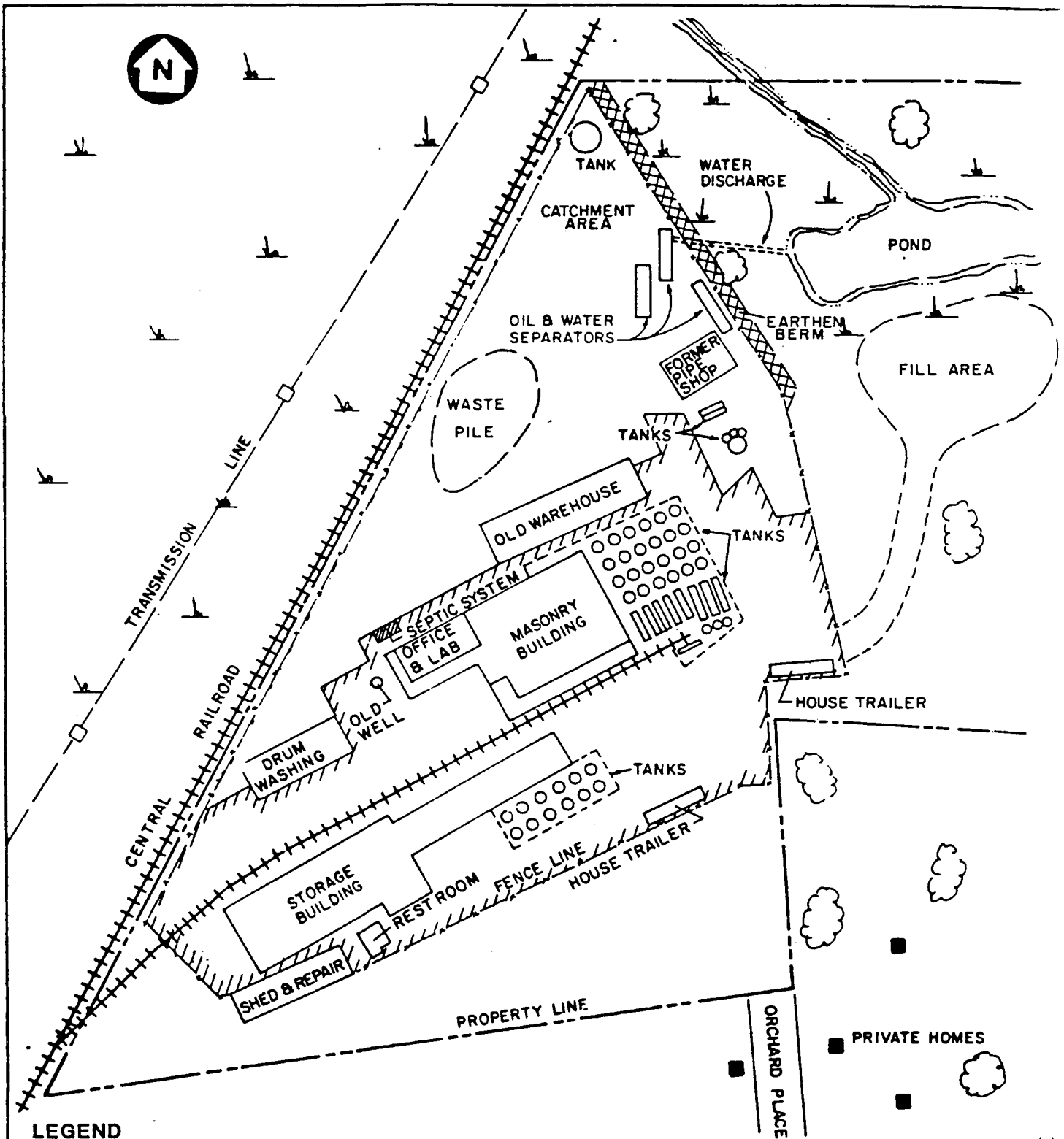
SCALE



**FIGURE 2-1**  
**SITE LOCATION MAP**  
**IMPERIAL OIL CO. SITE**  
**MORGANVILLE, NEW JERSEY**  
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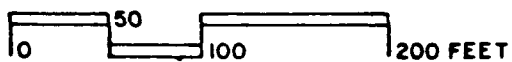




**LEGEND**

////// DENOTES EXTENT OF PAVED AREA

SCALE 1" = 100'



**FIGURE 2-2**  
**SITE LOCATION PLAN**  
**IMPERIAL OIL CO. SITE**  
**MORGANVILLE, NEW JERSEY**  
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drained conditions and are comprised of relatively recent deposits of loamy sands and silty loam materials.

Surface runoff originating from outside the plant area is diverted along the front of the Imperial Oil Co. facility; runoff originating from within the site is contained onsite by earthen berms which parallel the northeastern and northwestern fence lines. This contained site runoff passes through oil/water separators, and then is discharged into the fire pond via a pipe through the berm. This discharge point has been permitted by the NJDEP and is currently surrounded by a chain-link fence. Based on information supplied in the RAMP and the RFP, the shallow groundwater in the area of the plant site generally moves towards the east (having both a northeast and southeast component). According to information in the RAMP, depth to groundwater beneath the site ranges from 8 to 15 feet below the ground surface, depending on the topographic setting. It was also reported in the RAMP that there was no hydraulic connection between the groundwater beneath the site and the unnamed stream.

There are reportedly several private wells in the area; NJDEP asserts that all homes are now on public water. Private wells may be used in some cases for irrigation purposes. In addition to the private wells there are currently four monitoring wells within the Imperial Oil Co. site. These wells are all located along the northwestern side of the property, near the fence line and/or the railroad tracks.

### 2.3 Site History

The Imperial Oil Co. facility, which has been in operation since approximately 1912, produced ketchup and tomato paste until around the end of World War I; at that time it was converted to a chemical processing plant. The products of the chemical plant included arsenic acid and calcium arsenic, followed by manufactured flavors and essences. At the end of the 1940s the plant was purchased by Champion Chemicals and became an oil reclamation facility. This operation continued until Imperial Oil Co. leased the site from Champion Chemicals during the 1960s and began conducting oil blending operations at the site. The product is still produced and is currently packaged in either 5-gallon containers, 55-gallon drums, or shipped out in bulk.

Domestic wastes generated at this site are being disposed of in a septic tank and leachfield which are located behind the office building. Any other liquid wastes generated at this facility are reportedly treated by the oil/water separators at the site. Waste disposal practices prior to the 1950s are not known; however, it is reported that at one time an oil settling lagoon was located near the fence line at the rear of the site. Even though the lagoon's exact location and size are unknown, investigations by Princeton Aqua Science (1983) indicate it may have been as deep as five feet. Concurrent with, or subsequent to the lagoon, large piles of oil-saturated soils (filter clay) are alleged to have been stored at the site prior to their disposal at the Morganville dump during the 1950s. The remains of one such filter clay pile are located along the northwestern fence line. According to the RFP, there may have been disposal of other contaminated soils along the east side of the property, although no specific locations have yet been identified.

Previous investigations at this site have included the installation of 4 monitoring wells and the excavation of 6 test pits. In addition, six surface water and sediment samples were collected and analyzed. The results of these investigations have found that the soil and groundwater appear to be contaminated with petroleum hydrocarbons, lead, barium, arsenic, and PCBs, as well as other organic contaminants. Furthermore, it was reported by the NJDEP that during one site visit free product was found floating in Monitoring Well 3. According to NJDEP, MW-3 appears to exhibit the highest level of contamination of the site's four existing monitoring wells.

The RFP states that potential sources of contamination are the suspected old lagoon area, the existing filter clay pile, contaminated surface and/or subsurface soils, leaking oil storage tanks, and the oil/water separators (even though these were recently renovated they could have contributed in the past).

In addition to the plant area, two off-site areas appear to have been former dump sites for waste oil. As a result of these activities, the soils in those areas have been contaminated with petroleum hydrocarbons, heavy metals, and PCBs. The vegetation in these areas is stressed and the soils are stained as are the soils in the adjacent stream banks. During Jordan's site visit (May 16, 1986) an oil slick was observed on that portion of the stream near the railroad tracks. Sediment samples collected from the stream in the past have shown evidence of heavy metals and petroleum hydrocarbons. Abandoned drums in the two stressed areas (a minimum of 2 or 3 in each area) as well as one rusted drum in the stream were also noted during the site visit. No explanation was given as to how or when the drums were placed in these areas. The NJDEP personnel stated that they had no information on any drums being buried, either at the on-site or off-site locations.

### 3.0 WASTE DESCRIPTION AND CHARACTERIZATION

#### 3.1 Waste Description

Little information concerning the composition of wastes on-site is available. Previous testing conducted by the EPA, NJDEP, and others (Draft RAMP 1983) in the clay waste pile, on-site soils and off-site soils, revealed heavy metals and PCBs. Samples from this pile were not analyzed for volatile or semi-volatile organics. However, analysis of groundwater, surface water, sediment and soil samples indicate the presence of organics as well as heavy metals and PCBs at the site. Therefore, these compounds may be present in waste sources. Specific compounds found in various media are presented in Table 3-1. Additional information is available in Appendix H.

#### 3.2 Associated Hazards for On-site Waste Types

As discussed above, volatile and semivolatile organics, PCBs and heavy metals have been detected on the Imperial Oil site. Many of these compounds are toxic or carcinogenic when ingested, inhaled or absorbed by skin. Several of the chemicals are flammable and explosive or may produce toxic fumes when heated. Specific hazards and characteristics of compounds are presented below and in Table 3-1.

##### Waste Types

Liquid	<u>✓</u>	Solid	<u>✓</u>	Gas	_____
Sludge	<u>✓</u>	Semi-Solid	_____	Other	_____

##### Characteristics

Corrosive	<u>✓</u>	Flammable	<u>✓</u>	Explosive	<u>✓</u>
Volatile	<u>✓</u>	Radioactive	_____	Other	_____

##### Containment

Pit	_____	Pond	<u>✓*</u>	Lagoon	<u>✓</u>
Lake	_____	Process Vessel	<u>✓*</u>	Drum	_____
Tank	_____	Piping	<u>✓*</u>	Lab Pack	_____
Tank Car	_____	Other	<u>✓<sup>1</sup></u>		

<sup>1</sup> Other: The site is bermed to contain surface runoff.  
\* Oil/water separator system.

TABLE 3-1  
 ASSOCIATED HAZARDS AND CONCENTRATIONS OF ON-SITE CONTAMINANTS DETECTED  
 IN MEDIA AT THE IMPERIAL OIL SITE

Compound	Hazard	Location	Concentration Range Range (ppm)	Threshold Limit Value TLV (ppm)
<b>Volatile Organics</b>				
Benzene	Readily absorbed via inhalation & ingestion; absorbed through skin. carcinogenic. Harmful if swallowed.	Groundwater	ND-0.204	10
Benzol [C <sub>6</sub> H <sub>6</sub> ]		Soil	ND-0.01	
1,1-Dichloroethane [C <sub>2</sub> H <sub>4</sub> Cl <sub>2</sub> ]	Absorbed in GI tract and respiratory tract; Respiratory tract and skin irritant. Irritating to eyes.	Groundwater	ND-1.48	200
1,2-Dichloroethane Ethylene Dichloride [C <sub>1</sub> CH <sub>2</sub> CH <sub>2</sub> Cl]	Vapor irritating to eyes, nose, throat liquid burns skin and eyes. Harmful if swallowed.	Groundwater	ND-0.899	10
Trans-1,2-Dichloroethylene DCE [C <sub>1</sub> CH=CHCl]	Absorbed through GI tract and inhalation. Harmful if swallowed.	Groundwater	ND-0.257	200
1,2-Dichloropropane Propylene dichloride [CH <sub>3</sub> CHClCH <sub>2</sub> Cl]	Vapor irritating to eyes, nose and throat, Liquid irritating to skin and eyes.	Groundwater Soil	ND-0.013 ND-0.059	75
Ethylbenzene EB [C <sub>6</sub> H <sub>5</sub> CH <sub>2</sub> CH <sub>3</sub> ]	Vapor irritating to eyes, nose, throat, Liquid irritating to skin and eyes. Harmful if swallowed. Absorbed through respiratory tract.	Groundwater Soil	ND-0.098 ND-0.059	100
1,1,2,2-Tetrachloroethane Tetrachloroethane [Cl <sub>2</sub> CHCHCl <sub>2</sub> ]	Vapor irritating to eyes, nose, throat, Harmful if inhaled. Liquid irritating to skin and eyes. Poisonous if swallowed or if skin exposed.	Groundwater	ND-0.107 ND	1.0
1,1,1-Trichloroethane Trichloroethane Methychloroform [CH <sub>3</sub> CCl <sub>3</sub> ]	Vapor irritating to eyes, nose and throat. Liquid irritating to skin and eyes.	Groundwater	ND-0.045 ND-0.071	350
Trichloroethylene TCE CHCl=CCl <sub>2</sub>	Vapor irritating to eyes, nose and throat. Liquid is irritating to skin.	Groundwater Soil	ND-0.278 ND-0.65	50
Toluene Methylbenzene C <sub>6</sub> H <sub>5</sub> CH <sub>3</sub>	Vapor irritating to eyes, nose and throat, Liquid irritating to skin and eyes. Absorbed through skin and respiratory tract.	Groundwater Soil Sediment (Lake)	ND-0.499 ND-6.37 ND-0.002	100
Total Xylenes (p-,o-m-) C <sub>6</sub> H <sub>4</sub> (CH <sub>3</sub> ) <sub>2</sub>	Absorbed via inhalation. Vapor irritating to eyes, nose and throat. Liquid irritating to skin and eyes.	Groundwater	ND-0.211	100

TABLE 3-1  
 ASSOCIATED HAZARDS AND CONCENTRATIONS OF ON-SITE CONTAMINANTS DETECTED  
 IN MEDIA AT THE IMPERIAL OIL SITE  
 (continued)

Compound	Hazard	Location	Concentration Range (ppm)	Threshold Limit Value TLV (ppm)
Polychlorinated Biphenyls PCB  (C <sub>12</sub> H <sub>10-x</sub> )Cl <sub>2</sub>	Liquid and solid irritating to skin and eyes.	Groundwater Soil Sediment	ND-1.267(89.0) <sup>a</sup> ND-61.3 ND-27.14	0.5-1.0mg/m <sup>3</sup>
Tetrachloroethylene Perchloroethylene  Cl <sub>2</sub> C=CCl <sub>2</sub>	Inhalation irritates eyes, nose, throat, Contact irritating to skin and eyes. Carcinogen.	Soil	ND-0.115	50
Sec-Butyl Benzene 2-Phenylbutane C <sub>10</sub> H <sub>14</sub> ; C <sub>6</sub> H <sub>5</sub> C(CH <sub>3</sub> )C <sub>2</sub> H <sub>5</sub>	Moderately toxic by ingestion.	Soil	ND-0.16	
<u>Semi-Volatile Organics</u>				
PHENOLS Phenol 2,4-Dichlorophenol 2,4-Dimethylphenol 4-Nitrophenol Pentachlorophenol 2,4,6-Trichlorophenol 2,4-Dinitrophenol 2-Methyl 1,4, 6-Dinitrophenol 2-Nitrophenol  C <sub>6</sub> H <sub>5</sub> OH	Absorbed via ingestion, inhalation, and skin. Strong skin irritant. Irritates eyes, nose and throat. Maybe carcinogenic promotor. Liquid or solid poisonous if swallowed	Groundwater Soil Sediment Surface water	ND-0.654 NA ND-0.117 ND-0.018	5
Butyl Benzyl Phthalate BB  C <sub>4</sub> H <sub>9</sub> OOCCH <sub>2</sub> COOC <sub>7</sub> H <sub>7</sub> ; C <sub>9</sub> H <sub>21</sub> O <sub>4</sub>	Irritating to skin and eyes.	Groundwater	ND-0.172	N/A
Hexachlorobutadiene  Cl <sub>2</sub> C:CClCCl:CCl <sub>2</sub>	Absorbed via ingestion and inhalation. Suspected carcinogen.	Groundwater	ND-0.108	---
Bis(2-Chloroethoxy)methane Dichloroethyl formal Dichlorodiethyl formal CH <sub>2</sub> (OCH <sub>2</sub> CH <sub>2</sub> U) <sub>2</sub>	Absorbed via inhalation and ingestion. Strong irritant.	Groundwater Soil	ND-0.025 ND-0.928	---
Bis(2-Chloroisopropyl)ether Dichloroisopropyl ether C <sub>6</sub> H <sub>2</sub> Cl <sub>2</sub> O; [ClCH <sub>2</sub> C(CH <sub>3</sub> )H] <sub>2</sub> O	Absorbed via inhalation, ingestion, skin. Eye irritant.	Groundwater	ND-0.067	

TABLE 3-1  
 ASSOCIATED HAZARDS AND CONCENTRATIONS OF ON-SITE CONTAMINANTS DETECTED  
 IN MEDIA AT THE IMPERIAL OIL SITE  
 (continued)

Compound	Hazard	Location	Concentration Range Range (ppm)	Threshold Limit Value TLV (ppm)
1,4-Dichlorobenzene p-Dichlorobenzene PDCB $C_6H_4Cl_2$	Irritates eye, nose and throat. Skin irritant. Poisonous gas from fire.	Groundwater	ND-0.085	75
Nitrobenzene $C_6H_5NO_2$	Absorbed via inhalation, skin; will burn eyes. Eye, nose, throat, skin irritant; carcinogen. Heated vapor poisonous; liquid poisonous if swallowed or if skin exposed.	Groundwater	ND-0.016	1.0
Benzidine $C_{12}H_{12}N_2$	Absorbed via skin, inhalation. Eye, nose, throat, skin irritant. Carcinogen. Harmful if swallowed.	Groundwater	ND-0.191	10
1,2-Dichlorobenzene o-Dichlorobenzene $O-C_6H_4Cl_2$	Irritant to skin and mucous membranes. Eye irritant. Absorbed via inhalation and ingestion. Carcinogen.	Groundwater	ND-0.243	50
2,4-Dinitrotoluene $C_7H_6N_2O_4$ ; 2,4-( $NO_2$ ) $_2C_6H_3CH_3$	Absorbed via skin, inhalation. Irritant to skin mucous membranes. Carcinogen.	Groundwater	ND-1.03	1.5mg/m <sup>3</sup>
Isophorone $C_9H_{14}O$ ; $COCH=C(CH_3)CH_2C(CH_3)_2CH_2$	Irritates eyes, nose, throat. Harmful if swallowed.	Groundwater	ND-0.167	5
N-Nitrosodiphenylamine NDPA $C_{12}H_{10}N_2O$	No data available.	Soil	ND-8.69	
Bis(2-ethylhexyl)phthalate Dioctyl Phthalate Phthalic Acid; DOP Di(2-ethylhexyl) phthalate $o-C_6H_4[COOCH_2CH(C_2H_5)(CH_2)_3CH_3]$	Poorly absorbed through skin. Not harmful.	Sediment Surface Water	ND-11.7 ND-0.067	5 mg/m <sup>3</sup>

TABLE 3-1  
 ASSOCIATED HAZARDS AND CONCENTRATIONS OF ON-SITE CONTAMINANTS DETECTED  
 IN MEDIA AT THE IMPERIAL OIL SITE  
 (continued)

Compound	Hazard	Location	Concentration Range Range (ppm)	Threshold Limit Value TLV (ppm)
Polyaromatic Hydrocarbons (PAHs) Polynuclear Hydrocarbons PAHs include: Fluorene Naphthalene Acenaphthene Acenaphthylene Anthracene Phenanthrene Fluoranthene Pyrene	Absorbed via ingestion and inhalation. Irritates eyes, nose and throat. Skin irritant. Carcinogenic.	Groundwater	ND-0.407	
		Soil	ND-1.37	
		Sediment	ND-0.5	
		Surface water	ND-0.6	
<b>Elements</b>				
Arsenic	Highly toxic by inhalation, ingestion, and direct contact. Can cause skin abnormalities. Recognized carcinogen.	Surface Soil	1.7-852	0.2mg/m <sup>3</sup>
		Sediments	0.027-200	
		Groundwater	0.012-2.4	
		Surface Water	ND-0.534	
Barium	Toxic by inhalation, ingestion and direct contact. Some barium compounds cause irritation of the eyes, nose, throat, and skin	Surface Soil	ND-1260	0.5mg/m <sup>3</sup>
		Sediments	1.2-160	
		Groundwater	ND-0.241	
		Surface Water	ND-23	
Cadmium	Cadmium is not readily absorbed by the skin. When inhaled both cadmium dust and fumes are absorbed. Cadmium dust and fumes are highly toxic and carcinogenic when inhaled.	Surface Soil	ND-1.37	0.05mg/m <sup>3</sup>
		Sediments	ND-0.69	
		Groundwater	0.002-0.007	
		Surface Water	ND-0.008	
Chlorides	Toxicity varies widely with specific compound.	Sediments	86	---
		Groundwater	2-55.5	
Chromium	Commonly found in trivalent and hexavalent states. Hexavalent compounds have an irritating and corrosive effect on skin. Chromium dust and fumes are carcinogenic by inhalation.	Surface Soil	ND-160	0.5mg/m <sup>3</sup> 0.05mg/m <sup>3</sup> (as dust)
		Sediments	ND-52	
		Groundwater	ND-0.057	
		Surface Water	ND-0.031	
Copper	Copper dust toxic by inhalation; Irritates mucous membranes and eyes	Sediment	47-1500	0.2mg/m <sup>3</sup> (fume) 1 mg/m <sup>3</sup> (dust)
		Surface Water	ND-0.036	

2900 100 IMP



TABLE 3-1  
 ASSOCIATED HAZARDS AND CONCENTRATIONS OF ON-SITE CONTAMINANTS DETECTED  
 IN MEDIA AT THE IMPERIAL OIL SITE  
 (continued)

Compound	Hazard	Location	Concentration Range Range (ppm)	Threshold Limit Value TLV (ppm)
Lead	Toxic by ingestion and inhalation of dusts and fumes. Some evidence of carcinogenicity in animals.	Surface Soil	ND-7600	0.15mg/m <sup>3</sup> (dust and fumes)
		Sediments	ND-1200	
		Groundwater	ND-0.128	
		Surface Water	ND-0.190	
Mercury	Highly toxic by skin absorption and inhalation of fume and vapor.	Sediments	ND-1.01	0.05mg/m <sup>3</sup> (skin-all forms except alkyl vapor)
		Surface Water	ND-0.002	
Nickel	Toxic when inhaled as a dust. Carcinogenic when inhaled.	Sediments	16.0-21.0	1 mg/m <sup>3</sup> 0.1 mg/m <sup>3</sup> (soluble compound)
Selenium	Irritant to eyes, nose and throat when dust is inhaled.	Sediments	ND-0.95	0.2 <sup>#</sup> mg/m <sup>3</sup>
Zinc	Zinc compound fumes toxic by inhalation.	Surface soil	0.63-1500	Compound dependent
		Sediments	98.0-220	
		Groundwater	0.64-0.732	
		Surface Water	ND-0.320	

NOTES:

- a : Concentration detected in distinct oil layer
- ND: Denotes parameter analyzed for but not detected
- NA: Denotes parameter or class of parameters not analyzed for

#### 4.0 SCOPE OF WORK

##### 4.1 Overall Scope of RI/FS

The total scope of the Imperial Oil RI/FS consists of seven tasks. These tasks are defined as follows:

- Task 1 -- Pre-Investigation Activities
- Task 2 -- Site Investigations
- Task 3 -- Laboratory Analytical Requirements and Bench-Scale Treatability studies
- Task 4 -- Selection of Remedial Response Activities and Identification of Alternatives
- Task 5 -- Evaluation of Alternatives
- Task 6 -- Conceptual Design
- Task 7 -- Community Relations Support

##### 4.2 Scope of the Site Investigation

This HASP has been developed to provide Health and Safety guidance for field activities to be conducted in Task 2 (Site Investigation). The scope of this Task is presented below.

The major potential pathway of contaminant migration at the Imperial Oil site appears to be through the groundwater although the adjacent surface waterbodies also appear to have been impacted. The surface water drainage from the plant site discharges to adjacent surface waters through the pipe leading from the oil/water separators. However, at the offsite areas contaminant migration may be through either groundwater or surface runoff. Jordan's proposed investigation, therefore, focuses on: identifying contaminant sources through air monitoring, sediment, soil, waste, surface water, and groundwater sampling; defining the distribution of contaminant migration both laterally and vertically; and presenting feasible remedial actions to protect and prevent harm to potential receptors. The major elements of Jordan's proposed site investigation include the following:

- o Existing Well Sampling -- 4 existing onsite monitoring wells and 6 offsite residential wells will be sampled to confirm earlier findings and to direct subsequent field activities.
- o Air Monitoring -- volatile organic emissions will be detected through the use of portable photoionization meters.
- o Soil Sampling -- 37 samples, including shallow and deep soil samples, will be collected for chemical analyses to determine site characteristics and contaminant distribution. These samples will be obtained from test borings and surface sampling.
- o Groundwater Investigation -- 3 new shallow monitoring wells (25 feet deep) and 3 new deep monitoring wells (to the top of the Woodbury Clay or to a maximum of 100 feet deep) will be installed, gamma-logged, and sampled. The deep wells will be screened in the lower portion of the Englishtown

formation and natural gamma logging will be performed in each deep boring. Sampling will be conducted using decontaminated teflon bailers:

- o Waste Pile Sampling -- 3 composite samples of the filter clay will be collected from the pile and tested to characterize and/or identify it as a contaminant source.
- o Surface Water/Sediment Sampling -- 4 surface water and 4 sediment samples will be collected and analyzed to assess the contaminant distribution in the stream which empties into Lake Lefferts.

Jordan's site investigation is designed so that each subsequent task is developed and based on results from the previous task. In this manner, subsequent activities can be directed more specifically at those areas where the most valuable data can be obtained.

## 5.0 HAZARD ASSESSMENT

### 5.1 Personal Protection Level Description

The level of personnel protective equipment required shall be determined by the type and concentrations of waste or spill material present at the site where project personnel may be exposed. In situations where the types of waste or spill material onsite are unknown, the hazards are not clearly established or the situation changes during onsite activities, the Site Safety Officer must make a reasonable determination of the level of protection that will assure the safety of investigators and response personnel until the potential hazards have been determined through monitoring, sampling, informational assessment, laboratory analyses or other reliable methods. Once the hazards have been determined, protective levels commensurate with the hazards will be used. Protection requirements will be evaluated on a continuous basis to reflect new information as it is acquired. Gear required for each protection level is shown in Table 5-1. Preparation of the Imperial Oil site specific HASP is based on the information made available through site files, the RAMP report, and the RFP.

The levels of protection utilized by E.C. Jordan Co. are presented below:

Level A. Level A protection must be selected when the Site Safety Officer makes a reasonable determination that the highest available level of respiratory, skin and eye protection is needed. It should be noted that while Level A provides maximum available protection, it does not protect against all possible hazards. Consideration of the heat stress that can arise from wearing Level A protection should also enter into the subtask leaders decision. (Comfort is not a decision factor, but heat stress will influence work rate, scheduling, and other work practices.)

Level B. The Site Safety Office must select Level B protection when the highest level of respiratory protection is needed, but hazardous material exposure to the few unprotected areas of the body (e.g., the back of the neck) is unlikely.

Level C. The Site Safety Office may select Level C when the required level of respiratory protection is known, or reasonably assumed to be, not greater than the level of protection afforded by full face air purifying respirators; and hazardous materials exposure to the few unprotected areas of the body (e.g., the back of the neck) is unlikely. Level C requires carrying an emergency escape respirator.

Level D. Level D is the basic work uniform, selected when site hazards are judged to be minimal. Investigators and response personnel, however, must not be permitted to work in civilian clothes. Level D often requires carrying an escape respirator.

Fit testing of safety equipment is an important part of establishing adequate respiratory protection. Fit testing is accomplished prior to site explorations and each individual is assigned a fitted respirator for the duration of the project. These are tagged for identification. The equipment used for each level of protection is shown in Table 5-1.

TABLE 5-1  
Protective Gear

	Level D	Level C	Level B	Level A
Action Level <sup>1</sup>	0	0 to 5	5-500	500-1000
Respirator Type <sup>2</sup>	Escape	Full Face & Escape	SCBA	SCBA
Clothing				
o Boots	X	X	X	X
o Safety glasses or equivalent	X	X	X	
o Hard hat	X	X	X	
o Gloves, inner and outer	X	X	X	X
o Booties		X	X	X
o Coveralls	X	X	X	
o Chemical protective coveralls		X	X	
o Totally encapsulated suit				X

<sup>1</sup> Action levels are defined as air quality degradation from background levels, in ppm, by volatile contaminants as measured by a photoionization meter calibrated in the clean (support) zone. The action required is review of contaminants and reassessment of appropriate protective gear by the Site Safety Officer.

<sup>2</sup> Use of an air purifying respirator is allowed only where identification of constituents has occurred and appropriate respirator cartridges have been obtained.

<sup>3</sup> It must be recognized that a photoionization meter's relative response varies with each compound. Action levels should be reviewed (when constituents are known) to determine appropriate modifications.

It should be recognized that situations exist where different combinations of respiratory and dermal protective gear are appropriate, e.g., where splash protection is required but no respiratory hazard exists. The Site Safety Officer may elect a modification of the above specified combinations.

## 5.2 Protective Measures for the Imperial Oil Site

The choice of protection level was based on a review of data collected during the NUS RAMP Investigation and the Jordan background investigation. During these investigations, volatile and semivolatile organics, PCBs and heavy metals were determined to be present in site media. A list of specific compounds and their hazards are shown in Section 3.0, Table 3-1.

The hazard level anticipated to be encountered during the performance of the field investigation at Imperial Oil Company will vary according to the task being performed. The hazard level to be used at each site is discussed below. Level B equipment will be maintained on-site should monitoring indicate a need to go to that level of protection. For level C work, combination-type vapor/dust respirator cartridges will be used.

### Deep Borings and Monitoring Well Installation

The hazard level for the drilling of the borings in which monitoring wells are to be installed is level C dermal protection. If site conditions are dry and dusty or photoionization (PI) meter readings are 0-5 ppm above background in the breathing zone and air contaminants may be identified then level C respiratory protection will be required. If PI readings in the breathing zone are continually above 5 ppm then level B protection will be required.

### Shallow Borings Surface Soil Sampling

The hazard level for the drilling of the shallow borings (15 feet) and for the surface soil sampling is to be at level C respiratory and dermal protection as required by NJDEP. If PI readings of the breathing zone are greater than 5 ppm continually in the breathing zone then level B protection will be required.

### Waste Pile Sampling

The hazard level for the sampling of the waste pile is to be at level C respiratory and dermal protection as required by NJDEP. In the event that PI readings are at background levels and site conditions are not dry or dusty the level of protection will be reassessed. If conditions warrant, the site safety officer will downgrade to level D protection.

### Monitoring Well Sampling

The hazard level for sampling of monitoring wells will be at and level C dermal protection. If ambient air PI readings are 0-5 ppm in the breathing zone then level C respiratory protection will be required. If PI readings in the breathing zone are continuously above 5 ppm level B protection will be required.

### Private Well Sampling

The hazard level for the sampling of the private wells will be level D.

### Surface Water and Sediment Sampling

The hazard level for the surface water and sediment sampling will be at level D. If conditions are dry or dusty or PI readings are 0-5 ppm in the breathing zone then level C respiratory protection will be used.

### Selection of Protection

The dermal protection provided by the protective coveralls required for Level C should be adequate for protection against site contaminants. Contaminants which may pose a significant direct contact hazard include but are not limited to polycyclic aromatic hydrocarbons (PAHs), phenols, aromatics, and mercury.

In cases where little particulate matter is expected to be in site air and volatiles remain at or below background levels, Level D protection should be adequate. If site conditions warrant it, however, Level C respiratory protection will be used. Level C respiratory protection includes air purifying respirators. For the Imperial Oil site, cartridges for organic vapors as well as those for particulates would be selected. The organic vapor cartridges should protect field personnel against inhalation of volatile and semivolatile organics present in site air; particulate cartridges should protect personnel against inhalation of particulates, dusts and fumes of heavy metals on-site. If PI readings in the work area are continually greater than 5ppm, Level B protection will be selected.

A detailed discussion of Jordan's Respiratory Protection Program is presented in Appendix G. Level B Operations are discussed in Appendix F.

## 6.0 PROJECT ORGANIZATION AND PERSONNEL

### 6.1 Organization and Responsibilities

Jordan's project organization consists of seven components as illustrated in Figure 6-1. Key project personnel for the project include the Responsible Corporate Officer, Project Manager, Technical Review Board Members, Technical Director, RI Coordinator, FS Coordinator, and QA Coordinator. Responsibilities of these personnel as well as resumes are included in Jordan's Proposal (June 1986).

### 6.2 Health and Safety Personnel

The following briefly describes the health and safety staff designations and general responsibilities which may be employed for the Imperial Oil Site. These positions have been established to accommodate the site needs and requirements in order to ensure the safe conduct of on-site work. For the Imperial Oil Site, R.A. Steeves will serve as Corporate Health and Safety Coordinator (CHSC) and Linda Healey will serve as Health and Safety Officer (HSO).

#### Jordan Health and Safety Coordinator

The CHSC has overall responsibility for development and implementation of this HASP, and shall approve any changes, modifications, and/or additions to the HASP.

The CHSC will be responsible for the development of any new company safety protocols and procedures necessary for field operations, and will also be responsible for the resolution of any outstanding safety issues which arise during the conduct of site work. All health and safety-related duties and responsibilities will be assigned only to qualified individuals on-site, i.e., relative to medical exams and training, assignments must be cleared by the CHSC.

#### Site Health and Safety Officer

The HSO will be present on-site during all Level A or B, or high-hazard Level C field operations, monitor well installations and field sampling, and will be responsible for all health and safety activities and the delegation of duties to the H&S staff in the field. Where the site is identified as low-hazard Level C or Level D, the HSO may direct the site health and safety efforts through a health and safety designee approved by the CHSC. The designee will be responsible for implementation of the HASP. She may direct or participate in downrange activities as appropriate when this does not interfere with her primary HSO responsibility. The HSO has stop-work authorization which she will execute upon his determination of an imminent safety hazard, emergency situation, or another potentially dangerous situations (e.g., weather conditions), where this action is appropriate. Authorization to proceed with work will be issued by the CHSC after such action. The HSO will initiate and execute all contact with support facilities and personnel when this action is appropriate.



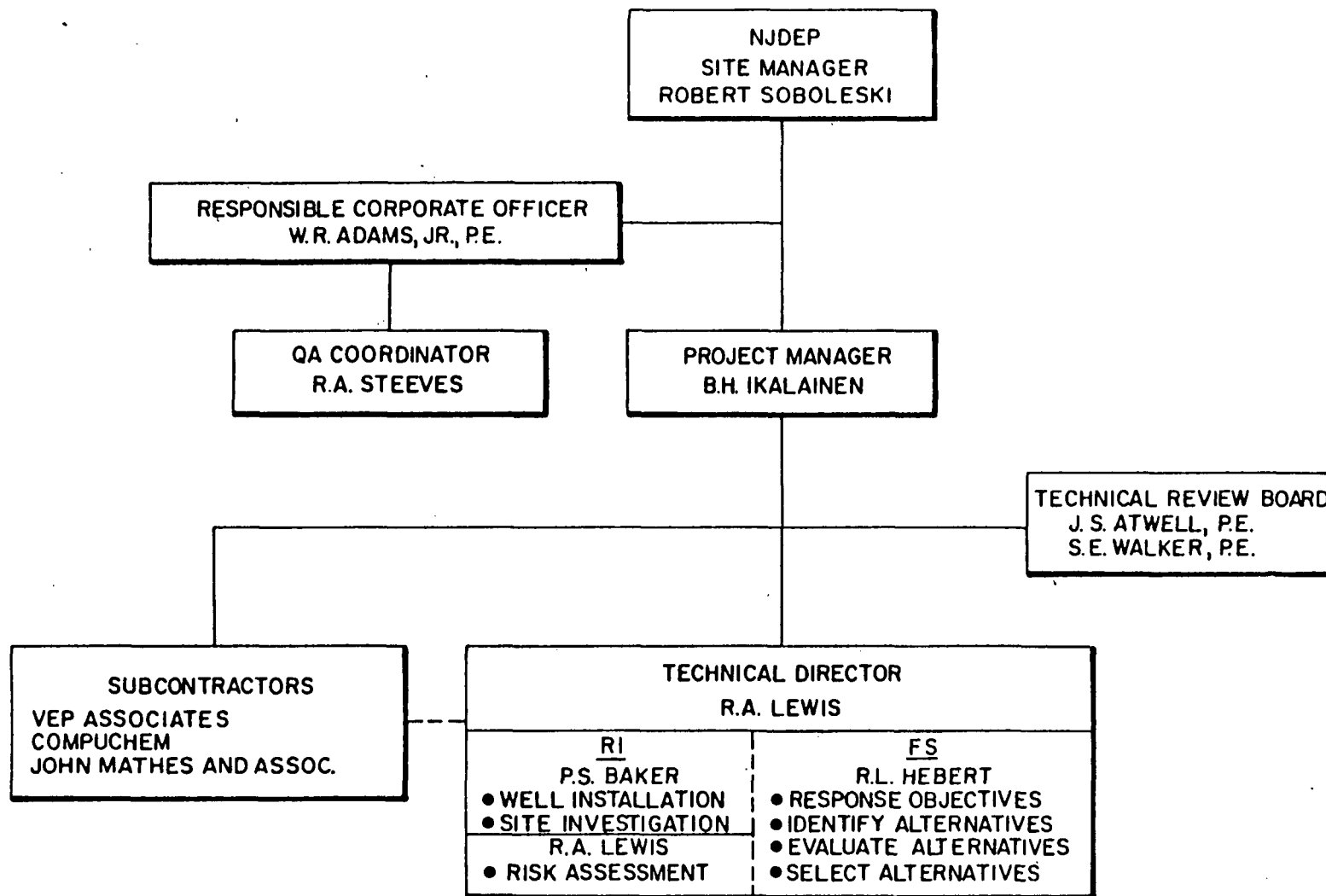


FIGURE 6-1  
 PROJECT ORGANIZATION CHART  
 IMPERIAL OIL CO. SITE  
 MORGANVILLE, NEW JERSEY  
 EC.JORDANCO

## Health and Safety Designee

An Assistant HSO may be designated. This will be the downrange person who accompanies field sampling teams and will report to the HSO. Where a site has been identified as a low-hazard Level C or Level D site, another qualified person (as determined by the CHSC) may be identified as the HSO designee. The designee will act for the Health and Safety Officer at the HSO's direction. Additionally, the designee may be required to support the HSO when multiple operations are conducted that require monitoring and HSO surveillance. The assistant's primary responsibility is to provide the appropriate monitoring to ensure the safe conduct of field operations and will have access to continuous communications with the command post. The number of Assistant HSO's will be dependent upon the number of downrange operations occurring simultaneously, site level of protection designation, and the individual assignments made by the HSO. Assistant HSO/Designee will also share responsibility with the Field Coordinator and the HSO for ensuring that all safety practices are utilized by downrange teams and that during emergency situations, appropriate procedures are immediately and effectively initiated. The Assistant HSO will also be responsible for the control of specific field operations and all related activities such as personnel decontamination, monitoring of worker heat or cold stress, distribution of safety equipment, and conformance with all other procedures established by the HASP.

### 6.3 Field Personnel and Training

Personnel that may be present at the Imperial Oil Site during field activities include:

#### Team Member

Baker, P.	Field Coordinator, Geologist
Burger, R.	Groundwater Sampling
Dionne, D.	Groundwater Sampling
Goodwin, C.	Groundwater Sampling
Healey, L.	<u>Health and Safety Officer,</u> Geologist
Ikalainen, B.	Project Manager
Lewis, R.	Technical Director
Longley, T.	Drilling Monitor, Geologist
McMullen, J.	Groundwater Sampling
Poor, D.	Field Support
Secovich, S.	Groundwater Sampling
Urquhart, J.	Drilling Monitor, Geologist
Wibby, S.	Drilling Monitor, Geologist

Required Training for site personnel is discussed in Section 7.0 Specific Health and Safety Training for personnel expected to be onsite during field activities is presented in Figure 6-2.

All Jordan personnel working on-site will have had the NUS or an equivalent health and safety training. This is a 40-hour course which deals specifically with health and safety concerns and proper procedures for hazardous waste site

**FIGURE 6-2  
ON-SITE PERSONNEL TRAINING**

TOPIC	HRS	PETER BAKER	ROBERT BURGER	DAVID DIONNE	CHUCK GOODWIN	LINDA HEALY	BARBARA IKALAINEN	RON LEWIS	TOM LONGLEY	JAY McMULLEN	DENLEY POOR	SHARON SECOVICH	JOANNE URQUHART	SCOTT WIBBY
INTRODUCTION/REFRESHER	8	●	●	●	●	●	●	●	●	●	●	●	●	
FIRST AID	8	●				●		●	●	●		●		
CPR	8	●				●				●		●		
NUS COURSE OR EQUIVALENT	30	●	●	●	●	●	●		●	●		●		●
OVA	16													
PI METER	2	●	●	●	●	●		●	●	●		●		●
SCBA REVIEW	4	●	●											●
SAMPLING	-	●	●	●	●	●	●	●	●	●		●		●
HEALTH MONITORING	-	●	●	●	●	●	●	●	●	●	●	●	●	●

● INDICATES REQUIRED TRAINING COMPLETED

work, including training for A, B, C, and D levels of personal protection, site entry procedures and use of monitoring equipment.

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## 7.0 HEALTH MONITORING AND SAFETY PROGRAM

To protect the health and safety of employees assigned to work at hazardous waste sites, the Jordan has developed and implemented a Health and Safety Program. This program is administered by a committee consisting of representatives of Jordan technical department staffs with support from medical advisors. All personnel onsite must be enrolled in the Health Monitoring Program and must receive training appropriate for their assigned function.

In addition to Jordan employees, subcontractors and consultants working on hazardous waste sites will be enrolled in an equivalent Health Monitoring Program and receive health and safety indoctrination prior to commencing work on the site. Indoctrination, training and periodic followup is conducted as appropriate. Indoctrination and training includes:

- o site history;
- o inventory of site chemicals known or suspected (will be updated and reviewed at each stage of the field investigation program);
- o project organization;
- o work plan review;
- o project documentation;
- o review of site safety plan (site safety plans are updated as new information becomes available)
- o review of decontamination procedures;
- o proper use and care of personal protective equipment;
- o proper calibration and use of monitoring equipment;
- o emergency response procedures;
- o accident reporting procedures; and
- o contingency plans.

At the Imperial Oil Site, a minimum of 2 field personnel will have current First Aid and CPR Training, prior to commencing the field activities.

## 8.0 MEDICAL SURVEILLANCE PROCEDURES

### 8.1 Health Monitoring Program

All onsite Jordan personnel and laboratory staff must be enrolled in the Health Monitoring Program which is implemented through Envirologic Data, Portland, Maine. Envirologic Data consists of a team of physicians and support personnel who specialize in toxicology. This program consists of an initial medical examination to establish the employee's general health profile and provides important baseline laboratory data for later comparative study. The contents of the initial comprehensive physical examination and laboratory testing routine is given in Table 8-1. Follow-up examinations are completed for all personnel enrolled in the health monitoring program on an annual basis, or more frequently if project assignments warrant testing following specific field activities. Followup examinations are tailored to the exposures recorded by the individual. The level of potential exposure that Jordan personnel are subjected to in carrying out hazardous waste work assignments is recorded by the individual and reviewed by the site supervisor on a daily basis. A copy of the Personal Hazardous Waste Exposure Record is included in Appendix B.

### 8.2 Review of Exposure Symptoms

Symptoms of exposure to hazardous materials will be reviewed for each site in order to indicate to personnel the recognized signs of possible exposure to those materials. This information will be supplemented with a discussion of the need for objectivity in the personal health assessment to account for normal reaction to stressful situations. The Site Safety Officer will be watchful for outward evidences of changes in worker health. These outward symptoms may include skin irritations, skin discoloration, eye irritation, muscular soreness, fatigue, nervousness or irritability, intolerance to heat or cold or loss of appetite. Employees will routinely be asked to assess their general state of health during the project.

Special medical monitoring may be identified for certain sites.

TABLE 8-1

BASELINE HEALTH MONITORING PROGRAM

1. PHYSICAL EXAMINATION

- a. Medical history
- b. Medical examination
- c. Vision:
  - o near/distant
  - o color
- d. Audiometry (optional, assignment dependent)
- e. Radiology: PA/LAT
- f. Spirometry
- g. Electrocardiogram (optional, age and history dependent)

2. LABORATORY ANALYSIS

a. Hematology

- complete blood count
- red blood cell count
- hemoglobin
- platelets
- sedimentation rate
- white blood cell count
- hematocrit
- indices: MCV, MCH, MCHC

b. Blood Chemistry

- Multi-22
- calcium
- glucose
- uric acid
- total protein
- bilirubin
- SGPT
- potassium
- creatine
- globulin
- triglycerides
- gamma GT
- serum iron
- iron binding capacity
- acetyl cholinesterase
- plasma
- red blood cell
- free erythrocyte porphyrin
- inorganic phosphate
- blood urea nitrogen
- cholesterol
- albumin
- alkaline phosphatase sodium
- chloride
- CO
- CO/globulin ratio
- BUN/creating ratio
- T3 uptake
- Total T4
- Immunoprofile III

c. Urine Analysis

- pH, specific gravity, appearance, sugar, etc.

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## 9.0 WORKER SAFETY PROCEDURES

### 9.1 General

Workers will be expected to adhere to the established safety practices for their respective specialties (e.g., drilling, laboratory analysis, construction, etc.). The need to exercise caution in the performance of specific work tasks is made more acute due to weather conditions, restricted mobility and reduced peripheral vision caused by the protective gear itself, the need to maintain the integrity of the protective gear and the increased difficulty in communicating caused by respirators. Work at the site will be conducted according to established protocol and guidelines for the safety and health of all involved. Among the most important of these principles for working at a hazardous waste site are:

1. In any unknown situation, always assume the worst conditions and plan responses accordingly.
2. Employ the buddy system. Establish and maintain communication. In addition to radio communications, it is advisable to develop a set of hand signals as conditions may greatly impair verbal communications.
3. Minimize contact with excavated or contaminated materials. Plan work areas, decontamination areas and procedures to accomplish this. Do not place equipment on drums or on the ground. Do not sit on drums or other materials.
4. Employ disposable items when possible to minimize risks during decontamination and possible cross-contamination during sample-handling. This will require a common sense approach to potential risks and costs.
5. Smoking, eating, or drinking after entering the work zone and before decontamination will not be allowed. Oral ingestion of contaminants is probably the second most likely means of introduction of the toxic substances into the body (inhalation being first).
6. Avoid heat and other work stresses related to wearing the protective gear. Work breaks should be planned to prevent stress related accidents or fatigue. Appendix D provides a summary heat stress casualty prevention plan; Appendix E discusses a Cold Weather Operations plan.
7. Maintain monitoring systems. Conditions can change quickly if subsurface areas of contamination are penetrated.
8. Conflicting situations which may arise concerning safety requirements and working conditions must be addressed and resolved rapidly by the Site Safety Officer to relieve any motivations or pressures to circumvent established safety policy.
9. Unauthorized breaches of specified safety protocol will not be allowed. Personnel unwilling or unable to comply with the established procedures will be replaced. Any changes in established procedure should be



documented on the form provided. The change should have a very specific, valid basis and must be approved by the HSO.

10. Be observant of not only one's own immediate surroundings but also that of others. Everyone will be working under constraints to awareness and it is a team effort to notice and warn of impending dangerous situations. Extra precautions are necessary when working near heavy equipment while utilizing personnel protective gear. Vision, hearing and communication are restricted by the protective gear.
11. Use of contact lenses will not be allowed onsite. These prevent proper flushing should corrosive or lachrymous substances enter the eyes.
12. Sites potentially requiring Level C or B protection will require the removal of facial hair (except moustaches) to allow a proper facepiece fit.
13. Rigorous contingency planning, and dissemination of plans to all personnel minimizes the impact of rapidly changing safety protocols in response to changing site conditions.
14. Withdrawal from a hazardous situation to reassess procedures is the preferred course of action.
15. Be aware that chemical contaminants may mimic or enhance symptoms of other illnesses or intoxication. Avoid excess use of alcohol and working with an illness during field investigation assignments.
16. The site leader, the HSO and sampling personnel shall maintain records in a bound notebook recording daily activities, meetings, facts, incidents, data, etc., relating to the project. These record books will remain on the site during the full duration of the project so that replacement personnel may add information in the same record book, maintaining continuity. These notebooks and daily records will become part of the permanent project file. Examples of forms, records and logs to be used at each site are given in Appendix B and C.

## 9.2 Site Entry Procedures

Typically, as at the Imperial Oil site, Jordan teams are not the first on-site investigators. Considerable knowledge of site history and current status allows the preparation of a site safety plan with reasonable assurance that personnel are adequately protected. In the event that sufficient site information is not available to perform a summary risk assessment and assign the appropriate level of personnel protective equipment, the following procedures should be followed. It must be understood that verification of the level of contamination (even with background information) will always require some of the steps below.

1. Recognize that Jordan's presence on-site implies a perceived contamination potential by the client.

2. Assume that the site is contaminated and conduct a site safety reconnaissance.
  - o establish support zone where First Aid and emergency equipment will be kept;
  - o establish contamination reduction zone (decontamination area);
  - o at the highest level of protection practicable, survey site beginning with a perimeter survey and gradually covering all areas of proposed activity with (as appropriate):
    - HNU photoionizer;
    - radiation survey meter;
    - oxygen deficiency meter; and
    - explosive mixture meter.
  - o establish "hot zone"; and
  - o review data, assess risk and select the appropriate level of protection.
3. During drilling and sampling, an office trailer will serve as command post. The trailer will be located near the fence at the entrance to Imperial Oil. Emergency telephone numbers will be posted, and a telephone will be available.
4. Prepare site specific health and safety plan and document all data acquired.

For the Imperial Oil site, some investigation has already been conducted. Therefore, a level of protection has been chosen (see Section 5.0) and a site specific decontamination scheme (see Section 11.0) has been devised. Unauthorized persons entering the site will be warned to leave. If such persons refuse, the proper authorities will be contacted.

## 10.0 SITE SPECIFIC MONITORING

During field activities several monitoring instruments will be used on the Imperial Oil site for the detection of air quality problems. All field personnel will be trained to use the monitoring equipment. Minimum onsite equipment will include:

- o Photoionization (PI) meter;
- o Combustible gas indicator (explosimeter);
- o Oxygen meter or oxygen deficiency alarm; and
- o Radiation survey meter or radiation alert.

During sampling activities, the air monitoring equipment described above will be used. During groundwater sampling the PI meter will be used to monitor the well as it is opened. During soil boring drilling, auger cuttings and split spoons will be monitored. Conditions will be monitored continuously and recorded at each sample interval, at a minimum. For all media, samples will be monitored and background levels will be determined. If the PI meter shows that the breathing zone ambient air is elevated higher than 5 ppm above background, the situation will be reassessed by the HSO.

All sampling equipment will be calibrated on a daily basis. Specific procedures for using, documenting use and calibrating air monitoring equipment are discussed in the Quality Assurance Project Management Plan.

Additional equipment may be specified and obtained as field conditions dictate. An equipment list and field safety gear requirements are specified in the site safety summary (Appendix A).

## 11.0 DECONTAMINATION

### 11.1 Personnel Decontamination Procedure

Decontamination procedures are carried out by all personnel leaving hazardous waste sites. Under no circumstances (except emergency evacuation) will personnel be allowed to leave the site prior to decontamination. Personnel helping in the decontamination area will be dressed in an appropriate level of protection. A generalized procedure for removal of protective clothing is as follows:

- o Drop tools, monitors, samples and trash at designated drop stations. These will be plastic containers or drop sheets.
- o Wash boots down with clear water in designated wash pit area.
- o Rinse boots with acetone.
- o Rinse boots with distilled water.
- o Remove tape from boots and remove boots. Discard tape in disposal container.
- o Remove outer gloves and place in container.
- o Remove hard hat and respirator and place or hang in the designated area.
- o Remove outer garment and discard in container.
- o Remove inner gloves and discard in container.
- o If the site required utilization of a decontamination trailer, all personnel would also shower before leaving the site at the end of the work day.

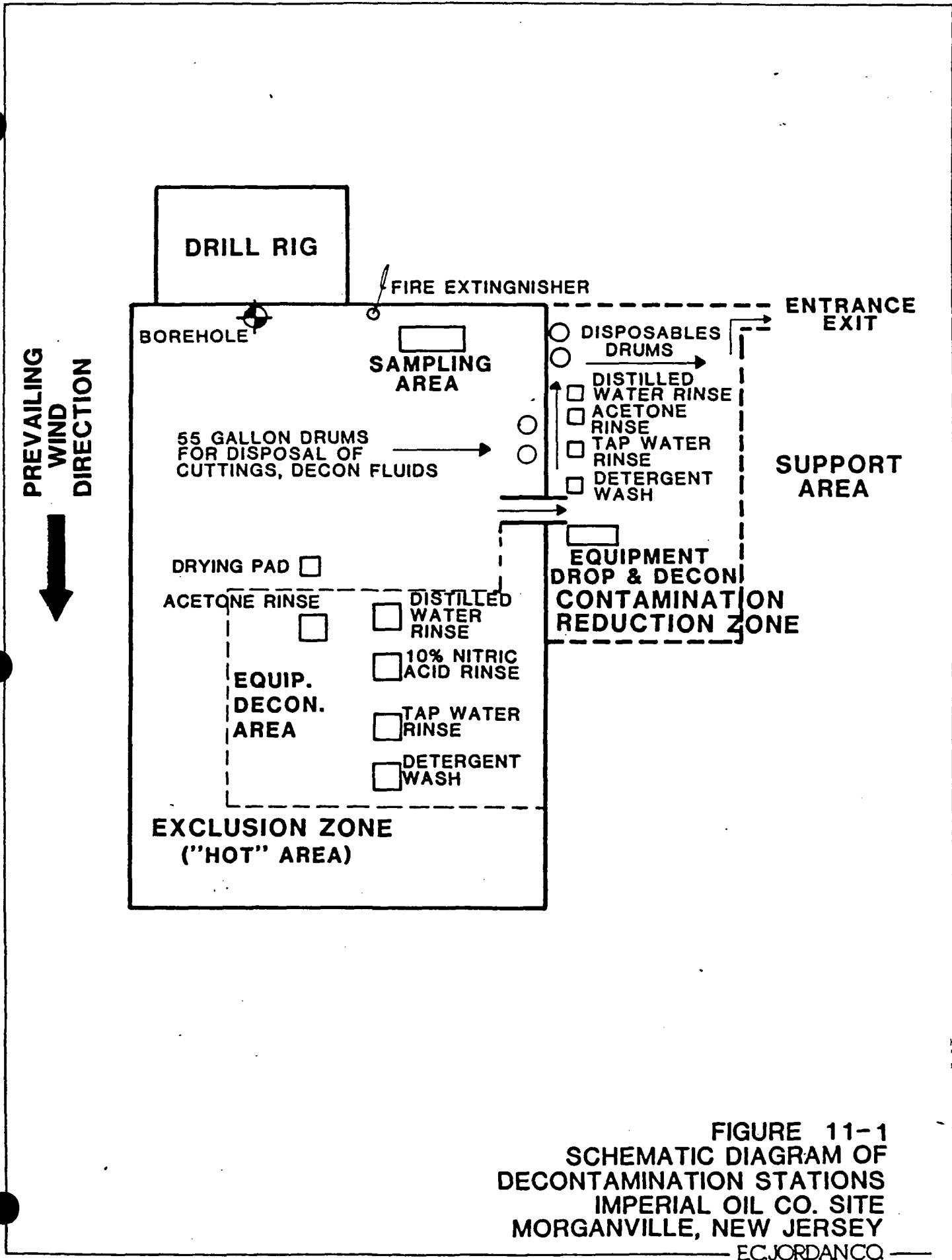
Note: Disposable items (Tyvek coveralls, inner gloves, and latex overboots) will be changed on a daily basis unless there is reason for changing sooner. Dual respirator canisters will be changed daily unless more frequent changes are deemed appropriate by site surveillance data or personnel assessment.

Pressurized sprayers or other designated equipment will be available in the decontamination area for wash down and cleaning of personnel, samples and equipment.

A schematic of a typical decontamination area is shown in Figure 11-1.

### 11.2 Equipment Decontamination

Equipment to be decontaminated during the project may include: (1) drill rig; (2) tools; (3) monitoring equipment; (4) respirators; (5) sample containers; (6) truck or trailer and (7) laboratory equipment.



**FIGURE 11-1**  
**SCHEMATIC DIAGRAM OF**  
**DECONTAMINATION STATIONS**  
**IMPERIAL OIL CO. SITE**  
**MORGANVILLE, NEW JERSEY**

ECJORDANCO

All decontamination will be done by personnel in protective gear appropriate for the level of decontamination, determined by the Site Safety Officer. The decontamination work tasks will be split or rotated among support and work crews. Decontamination procedures within the trailer (if used) should take place only after other personnel have cleared the "hot area", moved to the clean area and the door between the two areas closed.

During the drilling and sampling, sampling equipment will be decontaminated according to the following procedures.

1. Wash with non-phosphate detergent
2. Rinse with tap water
3. Rinse with 10% nitric acid solution\*
4. Rinse with distilled water\*
5. Rinse with acetone (pesticide grade)\*\*.
6. Air dry\*\*
7. Rinse with distilled water

\* Only if sample is to be analyzed for metals

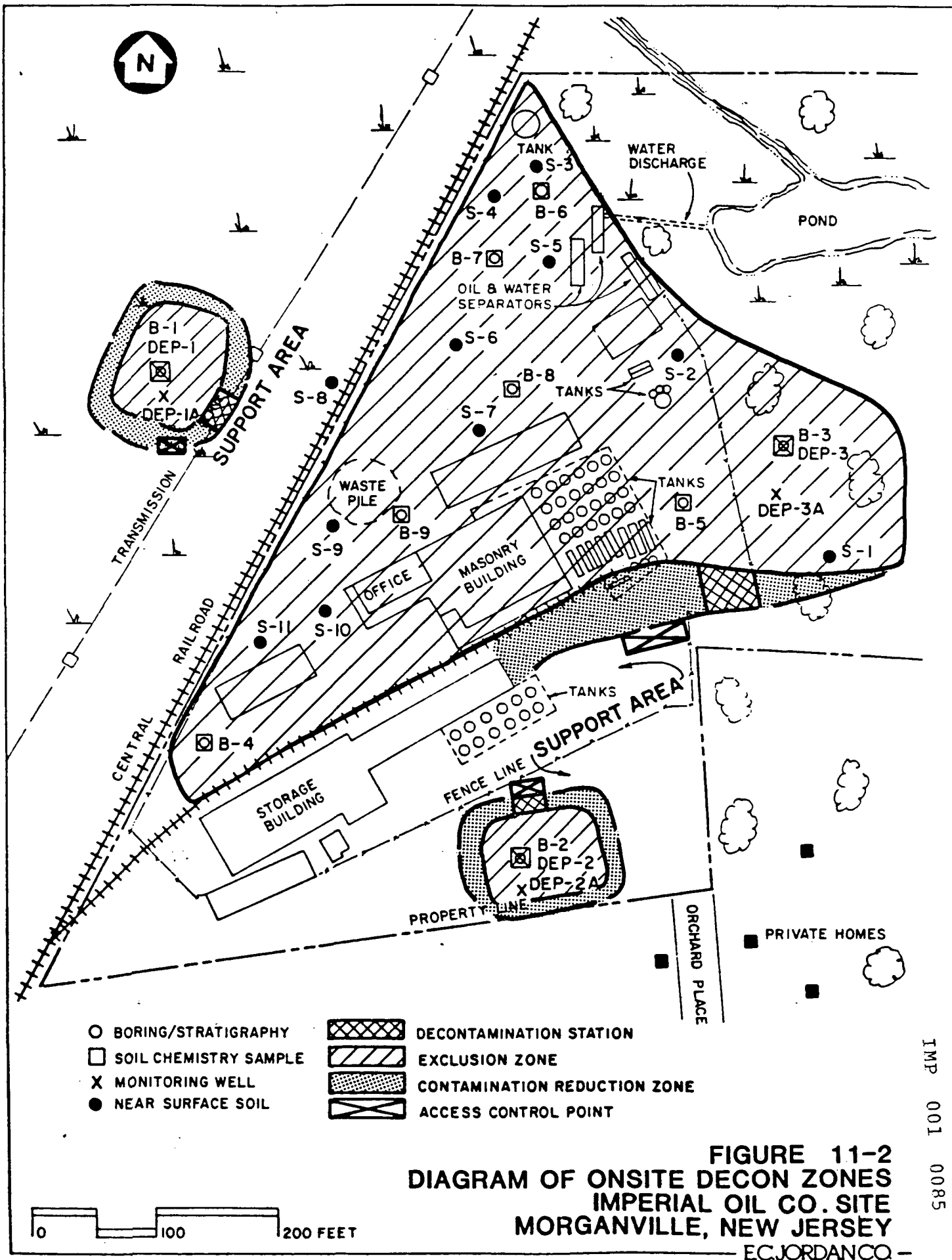
\*\* Only if sample is to be analyzed for organics

A schematic drawing of the decontamination setup at the drilling site is provided in Figure 11-1. Specific diagrams of the proposed on-site and off-site decontamination zones are shown in Figures 11-2 and 11-3. This is an active site, employing 30 people who may be working within the exclusion zone. They will be advised of existing site conditions.

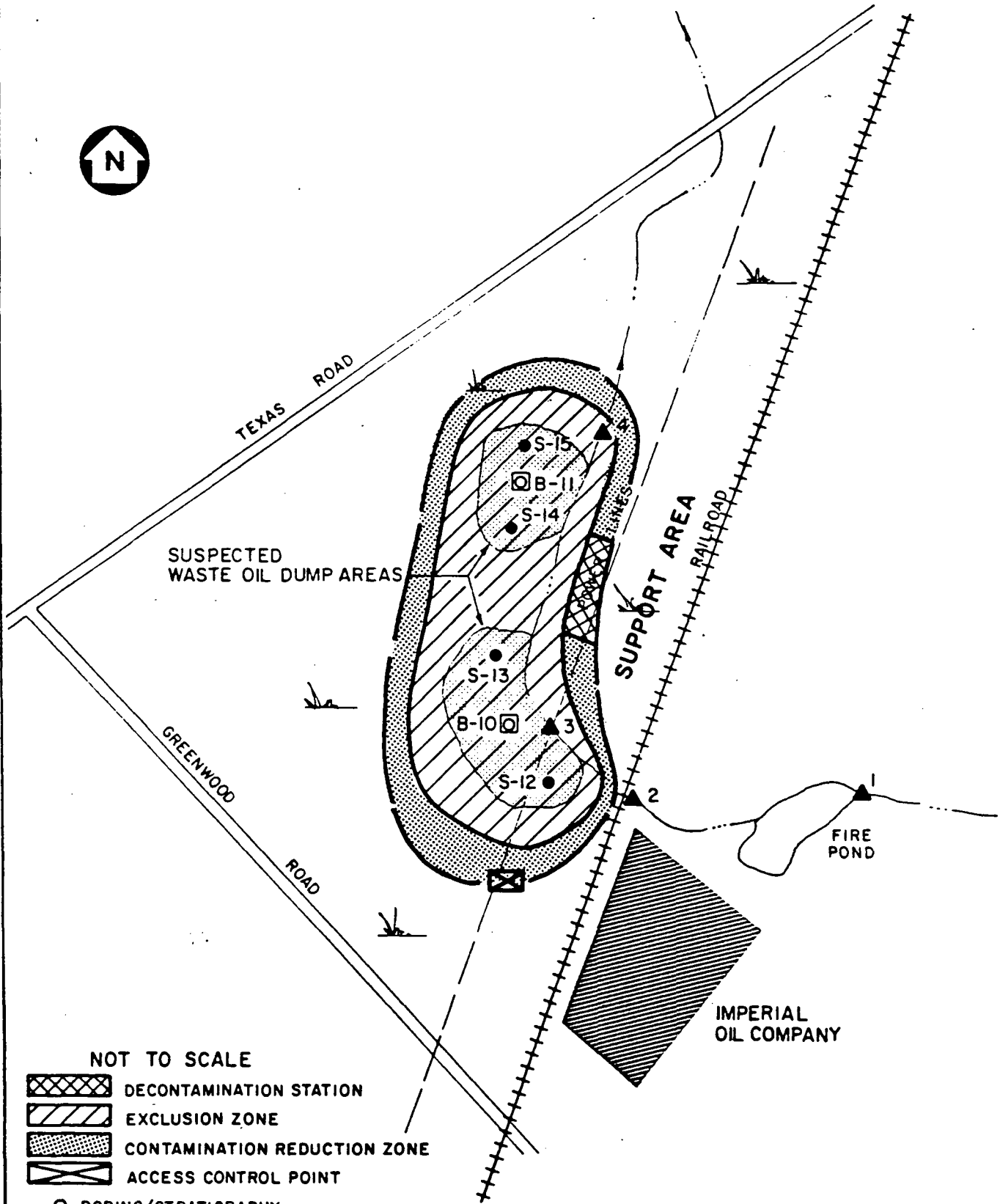
11.2.1 Drilling Rig and Tools. It is anticipated that drilling tools and possibly the drill rig will be contaminated during test pit/borehole activities. They will be cleaned with high pressure water or portable high pressure steam followed by soap and water wash and rinse. Loose material will be removed by brush. The person performing this activity will usually be at Level C protection.









11.2.2 Sampling Containers. Exterior surfaces of sample bottles will be decontaminated prior to packing for transportation to the analytical laboratory. Sample containers will be wiped clean at the sample site, but it will be difficult to keep the sample containers completely clean. The samples will be taken to the decontamination area. Here they will be further cleaned as necessary and transferred to a clean carrier and the sample identities noted and checked off against the chain-of-custody record. The samples, now in a clean carrier, will be stored in a secure area prior to shipment.

11.2.3 Monitoring Equipment. Monitoring equipment will be protected as much as possible from contamination by draping, masking or otherwise covering as much of the instruments as possible with plastic without hindering the operation of the unit. The HNU meter, for example, can be placed in a clear plastic bag which allows reading of the scale and operation of the knobs. The HNU sensor can be partially wrapped, keeping the sensor tip and discharge port clear.



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- NOT TO SCALE
-  DECONTAMINATION STATION
  -  EXCLUSION ZONE
  -  CONTAMINATION REDUCTION ZONE
  -  ACCESS CONTROL POINT
  -  BORING/STRATIGRAPHY
  -  SOIL CHEMISTRY
  -  NEAR SURFACE SOIL
  -  SEDIMENT & SURFACE WATER

**FIGURE 11-3**  
**DIAGRAM OF OFFSITE DECON ZONES**  
**IMPERIAL OIL CO. SITE**  
**MORGANVILLE, NEW JERSEY**  
EC.JORDANCO

IMP 001 0086



The contaminated equipment will be taken from the drop area and the protective coverings removed and disposed of in the appropriate containers. Any dirt or obvious contamination will be brushed or wiped with a disposable paper wipe. The units can then be taken inside in a clean plastic tub, wiped off with damp disposable wipes and dried. The units will be checked, standardized and recharged as necessary for the next day's operation. They will then be prepared with new protective coverings.

11.2.4 Respirators. Respirators will be decontaminated daily. Taken from the drop area, the masks will be disassembled, the cartridges set aside and the rest placed in a cleansing solution. (Parts will be precoded, e.g., #1 on all parts of mask #1). After an appropriate time within the solution, the parts will be removed and rinsed off with tap water. The old cartridges will be marked so as to indicate length of usage (if means to evaluate the cartridges' remaining utility are available) or will be discarded into the contaminated trash container for disposal. In the morning the masks will be re-assembled and new cartridges installed if appropriate. Personnel will inspect their own masks to be sure of proper readjustment of straps for proper fit (see also Appendix G).

11.2.5 Laboratory Equipment. Sample handling areas and equipment will be cleaned/wiped down daily. Disposable wipes will be used and discarded into a plastic bag. These will subsequently be taken to and placed in the disposal drum for final disposition. For final cleanup, all equipment will be disassembled and decontaminated. Any equipment which cannot be satisfactorily decontaminated will be disposed of (e.g., glassware, covers for surfaces) as previously indicated.

## 12.0 EMERGENCY SITE PLAN

### 12.1 Emergency Medical Services

During the development of this HASP, health facilities in the area of the Imperial Oil site were evaluated to determine their capabilities in relation to the needs of onsite project staff. The closest hospital that meets these needs is the Freehold Area Hospital in Freehold, NJ. Prior to the start up of site activities, the hospital will be briefed on site personnel and activities. In addition, the following safety equipment and personnel will be available on-site:

#### o On-site First Aid

- An industrial first-aid kit will be provided at the work site and contents of the kit will be checked weekly and restocked as necessary.
- All persons on-site will be qualified to perform first aid. These persons will have earned a certificate in first-aid training from the American Red Cross or will have received equivalent training. First aides will receive regular review training from the American Red Cross or an equivalent session.
- An eye-wash station will be provided at the work site, as well as flushing water for decontamination of boots, gloves, clothing, tools, etc.

#### o Transportation to Emergency Treatment:

- A vehicle will be available at all times for use in transporting personnel to the hospital (in the event an ambulance is unnecessary or unavailable).
- Alternate transportation routes to area hospitals will be established prior to on-site activity.

### 12.2 Contingency Planning

Prior to commencement of on-site activities, field personnel will review safety considerations with the HSO. The HSO is responsible for adherence to the designated safety precautions and assumes the role of onsite coordinator in an emergency response situation.

All on-site personnel will be familiarized with both the primary and secondary route to the hospital (see Appendix A) as well as the location of the nearest working telephone or radio communication device. Each will receive a list of emergency phone numbers as shown in Appendix A.

As discussed above, the local hospital and emergency response team will be advised in advance by the HSO of the work to be performed. The hospital will

also be briefed on the availability of personnel health data and technical support through Enviologic Data.

Emergency communication will be required to ensure positive pre-planned notification of emergency authorities in the event of episodes requiring initiation of contingency plans.

- o The communication will be coordinated with local agencies, fire department, police, ambulance and hospital emergency room.
- o Two-way radio communication may need to be established in the field, and a site alarm capable of warning site personnel and summoning assistance will be maintained (air horns).
- o Emergency evacuation for residents of nearby homes is an unlikely event, but a person will be designated onsite to be responsible for implementing the contingency plan. The person will be made aware of the total number of households within a radius of 2,000 feet. Appendix A will provide the emergency contacts that will be required in the event that evacuation is judged to be a possibility for a particular site.
- o Prior to any activity, personnel will investigate possible routes of evacuation.

A copy of an accident report form is provided in Appendix C. It should be filled out and provided to the HSO and a copy filed with the individual's supervisor.

### 12.3 Potential Hazards

The most common hazards associated with hazardous waste site investigation include: 1) accidents; 2) contact or ingestion of hazardous materials; 3) explosion; and 4) fire.

12.3.1 Accidents. Accidents must be handled on a case by case basis. Minor cuts, bruises, muscle pulls, etc., will still allow the injured person to undergo reasonably normal decontamination procedures prior to receiving direct first aid. More serious injuries may not permit complete decontamination procedures to be undertaken, particularly if the nature of the injury is such that the victim should not be moved. The nature and degree of surface contamination at a site is generally low enough that emergency vehicles could reach the victim onsite without undue hazard. However, in the event that access onsite is limited, accident victims may be transported to a point accessible by an ambulance by Jordan personnel trained for this response.

12.3.2 Contact and/or Ingestion of Hazardous Materials. Properly prescribed and maintained protective clothing and adherence to established safety procedures are designed to minimize this hazard. However, it is still a possibility that contact or ingestion of materials may occur. One possibility for exposure is the puncture of a buried drum of liquid during

Principal Disposal Method (type and location): Wastes were suspected to have been disposed of in a lagoon and filter clay pile. Flooding of the facility may have caused widespread distribution of contaminants across the facility.

Unusual Features (dike integrity, power lines, terrain, etc.) Power lines overhead in off-site areas and berms surrounding site

Status: (active, inactive, unknown) Active

History: (Worker or non-worker injury; complaints from public; previous agency action): During RAMP investigation, contaminants in site media were noted.

#### C. HAZARD EVALUATION

Volatile and semivolatile organics, PCBs and heavy metals have been detected at the site. Some of these compounds are toxic or carcinogenic when ingested, inhaled or absorbed by the skin; several are flammable or may produce toxic fumes when heated. Both dermal and respiratory protection may be needed.

D. SITE SAFETY PROCEDURES

Map/Sketch Attached? Yes Site Secured? Partially  
Perimeter Identified? Yes Zone(s) of Contamination Identified? Partially  
Perimeter Establishment: Specific zones will be marked with flagging  
Some off-site areas of suspected contamination are not secured.

PERSONNEL PROTECTION

<u>TASK</u>	<u>MINIMUM LEVEL OF PROTECTION</u>
<u>Drill borings and installation of</u> <u>monitoring well</u>	<u>Level D/Level C (Dermal)</u>
<u>Soil test borings and surface soil</u> <u>sampling</u>	<u>Level C</u>
<u>Waste pile sampling</u>	<u>Level C</u>
<u>Surface water/sediment sampling</u>	<u>Level D/Level C (Dermal)</u>
<u>Monitoring well sampling</u>	<u>Level D/Level C (Dermal)</u>
<u>Private well sampling/Surveying</u>	<u>Level D</u>
<u>Drill Cuttings/Well Development</u> <u>water sampling</u>	<u>Level C</u>

An equipment list and field safety gear requirements are specified in the personnel safety equipment checklist (Table A-1).

Modifications: \_\_\_\_\_

SITE MONITORING INSTRUMENTATION: Photoionization Meter, Combustible Gas  
Indicator, Oxygen Meter, Radiation Survey Meter.

TABLE A-1  
PERSONNEL SAFETY EQUIPMENT CHECK LIST

Estimated Quantity Required	Protective and Safety Equipment	Model or Material
2	SCBA Spare Cylinders	MSA 401
4	Escape Mask	ELSA
4	Full Face	
120	Cartridge	
4	Hardhat w/ Face Shield	
4	*Safety Glasses	
20	Ear Protection	
180	*Gloves, inner	surgical
60	*Gloves, outer:	nitrile
	Chem Resist Coveralls	
120	Disposable Coveralls	Coated Tyvek
	Splash Aprons	Vinyl
4	*Boots: Safety Boots	
	Fully Encapsulated Suits	
4	*Dosimeters	TLD
	First Aid Equipment	
2	*Utility First Aid Kit	
	Industrial First Aid Kit	
2	*Eye Wash Station	Portable
2	*Fire Extinguisher	CO <sub>2</sub>
	Safety Harness	
	Emergency Tools	
	Other	
10	Duct Tape (rolls)	

\* - Mandatory

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DECONTAMINATION PROCEDURES:

Personnel: 1. wash boots/booties in detergent; 2. rinse with tap water;  
3. rinse with acetone; 4. rinse with distilled water; 5. discard outer  
disposable gloves/booties in plastic garbage bag; 6. remove and discard  
tyveks; 7. remove and discard inner gloves.

Equipment: 1. wash with non-phosphate detergent; 2. rinse with tap water;  
3. rinse with deionized/distilled water; 4. rinse with 10% nitric acid  
solution; 5. rinse with distilled water; 6. rinse with (pesticide grade)  
acetone; 7. air dry; 8. rinse with distilled water; 9. air or wipe dry  
with clean paper towel or wipe.

Decontamination equipment and materials are listed in Table A-2.

MOBILIZATION AND SITE ENTRY: Personnel shall enter the exclusion zone through  
the marked decontamination corridor.

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TABLE A-2

## DECONTAMINATION EQUIPMENT/MATERIALS

Quantity	Type	Remarks
10	wash tubs	
	high pressure water sprayer	
	cold	
	hot	
1	steam sprayer	
10	scrub brushes	
	containers	
2	contaminated liquids	55 gallon drums
4	contaminated disposables	
10 lbs.	detergent	non-phosphate
10 gallons	acetone	
25 gallons	deionized water/distilled	
10 boxes	disposable wipes	
1 roll	plastic wrap	
10 boxes	Ziploc bags	

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TEAM ORGANIZATION:

<u>Team Member</u>	<u>Responsibility</u>
<u>Peter Baker</u>	<u>Field Coordinator</u>
<u>Ian Broadwater</u>	<u>Drilling Monitor</u>
<u>Robert Burger</u>	<u>Groundwater Sampler</u>
<u>David Dionne</u>	<u>Groundwater Sampler</u>
<u>Charles Goodwin</u>	<u>Groundwater Sampler</u>
<u>Linda Healey</u>	<u>Drilling Monitor/HSO</u>
<u>Barbara Ikalainen</u>	<u>Project Manager</u>
<u>Ronald Lewis</u>	<u>Technical Director</u>
<u>Tom Longley</u>	<u>Drilling Monitor</u>
<u>Jay McMullen</u>	<u>Groundwater Sampler</u>
<u>Denley Poor</u>	<u>Drilling Monitor</u>
<u>Sharon Secovich</u>	<u>Groundwater Sampler</u>
<u>Scott Wibby</u>	<u>Drilling Monitor</u>

WORK LIMITATIONS (Time of day, etc.): Daylight hours and as weather permits.

PERSONNEL PROTECTIVE GEAR, DECONTAMINATION AND OTHER MATERIAL DISPOSAL: \_\_\_\_\_

Disposables placed in plastic garbage bags which in turn are placed in  
55 gallon drums. Decontamination fluids emptied into 55-gallon drums and  
closed. Drums will be marked for identification.

E. EMERGENCY INFORMATION

LOCAL RESOURCES

Ambulance 201-536-0100 First Aid Squad/Morganville, NJ

Hospital Emergency Room Freehold Area Hospital 201-431-2000

Poison Control Center Hotline 1 (800) 962-1253

Police 201-536-0100 Marlborough Police Department

Fire Department 201-591-1411 Morganville, NJ

Airport Newark Int'l Airport (201) 961-2000 (main number); Marlboro Airport, Rte. 79 (201) 591-1591 (small aircraft only)

Explosives Unit N/A

EPA Contact Alberto Barrera (212) 264-1217

SITE RESOURCES

Water Supply Provided by Imperial Oil

Telephone Imperial Oil Facility/Public Phone at Jct. of Tennant Road

Radio \_\_\_\_\_

Other \_\_\_\_\_

EMERGENCY CONTACTS

1. Dr. Frank Lawrence . . . . . (207) 871-2617
2. Bruce Campbell, RPh. . . . . (207) 871-2449
3. Maine Poison Control Center. . . . . (207) 871-2950
4. E.C. Jordan (Maine). . . . . (207) 775-5401
5. E.C. Jordan (Florida). . . . . (904) 656-1293
6. E.C. Jordan (Detroit). . . . . (313) 569-3955
7. Envirollogic Data . . . . . (207) 773-3020
8. Bob Soboleski, Site Manager (NJDEP). . . . . (609) 984-2990
9. USEPA Emergency Response . . . . . (800) 424-8802
10. CMA Chemical Referral Center . . . . . (800) 262-8200
11. L. Healey (HSO). . . . . (207) 775-5401
12. Lester Jargowsky, Health Officer . . . . . (201) 431-7465
13. Saul Hornick, Mayor (Municipal Offices). . . . . (201) 536-0200
14. 24-Hour Hotline. . . . . (609) 292-7172
15. NJDEP Emergency Response . . . . . (201) 426-0796
16. Imperial Oil Contact (George Kulick) . . . . . (201) 591-9400

F. EMERGENCY ROUTES

(Give road or other directions; attach map)

HOSPITAL: PRIMARY ROUTE:

From off-site go left on Greenwood Rd. to Tennent Rd. (Route 3). Go  
left on Tennent Rd. to the intersection Route 79, go right onto  
Route 79 south toward Freehold. Approximately 7 miles to Freehold.  
Proceed on Route 79 south to jct Route 537 (in Freehold). Turn  
right on Route 537, approximately 4 miles to Freehold Area Hospital.  
Hospital on right. From on-site turn left onto Tennent Rd. from  
Orchard Place, and continue with above directions. Figure A-1  
indicates primary and alternate routes to the hospital.

HOSPITAL: ALTERNATE ROUTE:

From off-site go left on Greenwood Rd. to Tennent Rd. (Route 3). Go  
right on Tennent Rd. to Gordan's Corner. Approximately 7.5 miles  
to Gordan's Corner. Get on Route 9 south toward Freehold.  
Approximately 4.5 miles to intersection Route 537. Go right on 537  
approximately 3 miles to Freehold Area Hospital. Hospital on right.  
From on-site turn right onto Tennent Rd. from Orchard Place, and  
continue with above directions.

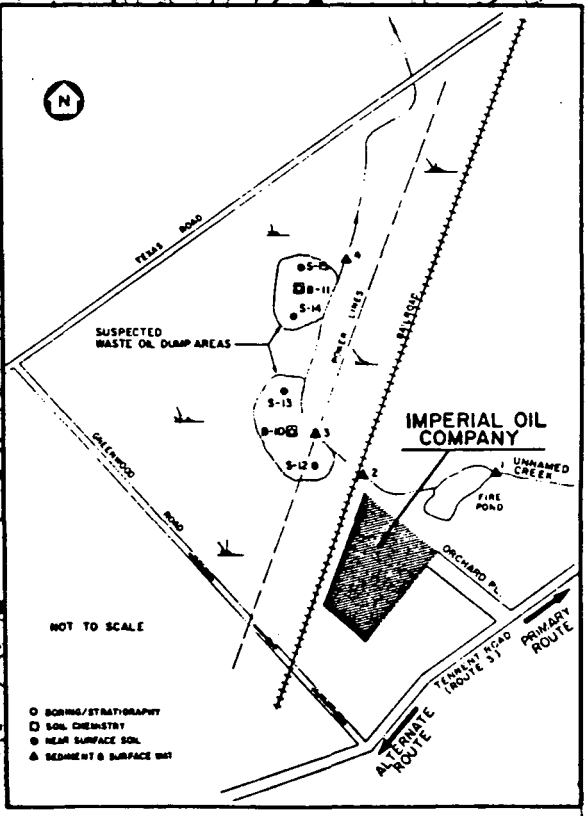
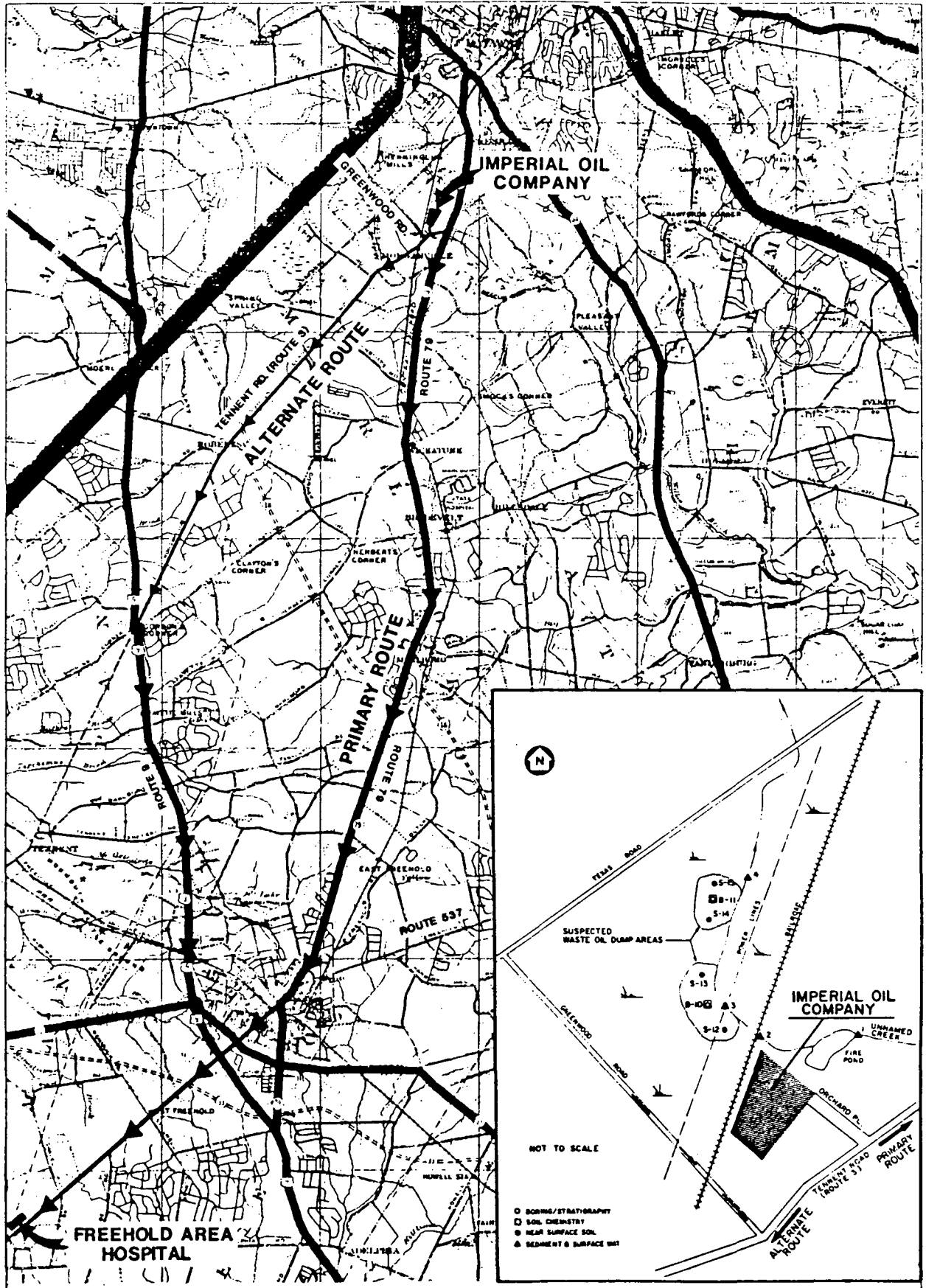


FIGURE A-1  
 HOSPITAL ROUTE  
 IMPERIAL OIL CO. SITE  
 MORGANVILLE, NEW JERSEY  
 E.C. JORDAN CO.

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APPENDIX B  
PERSONAL FORMS AND LOGS

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DAILY SAFETY LOG

PROJECT NAME: \_\_\_\_\_ DATE: \_\_\_\_\_

PROJECT NUMBER: \_\_\_\_\_ DAY NO: \_\_\_\_\_

E.C. JORDAN WORK PARTY: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

SUBCONTRACTOR ( ): \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

VISITORS: \_\_\_\_\_

\_\_\_\_\_

WORK SITE LOCATION: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

SUMMARY OF CONDITIONS ENCOUNTERED: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

FIRST AID ADMINISTERED? \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

INFRACTIONS OBSERVED: \_\_\_\_\_

\_\_\_\_\_

BY: \_\_\_\_\_

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HASP & HEALTH MONITORING PLAN ACKNOWLEDGEMENT

I have read and understood the Imperial Oil Co. Health and Safety Plan (HASP), and am familiar with the nature of the site and the safety provision to be followed on-site. I am currently enrolled in a health monitoring program comparable to E.C. Jordan's as described in the HASP.

Signed \_\_\_\_\_  
Date \_\_\_\_\_

# PERSONAL HAZARDOUS WASTE EXPOSURE RECORD

NAME: \_\_\_\_\_

SITE: \_\_\_\_\_

DATE: \_\_\_\_\_

NUMBER OF HOURS ON SITE: \_\_\_\_\_

CONDITION OF SITE: \_\_\_\_\_

## AMBIENT AIR/SOIL/WATER INDICATORS:

LABORATORY: G.C. \_\_\_\_\_

ON-SITE: G.C. \_\_\_\_\_

P.I. METER \_\_\_\_\_

P.I. METER \_\_\_\_\_

OTHER \_\_\_\_\_

OTHER \_\_\_\_\_

TYPE OF EXPOSURE (i.e. inhalation, soil/water contact): \_\_\_\_\_

OPERATION PERFORMED (i.e. test pit inspection, sampling, drilling): \_\_\_\_\_

CHEMICALS BURIED OR KNOWN PRESENT: \_\_\_\_\_

## PROTECTIVE EQUIPMENT WORN:

SAFETY SHOES (STEEL TOE & SHANK)

INNER LAB GLOVES

CHEMICAL RESISTANT BOOTS, TYPE: \_\_\_\_\_

OUTER CHEMICAL RESISTANT GLOVES

HALF-FACE RESPIRATOR

TYPE: \_\_\_\_\_

TYPE OF CARTRIDGE: \_\_\_\_\_

COVERALLS

FULL-FACE RESPIRATOR

TYPE: \_\_\_\_\_

TYPE OF CARTRIDGE: \_\_\_\_\_

\_\_\_\_\_

## DECONTAMINATION MEASURES TAKEN:

CHANGE OF CLOTHES

\_\_\_\_\_

SHOWER

\_\_\_\_\_

CHANGE OF PROTECTIVE EQUIPMENT

\_\_\_\_\_

PERSONAL PROTECTIVE DECONTAMINATION PROCEDURES: \_\_\_\_\_

UNUSUAL SITE CONDITIONS/OCCURANCES: \_\_\_\_\_

OBSERVED HEALTH EFFECTS: \_\_\_\_\_

NOTES: \_\_\_\_\_

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APPENDIX C  
MISCELLANEOUS REPORTS

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SITE SAFETY FOLLOW-UP REPORT

(To be completed for each field change in plan.)

Was the Safety Plan followed as presented? \_\_\_yes \_\_\_no

DESCRIBE IN DETAIL ANY CHANGES TO THE SAFETY PLAN:

REASON FOR CHANGES:

APPROVED BY SITE MANAGER:  
SITE SAFETY OFFICER:

DATE:  
DATE:

EVALUATION OF SITE SAFETY PLAN

Was the Safety Plan adequate? \_\_\_yes \_\_\_no

WHAT CHANGES WOULD YOU RECOMMEND?

ACCIDENT REPORT

Report No.:

SITE:  
LOCATION:

PROJECT NO.:

DATE OF REPORT:  
NAME AND ADDRESS OF INJURED:

PREPARERS NAME:  
SSN: AGE:  
SEX:

YEARS OF SERVICES: TIME ON PRESENT JOB: TITLE/CLASSIFICATION:  
DIVISION/DEPARTMENT: DATE OF ACCIDENT: TIME:

ACCIDENT CATEGORY:  Motor Vehicle  Property Damage  Fire  
 Chemical Exposure  Near Miss  Other

SEVERITY OF INJURY OR ILLNESS:  Non-disabling  Disabling  
 Medical Treatment  Fatality

AMOUNT OF DAMAGE: \$ PROPERTY DAMAGED:

ESTIMATED NUMBER OF DAYS AWAY FROM JOB:  
NATURE OF INJURY OR ILLNESS:

CLASSIFICATION OF INJURY

Fractures  Heat Burns  Cold Exposure  
 Dislocations  Chemical Burns  Frostbite  
 Sprains  Radiation Burns  Heat Stroke  
 Abrasions  Bruises  Heat Exhaustion  
 Lacerations  Blisters  Concussion  
 Punctures  Toxic Respiratory  Faint/Dizziness  
 Bites  Exposure  Toxic Respiratory  
 Respiratory Allergy  Toxic Ingestion  Dermal Allergy  
 Other (explain) \_\_\_\_\_

PART OF BODY AFFECTED:  
DEGREE OF DISABILITY:  
DATE MEDICAL CARE WAS RECEIVED:  
WHERE MEDICAL CARE WAS RECEIVED:  
ADDRESS (if offsite):  
FOLLOW-UP EXAMINATION REQUIRED:

EMERGENCY SERVICE:

ACCIDENT LOCATION

Causative agent most directly related to accident (object, substance, material, machinery, equipment, conditions):

WAS WEATHER A FACTOR?

UNSAFE MECHANICAL/PHYSICAL/ENVIRONMENTAL CONDITION AT TIME OF ACCIDENT (be specific):

UNSAFE ACT BY INJURED AND/OR OTHERS CONTRIBUTING TO THE ACCIDENT (be specific, must be answered):

PERSONAL FACTORS (improper attitude, lack of knowledge or skill, slow reaction, fatigue):

LEVEL OF PERSONAL PROTECTION EQUIPMENT REQUIRED IN SITE SAFETY PLAN:

MODIFICATIONS

WAS INJURED USING REQUIRED EQUIPMENT?

IF NOT, HOW DID ACTUAL EQUIPMENT USE DIFFER FROM PLAN?

WHAT CAN BE DONE TO PREVENT A RECURRENCE OF THIS TYPE OF ACCIDENT (modification of machine; mechanical guards; correct environment; training):

DETAILED NARRATIVE DESCRIPTION (how did accident occur, why; objects, equipment, tools used, circumstance assigned duties. Be specific.):

(Use back of sheet as required)

WITNESSES TO ACCIDENT

Signature of Preparer:  
Signature of Site Manager:

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APPENDIX D  
HEAT STRESS CASUALTY PREVENTION PLAN

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## HEAT STRESS CASUALTY PREVENTION PLAN

Due to the increase in ambient air temperatures and the effects of protective outer wear decreasing body ventilation, there exists an increase in the potential for injury, specifically, heat casualties. Site personnel will be instructed in the identification of a heat stress victim, the first-aid treatment procedures for the victim and the prevention of heat stress casualties.

### A. IDENTIFICATION AND TREATMENT

#### 1. Heat Exhaustion

- a) Symptoms: Usually begins with muscular weakness, dizziness, nausea, and a staggering gait. Vomiting is frequent. The bowels may move involuntarily. The victim is very pale, his skin is clammy, and he may perspire profusely. The pulse is weak and fast, breathing is shallow. The victim may faint unless he lies down. This may pass, but sometimes it persists and, while heat exhaustion is generally not considered life threatening, death could occur.
- b) First Aid: Immediately remove the victim to the Decontamination Reduction Zone in a shady or cool area with good air circulation. Remove all protective outer wear. Call a physician. Treat the victim for shock. (Make the victim lie down, raise feet 6-12 inches, maintain body temperature but loosen all clothing.) If the victim is conscious, it may be helpful to give sips of water. Transport victim to a medical facility.

#### 2. Heat Stroke

- a) Symptoms: This is the most serious of heat casualties due to the fact that the body excessively overheats. Body temperatures often are between 107°- 110°F. The victim will have a red face and will not be sweating. First there is often pain in the head, dizziness, nausea, oppression, and a dryness of the skin and mouth. Unconsciousness follows quickly and death is imminent if exposure continues. The attack will usually occur suddenly. Heat stroke is always serious.
- b) First Aid: Immediately evacuate the victim to a cool and shady area in the Decontamination Reduction Zone. Remove all protective outer wear and all personal clothing. Lay the victim on his back with the head and shoulders slightly elevated. It is imperative that the body temperature be lowered immediately. This can be accomplished by applying cold wet towels, ice bags, etc., to the head and groin. Sponge off the bare skin with cool water or rubbing alcohol, if available, or even place in a tub of cool water. The main objective is to cool without chilling. Give no stimulants. Transport the victim to a medical facility as soon as possible.

B. PREVENTION OF HEAT STRESS

- 1) One of the major causes of heat casualties is the depletion of body fluids. Fluids should be maintained in the support zone. Personnel should replace water and salts loss from sweating. Salts can be replaced by either a 0.1% salt solution, more heavily salted foods, or commercial mixes such as Gatorade. The commercial mixes are advised for personnel on low sodium diets.
- 2) A work schedule will be established during warm weather so that the majority of the work day will be during the morning hours of the day before ambient air temperature levels reach their highs.
- 3) A work/rest schedule will be implemented for personnel required to wear Level B or C protection (i.e. impervious outer garment). A sufficient period will be allowed for personnel to "cool down". This may require shifts of workers during operations in addition to the breaks provided by required air tank changes (Level B). Maximum time between breaks at Level B or C shall be two hours regardless of temperature. At elevated temperatures, breaks should be scheduled as described below.

<u>Ambient Temperatures</u>	<u>Maximum Time Between Cooldown Breaks</u>
Above 90°F	¼ hr.
85°-90°F	½ hr.
80°-85°F	1 hr
70°-80°F	1½ hr.

- 4) Periodic breaks for "cooldown" and liquid replenishment should also be scheduled while wearing any chemical resistant outer wear.

C. HEAT STRESS MONITORING

For monitoring the body's recuperative ability to excess heat, one or more of the following techniques should be used as a screening mechanism. Monitoring of personnel wearing impervious clothing should commence when the ambient temperature 70°F or above. Frequency of monitoring should increase as the ambient temperature increases or as slow recovery rates are indicated. When temperatures exceed 85°F, workers should be monitored for heat stress after every work period. The following are important considerations:

1. Heart rate (HR) should be measured by the radial pulse for 30 seconds as early as possible in the resting period. The HR at the beginning of the rest period should not exceed 110 beats/minute. If the HR is higher, the next work period should be shortened by 10 minutes (or 33 percent), while the length of the rest period stays the same. If the pulse rate is 100 beats/minute at the beginning of the next rest period, the following work cycle should be shortened by 33 percent.

2. Body temperature should be measured orally with a clinical thermometer as early as possible in the resting period. Oral temperature (OT) at the beginning of the rest period should not exceed 99°F. If it does, the next work period should be shortened by 10 minutes (or 33 percent), while the length of the rest period stays the same. However, if the OT exceeds 99.7°F at the beginning of the next period, the following work cycle should be further shortened by 33 percent. OT should be measured again at the end of the rest period to make sure that it has dropped below 99°F.
3. Good hygienic standards must be maintained by frequent change of clothing and daily showering. Clothing should be permitted to dry during rest periods. Persons who notice skin problems should immediately consult medical personnel.



APPENDIX E  
COLD WEATHER OPERATIONS

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## COLD WEATHER OPERATIONS

### I. INTRODUCTION

Cold weather often causes problems for personnel working outside. There are several types of cold weather injuries which can occur, even at temperatures above freezing. As temperatures drop below freezing, the potential for these injuries increases dramatically, as does the potential for equipment failure. Because of the considerable danger to personnel, outdoor work should be suspended if the ambient temperature drops below 0° F (-18° C) or if the windchill factor drops below -29° F (-34° C). This level represents a guideline which should be used as an action level unless the Site Safety Officer determines and documents otherwise.

Snow and ice add additional risks to personnel and operations. Reduced visibility, increased potential for falling injuries, reduced onsite mobility, and the increase in time required to access the site (or off-site support services) are some of the problems posed by snow and ice.

In view of the above, it is critical that the Site Safety Officer establish site specific safety and operating protocols, and that all on-site personnel be made aware of the risks from the recognition of, and the treatment of cold weather injuries.

### II. COLD WEATHER INJURIES

There are two basic categories of cold weather injuries; local and systemic.

#### A. Local Cold Injuries

Local cold injuries are those injuries which affect specific areas of the body (e.g., fingers, ear, toes) and include the more commonly recognized cold weather injuries described below.

1. Chilblains is a condition that can result from prolonged exposure of bare skin to temperatures in the low sixties (°F) or below. This condition generally occurs in the extremities, and is a chronic injury of the skin and peripheral capillary circulation. Covering and protecting the skin from prolonged exposure to the cold is the best method of preventing and treating chilblains.
2. Frostbite is the freezing of some part of the body as a result of exposure to very low temperatures. Frostbite can affect hands, feet, ears, and exposed parts of the face. It occurs when ice crystals form in the fluid in cells of the skin and tissue. As long as blood circulation remains good, frostbite will not occur. Frostbite is a constant hazard in sub-zero weather, especially where there are strong winds.

There are three stages of frostbite. Classification depends upon the amount of tissue damage. Severity can range from incipient frostbite (frostnip), which affects the skin, to superficial frostbite, which involves the skin and the tissues immediately beneath it, to deep frostbite, a much more serious injury with damage that may affect deeper tissue and even bone.

a. Symptoms

Symptoms for each of the three stages of frostbite include:

Frostnip

Skin first turns red, later becomes pale or waxy white. May be tingling, stinging, or aching or uncomfortable sensation of coldness, followed by numbness, or it may be unnoticed by person.

Superficial Frostbite

Skin is white or gray-white and waxy in appearance. Skin is firm to touch, does not move easily. Tissue beneath the skin is soft and resilient. Lack of sensation in the area.

Deep Frostbite

Tissues are pale, cold, solid. Usually affects hands and feet. Blisters and swelling may occur.

b. Emergency Treatment of Frostbite

Frostnip is easily reversed in the field by the application of body heat. Apply body heat before the affected area becomes numb. Thaw frozen spots immediately. Do not rub affected areas.

If frostnip affects your fingers and hands, place them against the skin of your chest or in your armpits. To warm your face, hold a mitten or scarf over the lower part of your face and breathe into it.

Superficial Frostbite usually responds to the application of body heat. If it does not or if it resembles the early stages of deep frostbite, treat the condition as though it were.

Deep Frostbite

If possible remove person to a heated shelter to avoid further frostbite.

Remove all constricting items (boots, gloves, socks) from area of injury if it can be done without danger of further frostbite.

RAPID REWARMING WILL MINIMIZE TISSUE LOSS.

Warm extremities in a carefully-controlled warm water bath (104°F to 106°F) until tips of the fingers or toes turn pink and feeling is restored.

If a water bath is not available, use ALTERNATE METHODS;

Apply wet packs (100°F to 112°F) to the person's body.

Gently wrap frostbitten area in blankets or other warm material.

DO NOT attempt to thaw by exercising the affected parts or heating them in front of an open fire, heat lamps, radiator or a stove. The person may have lost sensation in the parts and may receive a heat injury as a result.

DO NOT use snow to thaw frostbite.

DO NOT rub, massage or use pressure on the affected areas.

Watch to see if CPR is necessary.

Continue Care:

Keep frostbitten parts elevated if possible.

Give victim warm drinks such as tea, coffee, or soup.

DO NOT GIVE ALCOHOLIC BEVERAGES.

Have victim exercise fingers or toes as soon as they are warmed.

Do NOT allow a person with frostbitten feet to walk. It may cause additional damage.

#### c. Medical Treatment of Frostbite

Frostnip usually does not require medical care.

Superficial Frostbite. Blisters may require medical care.

Deep Frostbite. EARLY MEDICAL TREATMENT IS URGENT! Get the victim to medical care at once.

#### d. Prevention of Frostbite

It is far easier to prevent or to stop frostbite in earlier stages than to thaw and take care of badly frozen flesh:

Wear enough clothing to protect yourself against cold and wind.

Wear warm gloves and boots.

Pull a scarf or jacket flap over the lower part of your face or a hood tightly around your face.

Exercise face, fingers and toes from time to time to keep them warm and to detect any areas that may have become numb.

Crew members should watch each other closely for signs of frostbite, especially on the face.

3. Immersion foot (formerly called trench foot) is a cold injury resulting from prolonged exposure to temperatures near freezing, especially when standing or walking in wet or swampy ground.

- a. Symptoms

In the early stages the feet and toes are pale, feet are cold, numb, stiff. Walking is difficult. If preventive action is not taken, feet will swell and ache. In extreme cases, irreversible damage to the tissues of the foot or leg may result.

- b. Emergency Treatment of Immersion Foot

Feet should be handled very gently. Do not rub or massage.

If necessary, clean feet carefully with soap and water, then dry and elevate them and expose them to warm but not hot air.

- c. Prevention of Immersion Foot

Because early stages of immersion foot are not painful, you must be constantly alert to prevent this condition.

Check feet often when working in wet cold.

Keep your feet dry by wearing waterproof foot gear and by avoiding standing in wet areas.

Since perspiration trapped inside waterproof boots or heavy footgear can contribute to immersion foot symptoms, change your socks frequently.

Dry your feet as soon as possible if they get wet. Warm them with your hands. Use foot powder and put on dry socks.

If you cannot change wet boots and socks, exercise your feet frequently by wiggling your toes and moving your ankles. Never wear tight boots.

B. Systemic Cold Injuries

Systemic injuries are those that affect the entire body system. Severe general body cooling is known as systemic hypothermia, and can occur at temperatures well above freezing. Hypothermia is the progressive lowering of body temperature accompanied by rapid, progressive mental and physical collapse. Subnormal temperature within the central body can be fatal. A large percentage of wilderness deaths are the result of hypothermia.

Hypothermia is caused by exposure to cold and it is aggravated by moisture, cold winds, fatigue, hunger, and inadequate clothing or shelter. Excessive perspiration from strenuous exercise followed by too rapid cooling can lead to hypothermia.

Hypothermia usually occurs between the temperatures of 30-50°F, temperatures which most people believe are not dangerous. Crew members should be alert for symptoms of hypothermia, especially when temperatures are dropping rapidly or when they must work in rain, snow or ice.

Hypothermia may occur on land or following submersion in even moderately cold water, 65°F or below. Death in cold water may seem to be from drowning but it is usually the result of hypothermia.

On land, hypothermia may take up to a full day or more of exposure to develop. If the cold conditions are extremely severe, however, death may occur within a few hours of the first symptoms.

In water, skin and nearby tissues chill very fast. Within even 10 to 15 minutes, the temperature of the heart and brain may drop. When core (internal body) temperature reaches 90°F, unconsciousness may occur. In water, when the body temperature drops to 80°F, heart failure is the usual cause of death. A person may drown as a result of losing the use of arms and legs or by becoming unconscious.

a. Symptoms

In the early stages of hypothermia, the body begins to lose heat faster than it can produce it and makes efforts to stay warm by shivering. When the body can no longer generate heat fast enough to overcome heat loss and the energy reserves of the body are becoming exhausted, a second stage begins; the body temperature begins to drop. This affects the ability of the brain to make judgments and also results in loss of muscular control.

As the body temperature drops, hypothermia symptoms become increasingly severe:

SYMPTOMS OF HYPOTHERMIA

Person is conscious, alert. May have shivering that becomes uncontrollable as core temperature nears 95°F. Respirations increase at first.

APPROX.  
CORE TEMPS.

Above 95°F

Person is conscious but disoriented, apathetic. Shivering present but diminishes as temperature drops. Below 92°F respiratory rate gradually diminishes, pupils begin to dilate.	95-90°F
Person is semi-conscious. Shivering replaced by muscular rigidity. Pupils fully dilated at about 86°F.	90-86°F
Unconscious, diminished respirations.	Below 86°F
Barely detectable or nondetectable respirations.	Below 80°F

b. Emergency Treatment of Hypothermia

In very mild cases of hypothermia, dry clothing and shelter may be all that is needed.

Move victim to shelter and warmth as rapidly as possible.

Gently remove all wet clothing (so victim does not expend energy warming and drying wet clothing) and replace it with dry.

Give the person something warm to drink. Do not give alcoholic beverages.

ALL OTHER CASES SHOULD BE CONSIDERED MEDICAL EMERGENCIES.

PROVIDE EXTERNAL HEAT ANY WAY POSSIBLE!

A WARM BATH with the water kept between 105°F and 110°F is the most effective way of warming a victim of hypothermia. (NEVER put an UNCONSCIOUS VICTIM in a bathtub.)

If it is not possible to give the person a warm bath, use an ALTERNATIVE METHOD:

Wrap warm moist towels (or other fabric) around the victim's head, neck, sides, groin. As the packs cool, rewarm them by adding warm water (about 105°F). (Check the temperature of the water with your elbow or the inside of your arm. Water should be warm but not hot).

Or, if you are at an remote outdoor location and cannot use any of the other methods:

Make a "human sandwich" by placing the unclothed victim in a sleeping bag (or between blankets) with two other undressed persons to provide body-to-body heat transfer. THIS WILL SAVE LIVES. Additional sleeping bags or blankets can be placed over and under the sleeping bag.

Do NOT wrap a hypothermia victim in a blanket without an auxillary source of heat unless it is to protect against any further heat loss before treatment can begin.

Do NOT leave the person in a sleeping bag without extra heat in order to go for help unless there is no other alternative.

Continue treatment:

Give warm liquids and nourishing food if the person is conscious.

Check the person for symptoms of frostbite and if necessary, give treatment for frostbite.

Handle the patient gently and do not allow him to walk. Exertion can circulate cold stagnant blood from extremities to the central body and cause "after-drop", in which the patient's core temperature may drop below the level which will sustain life. (Alcohol also contributes to after-drop.)

c. Medical Care for Hypothermia

HYPOTHERMIA IS A SEVERE EMERGENCY. GET MEDICAL TREATMENT AS SOON AS POSSIBLE. Even persons with mild hypothermia should see a doctor.

d. Prevention of Hypothermia

Never go into the field in cold weather without wearing adequate clothing and taking a complete change of warm clothes and one or two pairs of extra socks (in plastic bags).

Wear or carry a windproof, water-resistant outer jacket. In rain or snow, wear adequate rain gear.

Stay dry. If your clothing becomes wet from perspiration, rain, snow or immersion in water, change it as soon as possible.

If you start to shiver in a prolonged or violent way, seek shelter at once. Shivering produces heat but uses up energy. Shivering violently may be an early sign of hypothermia.

Avoid accidental immersion in water. Practice boat safety and learn cold water survival techniques if your field work involves activities where you could fall into the water.

If you do fall into water (and are not very close to shore), remain quiet with your head out of water or climb onto the boat or any other object that will support you and keep you up out of the water.



C. Safety/First Aid Equipment

In view of the causes, results, and appropriate treatment of cold weather injuries discussed above, the following items should be included as safety equipment during cold weather operations.

- Extra clothing for all personnel
- Blankets/sleeping bag
- High energy food, and drinking water supply
- Toboggan
- Tow ropes

In extreme cold conditions, the following safety items should also be included:

- Electric blanket
- Portable emergency generator (with fuel, oil, and cords)
- Space heater and fuel

III. GENERAL WINTER OPERATIONS

Cold weather conditions can severely affect winter operations. The Site Manager and Site Safety Officer must plan work schedules and project tasks accordingly.

A. Preliminary Assessment

If you will be working outdoors in cold weather, assess the local weather conditions through the news media (radio, television, newspapers) in order to know the amount of preparation you will need to make. Carefully consider such questions as:

What are the typical wind and weather conditions for the period in which you will be sampling?

Are the areas in which you will work sheltered or open to the wind?

Is there a place nearby for periodic warming breaks? Can you obtain or heat warm food and beverages there? Is there a source of drinking water?

Are there ways to minimize the length of time that crew members will have to work outdoors in the cold?

If you use a vehicle for a warming area or will use a heater in a closed room, how can you insure there is adequate ventilation to prevent carbon monoxide poisoning?

B. Scheduling

Try to schedule work in the least severe weather.

Plan to rotate crew members to keep cold exposures short.

Allow sufficient time for frequent warming breaks.

Remember that workers in heavy clothing may need more time to complete tasks and may become fatigued more easily.

Be aware that you may have to discontinue operations if winds increase or the temperature drops.

Remember that winter days are short. Scheduling should allow time for taking care of equipment and supplies before nightfall when it is more difficult to gauge terrain and when temperatures are likely to drop.

#### C. Site Access

Snow and ice could make travel on site access roads impossible, or treacherous at best. Personnel should not be allowed to work on-site if conditions severely hamper the arrival or departure of emergency vehicles. An otherwise minor injury could result in a major medical emergency if the route to off-site medical facilities is blocked by snow, ice, etc.

If conditions warrant, the following provisions should be made:

1. Snow removal/plowing services for site access roads should be secured.
2. A dependable four wheel drive vehicle should be immediately available on-site to transport injured to off-site medical facilities.
3. Sleeping bags, blankets, food supply, and water should be kept on-site in the event a sudden storm requires personnel to remain onsite overnight.

The Site Safety Officer must decide when weather conditions make site access unsafe, and must stop work until conditions improve.

#### D. Equipment and Supplies

You should obtain equipment and supplies that will help prevent cold stress and that will help in the treatment of cold stress disorders.

Take a reliable ambient temperature thermometer, a wind gauge and a wind chill chart.

If the site is very windy, try to provide means of shielding workers from the wind.

If you are working at a distance from stores, carry extra food and water since hunger and dehydration contribute to cold stress. Try to take a means of providing hot food and beverages if one is not available nearby.

Provide emergency communication equipment for use between ground crews and those working in the cold, at heights, or in remote locations.

Very close attention must be paid to the effects of cold weather on field equipment. Many types of batteries can be severely affected by cold resulting in disabled radios, air monitoring equipment, sampling pumps, and vehicles. A supply of fresh batteries, sufficient number of charging units, and a set of automotive jumper cables should be maintained onsite.

The electronics in many field instruments such as PI meters, LEL meters and oxygen meters can also be adversely affected by the cold. Manufacturers literature must be consulted for operating ranges.

If at all possible, monitoring well sampling tasks should not be scheduled during cold weather. These tasks generally require the use of (relatively delicate) pumps; long, uninsulated stretches of tubing; and significant quantities of decontamination solutions. Unless considerable effort is expended to prevent pumps, hoses, decontamination solutions, and sample containers from freezing, attempting to sample monitoring wells in cold weather may be counter-productive. Portable shelters should be considered if cold weather sampling is necessary.

#### IV. CONCLUSIONS

Safe cold weather operations require considerable planning on the part of the Site Manager and Site Safety Officer.

Weather conditions and forecasts must be watched closely, and onsite activities and procedures modified accordingly.

On-site personnel must be made aware of the hazards of cold weather, and the symptoms and treatment of cold weather injuries.

A sufficient number of warm-up breaks must be provided to onsite personnel.

Enclosed, heated decontamination facilities may be required.

Additional time must be allotted in the morning to check out and warm-up field equipment. Additional time must also be allotted for the end of the day to drain hoses and pumps, pack and secure equipment, and plan the next day's activities based upon up-to-date weather forecasts.

APPENDIX F  
LEVEL B OPERATIONS

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## LEVEL B OPERATIONS

### I. Introduction

Level B protection is selected when respiratory and dermal hazards are severe, but total encapsulation is not indicated. Level B protection includes a self-contained breathing apparatus (SCBA), a hard hat, steel-toed chemical resistant boots, two pair of chemical resistant gloves and chemical resistant coveralls. A rubber apron to protect the SCBA harness assembly and regulator from contamination may be needed at sites where high chemical concentrations and splash potential are anticipated. Decontamination workers should utilize Level C protection whenever site workers have selected Level B as they may also be exposed to highly volatile liquids, highly toxic materials, or other hazardous substances in the decontamination area.

### II. Team Size

Team size and organization will depend upon the degree of difficulty of tasks and the site-specific requirements of the individual investigation. An important consideration during Level B operations is that each team member receive sufficient training to readily complete an emergency response task that may occur on the site. This means that every person on the site who is part of the operating team must be able to respond to an emergency by using all available safety equipment and, if necessary, entering the contaminated zone.

A minimum of three people are required, but four are recommended, for any Level B operation. There should always be at least one person outside the contaminated zone dressed at the same level of protection as the downrange people, filling the functions of emergency response person and site safety officer.

#### Site Safety Officer

The site safety officer usually remains at the decontamination area in order to monitor all downrange operations. Downrange personnel are either in the safety officer's line of sight or other individuals are located between the safety officer and downrange personnel in order to maintain an unbroken person to person line of sight. In some operations constant radio contact between the site safety officer and downrange personnel may be sufficient. The specific responsibility of the site safety officer during a Level B operation is to: 1) monitor "on-air" work time and physical conditions of all personnel (especially heat stress & fatigue); 2) to make all decisions concerning protective equipment; and 3) monitor all activities to remove personnel from any developing unsafe work conditions or unsafe work activities.

#### Decontamination Person

This individual is responsible for organizing decontamination stations, assisting/supervising all decontamination operations, changing air tanks, disassembling the decontamination stations, and disposing of all contaminated fluids.

### Emergency Response Person

This person is outfitted in Level B protection but normally is not utilizing his containerized air supply. The rescue person remains at the decontamination station and goes downrange only to assist with emergency evacuations. On small teams, the rescue and decontamination task can be handled by a single individual.

### Sample/Field Personnel

These are individuals who complete all downrange operations. On large teams, the field personnel who are not currently downrange can assist with decontamination or command post operations.

### Other Personnel

In some operations it is considerably more efficient to dedicate a person to record notes transmitted by radio from downrange personnel, to fill out sample claim-of-custody and other paperwork or to monitor and refill tanks for the longer operations. Other personnel must be planned on a task specific basis.

### III. Record Keeping

In addition to the basic records kept during any field activity, a record containing the chronology of operations must be completed. This record includes all personnel and the times they were utilizing a self-contained breathing apparatus.

APPENDIX G  
RESPIRATORY PROTECTION PROGRAM

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## RESPIRATORY PROTECTION PROGRAM

### I. INTRODUCTION

This program has been developed to govern the selection and use of respiratory protective devices by E.C. Jordan Co. (Jordan) personnel. The program is intended to comply with Occupational Safety and Health Administration (OSHA) requirements as set forth in 29 CFR 1910.134(b). The scope of this program is limited to activities related to field investigations of potentially hazardous waste disposal sites.

### II. PERSONNEL REQUIREMENTS

All personnel assigned to field activities at hazardous or potentially hazardous locations are currently required by Jordan's Health and Safety policies to be enrolled in the corporate Health Monitoring Program. A portion of this program involves spirometry, a measure of the respiratory system status. No personnel may be assigned to the use of, or withdraw from stock, any respiratory protective device without physician certification that use of such a device will not be injurious to health. Psychological limitations, e.g., claustrophobia, are also considered in personnel assignments. Training in the use of the selected device and fit testing, as described herein, are also required.

No personnel will be assigned duties which require a respirator when facial hair, skullcaps or eye glasses will interfere with a proper fit. No contact lenses may be worn with any respiratory protective device. Eyeglass frames which fit inside the respirator facepiece are provided as necessary.

### III. APPLICABLE EQUIPMENT

Jordan maintains the following respiratory protective equipment:

- o full-face chemical/mechanical air purifying respirators
- o self-contained breathing apparatus
- o full-face air line-supplied breathing apparatus
- o 5-minute escape air supply

This equipment is intended for use on an as needed basis, to be determined by an evaluation of on-site conditions. Respiratory protective equipment should not be used arbitrarily by any Jordan personnel.

Selection criteria are presented separately; training is required in the use of each type of equipment prior to drawing from stock.



#### IV. PERSONNEL TRAINING

Training of personnel in the proper use and care of respiratory protective equipment is considered essential to the success of the program. Training encompasses:

- o respiratory protection principles
- o selection of appropriate equipment
- o use of equipment
- o maintenance of equipment
- o fit testing

Information regarding each topic is presented as standard respiratory protection procedures.

#### V. STANDARD RESPIRATORY PROTECTION PROCEDURES

The following information has been organized and presented by topic as Standard Respiratory Protection Procedures, to be used both in training and as reference material for field operations.

<u>Standard Respiratory Protection Procedure No.</u>	<u>Topic</u>
1	Respiratory Protection Principles
2	Selection of Respirators
3	Fit Testing
4	Inspection/Maintenance/Storage

These procedures are attached.

#### VI. PROGRAM ADMINISTRATION AND DOCUMENTATION

The administration of Jordan's Respiratory Protection Program is the responsibility of the Personnel Health and Safety Committee (PHSC). Administration includes:

- o respirator selection
- o personnel training
- o fit testing
- o respirator maintenance
- o documentation
- o program evaluation and improvements
- o personnel pulmonary testing and certification

Written health and safety plans for each site, and site hazard assessments result in respirator selection in accordance with the decision logic set forth in Standard Respiratory Protection Procedure No. 2.

Fit testing and respirator maintenance is performed by the equipment manager of Jordan's Sample Control and Staging Center under the administration of PHSC. Major maintenance is performed by manufacturer certified technicians only. Personnel training in respiratory protection is one aspect of PHSC's ongoing personnel training programs.

Program evaluation is a dynamic process, occurring each time a Project Health and Safety Plan is prepared.

Medical supervision of personnel occurs as part of Jordan's Health Monitoring Program, also administered by PHSC. Medical surveillance is required for all personnel assigned to hazardous or potentially hazardous site activities.

Documentation of the various elements of Jordan's Respiratory Protection Program is achieved through several media:

- o Documentation of respirator selection is included in the hazard assessment of each site's Health and Safety Plan.
- o Documentation of personnel training is maintained in both hard-copy and computerized files.
- o Documentation of medical surveillance is achieved indirectly by maintaining a list of enrolled employees in the Health Monitoring Program and directly through physician certification of personnel allowed to be assigned respiratory protective devices.
- o Documentation of fit-testing is maintained on file with the equipment manager of the Sample Control and Staging Center, utilizing the appropriate form. (Exhibit 1)
- o Documentation of site surveillance is required both by this program and by the Health and Safety Plan for each site. Records of site surveillance are created by the Site Safety Officer and maintained in project files.
- o Respirator inspection and maintenance records are created and maintained for each respirator, SCBA, and escape respirator by the equipment manager. (Exhibit 2)

Inspection and documentation occurs before each unit is removed from stock and when it is returned, or monthly.

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Exhibit 1

Respirator Fit Test Worksheet

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Exhibit 2

Respirator Use & Maintenance Record

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STANDARD RESPIRATORY PROTECTION PROCEDURE NO. 1  
RESPIRATORY PROTECTION PRINCIPLES

1.1 INTRODUCTION

Since the lungs are not completely effective in protecting the body against respirable chemical hazards, they must be artificially protected from toxic gases, vapors, and particulates. In addition, the body must be supplied with enough oxygen to maintain a normal capacity to perform tasks.

1.2 ROUTES OF EXPOSURE

The volume of air inhaled during "normal" activities is approximately 6 l/min. The volume of air inhaled during brisk activity or during periods of stress can go up to 75 l/min (a 12-fold increase).

Air is inhaled through the nose and mouth and travels an extremely turbulent path to the lungs. This turbulency results in the air impinging on many sites, thus allowing the insoluble particulates to become impacted and soluble particulates, vapors, and gases to become absorbed.

The inhaled air passes through the pharynx, the common passageway for both food and air, and enters the trachea at the larynx. The trachea (or windpipe) divides into two bronchi, which lead to the two lungs. All of these organs are collectively called the conducting tubes, since they lead the air to the alveoli, the site of gaseous exchange with the pulmonary capillaries (i.e., the blood).

Toxic substances may be absorbed at any point in the respiratory tract. The conducting tubes are lined with mucus and cilia. Insoluble contaminants caught in the mucus are swept up to the esophagus by the cilia and swallowed, thus causing an ingestion problem.

1.3 OXYGEN DEFICIENCY

1.3.1 Oxygen and the Respiratory Process

The chemical composition of normal air is presented below as Table 1.

Table 1. Atmospheric Composition

Gas	Volume (%)	Partial Pressure (mm Hg at sea level)
Nitrogen	78.9	594
Oxygen	20.95	159
Argon	0.93	7
Carbon dioxide	0.04	0.03

It is not the percentage of O<sub>2</sub> in the air, but rather its partial pressure (pO<sub>2</sub>), that is important in respiration. As one increases in altitude, the

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percentage of O<sub>2</sub> stays constant, but pO<sub>2</sub> drops. Additionally, as the percentage of O<sub>2</sub> in the air drops, so does its partial pressure.

The "anatomic dead space volume" of the respiratory tract is about 150 ml. The average breath draws in about 500 ml of air; this air is mixed with the air remaining in the dead space from the previous exhalation, which has been depleted in oxygen due to the normal respiratory process. The overall effect is a lower pO<sub>2</sub> in the respiratory tract as compared with the ambient air. The average respirator adds about 100 ml of dead space to the respiratory system, which further lowers the pO<sub>2</sub> in the respiratory system, causing a slight oxygen deficiency.

### 1.3.2 Oxygen Levels/Physiological Effect

The currently accepted National Institute for Occupational Safety and Health (NIOSH) standards specify that if an atmosphere contains less than 19.5 percent by volume O<sub>2</sub> at sea level, then an atmosphere-supplying device must be used.

Note that as altitude increases, the percentage of O<sub>2</sub> stays constant, but the pO<sub>2</sub> drops. There is currently no standard that accounts for the drop in pO<sub>2</sub> with altitude; the problem is currently under study by NIOSH.

The physiological effects of oxygen deficiency are indicated in Table 2.

### 1.4 PARTICULATE CONTAMINANTS - AEROSOLS

Aerosol is a term used to describe particulates in air without regard to their origin. Particulates are collected on the walls of the respiratory tract depending upon their size as follows:

1. Pharynx - 10-30  $\mu\text{m}$
2. Trachea - 10  $\mu\text{m}$
3. Bronchus - 5-10  $\mu\text{m}$
4. Alveoli - 0.1-1  $\mu\text{m}$

Particulates less than 0.5  $\mu\text{m}$  may never be deposited in the respiratory tract and may simply be exhaled.

Particulates affect the human body as follows:

1. Nuisances - inert substances that cause no lung damage but inhibit proper functioning of the lungs.
2. Inert pulmonary reaction causing substances - substances that produce nonspecific pulmonary effects.



3. Pulmonary fibrosis causing substances - substances that produce effects ranging from nodule production to serious diseases such as asbestosis.
4. Irritants - substances that irritate, inflame, or ulcerate lung tissues.
5. Systemic poisons - substances that cause injury to specific organs and body systems.
6. Allergens - substances that produce hypersensitivity.

#### 1.5 GASEOUS CONTAMINANTS

Gaseous contaminants are "filtered" to a small degree by the respiratory tract before they reach the alveolar spaces. However, if the contaminants are soluble, they can be directly absorbed through the walls of the respiratory tract.

Gaseous contaminants affect the human body as follows:

1. Irritants - corrosive compounds that injure and inflame tissue.
2. Asphyxiants - substances that displace oxygen or prevent the use of oxygen by the body.
3. Anesthetics - substances that depress the central nervous system and cause intoxication or loss of sensation.
4. Systemic poisons - substances that cause diseases.

#### 1.6 EXPRESSING AIR CONTAMINANT CONCENTRATIONS

Any substances that are not normal components of breathing air (oxygen, nitrogen, etc.) are considered to be contaminants. The respiratory threat posed by contaminants is a function of the actual contaminant and its concentration in the air. The concentration is expressed in a variety of ways, as listed below.

1. Particulates
  - a. mppcf - millions of particulates per cubic foot.
  - b. ppcc - particles per cubic centimeter.
  - c.  $\text{mg}/\text{m}^3$  - milligrams per cubic meter.
2. Gases and Vapors
  - a. ppm - volumes per million volumes of air (parts per million).
  - b. ppb - volumes per billion volumes of air (parts per billion).
  - c.  $\text{mg}/\text{m}^3$  - milligrams of gas per cubic meter.

- d. Conversion of units. The following equation converts  $\text{mg}/\text{m}^3$  to ppm, at  $24^\circ\text{C}$  and 760 mm Hg.

$$\text{ppm} = \frac{24.45}{\text{molecular weight}} \text{mg}/\text{m}^3,$$

This equation is extremely useful for determining respiratory protection requirements.

### 1.7 MEASURES OF RESPIRATORY HAZARDS

Every contaminant contained in breathing air has a limit, above which it becomes a threat to human health. These limits are determined either from animal studies or from epidemiological data. Unfortunately, animal studies can only approximate human response and may vary widely for individual chemicals. Epidemiological studies, although capable of providing a more precise forecast of human response, are limited by a lack of accurate records and a lack of controlled studies. Therefore, the "safe" limits of various chemicals must be viewed only as guidelines. Furthermore, these guidelines are primarily designed for the industrial situation where an individual is being exposed to one or two well-defined substances. These guidelines do not address the problems of synergism, potentiation, or allergic response.

The guidelines used in measuring respiratory hazards are listed below.

1. Threshold Limit Value. The threshold limit value (TLV) is recommended by the American Conference of Governmental Industrial Hygienists (ACGIH) and is derived from consensus review. It is a time-weighted average concentration set for a particular substance that represents a level that almost all workers can be exposed to for an 8-hr day (40-hr week) without suffering adverse health effects. It is assumed that following each 8-hr. exposure there will be a 16-hr. recovery period and that after 5 days there will be a 48-hr. recovery period. The TLV lists are revised on a yearly basis.
2. Permissible Exposure Limits. The permissible exposure limits (PELs) are set forth in the Occupational Safety and Health Administration (OSHA) Standards 29 CFR 1910.1000, Tables Z<sub>1</sub>, Z<sub>2</sub>, and Z<sub>3</sub>. These levels were promulgated initially from the ACGIH TLV lists (1968). As part of the law, they represent the legal maximum concentrations for personnel exposure. They are not updated on a yearly basis, as is the TLV list. Therefore, the most current ACGIH TLV is used in determining respiratory protection, rather than the PEL listing.
3. Immediately Dangerous to Life and Health. 30 CFR 11.3 defines conditions that are immediately dangerous to life and health (IDLH) as "conditions that pose an immediate threat to life or health or conditions that pose an immediate threat of severe exposure to contaminants such as radioactive materials, which are likely to have an adverse cumulative or delayed effect on health".

OSHA adds these criteria:

- a. The worker must be able to escape without losing his life or suffering permanent health damage within 30 minutes.
  - b. The worker must be able to escape without severe eye or respiratory irritation or other reactions.
4. Lower Flammable Limit. The lower flammable limit (LFL) is the lowest concentration by volume of a gas or vapor in air that will explode when there is an ignition source.

#### 1.8 RESPIRATORY PROTECTION

When it has been determined that the ambient atmosphere is hazardous, it becomes necessary to protect the individual by:

1. avoiding and/or minimizing exposure;
2. applying engineering controls such as ventilation; and
3. using a respirator to either filter the air or supply air.

The legal requirements for respiratory protection are summarized below.

1. Williams and Steiger Occupational Safety and Health Act of 1970 established standards that state that "approved or accepted respirators shall be used when they are available".
2. 29 CFR 1910.134 gives legal requirements for the selection and use of respiratory equipment as promulgated by OSHA and based on American National Standards Institute (ANSI) Standard Z88.2, "American National Standards Practices for Respiratory Protection". Standard Z88.2 was originally a consensus standard, but now has been cited as a Federal regulation.
3. 30 CFR Part 11 describes tests for permissibility of respiratory protective apparatus and updates or deletes approvals. 30 CFR Part 11 also cites ANSI Z88.2 as the basis for respiratory protection.

STANDARD RESPIRATORY PROTECTION PROCEDURE NO. 2  
SELECTION OF RESPIRATORS

2.1 INTRODUCTION

This text is based on "Joint NIOSH/OSHA Standards Completion Program - Respirator Decision Logic". The text is excerpted for the purpose of covering the major points of the respirator decision logic. For the complete text, see John S. Pritchard's, "A Guide to Industrial Respiratory Protection" (U.S. Department of Health, Education, and Welfare, U.S. Public Health Service, Center for Disease Control, National Institute for Occupational Safety and Health, Cincinnati, Ohio, June 1976). It is not intended to be all-inclusive in content.

The purpose of the respirator decision logic is to provide technical accuracy and uniformity in the selection of respirators and to provide necessary criteria to support this selection. The decision logic is a step-by-step elimination of inappropriate respirators until only those that are acceptable remain. Judgment by persons knowledgeable of inhalation hazards and respiratory protection equipment is essential to ensure appropriate selection of respirators.

The primary technical criteria for what constitutes a permissible respirator are based on the technical requirements of 30 CFR 11. The health standards will allow only respirators approved under 30 CFR 11. Classes of respirators are only included when at least one device has been approved.

Protection factors are criteria used in determining what limiting concentrations are to be permitted for each respirator type that will afford adequate protection to the wearer. The referenced Subparts of 30 CFR 11 give technical descriptions concerning each type or class of respirators referenced in the decision logic; 30 CFR 11 should be used with the decision logic in order to properly understand the criteria for the specification of allowable respirators.

Throughout this text, reference is made to PELs. Prudent, accepted practice dictates the use of current ACGIH TLVs, which are updated each year, in the place of the PEL, which is only periodically updated.

2.2 GENERAL DECISION LOGIC FLOWCHART

The following material used in concert with the decision logic chart (Figure 1) provides a formalized selection guide for respiratory protection.

1. Step 1 - Assemble Information on Substance. Assemble necessary toxicological, safety, and research information for the particular contaminant. The following are required:
  - a. Permissible exposure limits specified in 29 CFR 1910.1000 (Tables Z-1, Z-2, and Z-3).
  - b. Warning properties if the substance is a gas or a vapor.
  - c. Eye irritation potential of the substance.

- d. LFL for the substance.
  - e. IDLH concentration for the substance.
  - f. Any possibility of poor sorbent efficiency at IDLH concentration and below.
  - g. Any possibility of systemic injury or death resulting from absorbance of the substance (as a gas or vapor) through the skin.
  - h. Any possibility of severe skin irritation resulting from contact of the skin with corrosive gases, vapors, or particulates.
  - i. The vapor pressure of the substance (and equivalent ppm).
  - j. Any possibility of high heat of reaction with sorbent material in cartridge or canister.
2. Step 2 - Determine Physical State of Substance. Determine the physical state(s) of the substance as it is likely to be encountered in the occupational environment. It will be either (1) gas or vapor; (2) particulate (dust, fume or mist); or (3) combination of (1) and (2).
  3. Step 3 - Assemble a Table of Permissible Respiratory Protection for Substance. This is done using the material from Step 1 and the appropriate specific decision logic chart from Section 2.3 below and respirator protection factors. Classes of respirators are only included where at least one device has been approved.
  4. IF STEPS 1 THROUGH 3 CANNOT BE COMPLETED, THE ATMOSPHERE IS UNKNOWN AND MUST BE CLASSIFIED IDLH. ONLY POSITIVE PRESSURE SCBA MAY BE SELECTED.

### 2.3 SPECIFIC DECISION LOGIC CHARTS

A decision logic chart for respiratory protection against gases or vapors and against particulates is shown as Figure G-1.

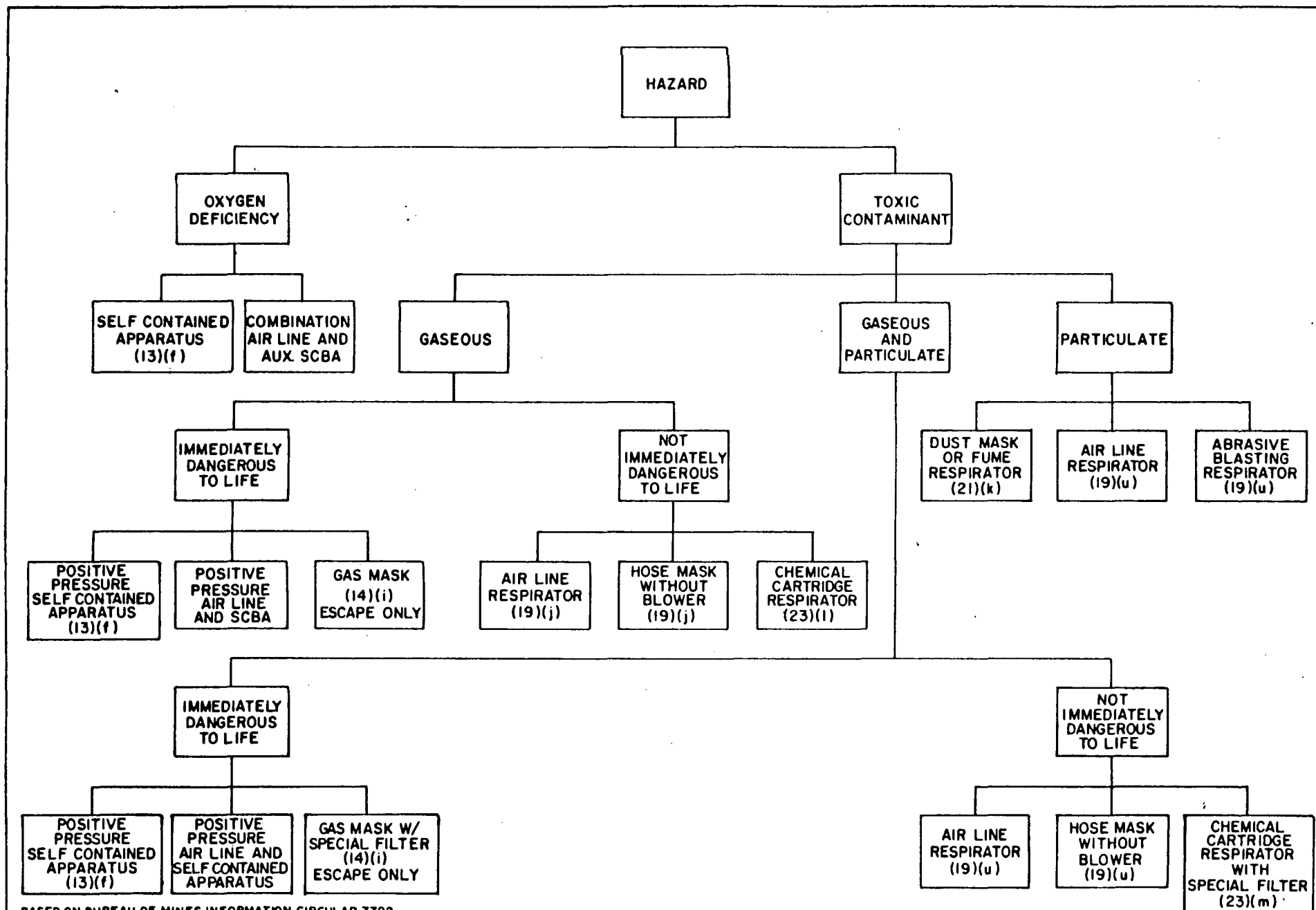
### 2.4 DECISION LOGIC CRITERIA

#### 2.4.1 Skin Absorption and Irritation

Respirator selection criteria are based primarily on the inhalation hazard of the substance. A supplied-air suit may protect the skin from extremely toxic substances that may be absorbed through the skin or from substances which may cause severe skin irritation or injury.

Supplied-air suits are not covered in 30 CFR 11. Data are not available upon which to make recommendations for supplied-air suits for all types of exposures.

Where information is available indicating systemic injury or death resulting from absorbance of gas or vapor through the skin or where severe skin irritation or injury may occur from exposure to a gas, corrosive vapor, or



BASED ON BUREAU OF MINES INFORMATION CIRCULAR 7792  
 NUMBERS IN PARENTHESIS REFER TO BUREAU OF MINES SCHEDULES  
 LETTERS IN PARENTHESIS REFER TO SUBPART OF NIOSH/MESA 30 CFR PART 11

SELECTION OF RESPIRATORY EQUIPMENT (LUNDIN, A., 1979)

FIGURE G-1  
 E.C.JORDANCO

particulate, the following statement is included as a footnote to the respirator tables, and both the employee and employer are cautioned in the appendices concerning their use:

Use of supplied-air suit may be necessary to prevent skin contact and respiratory exposure from airborne concentrations of (specific substance). Supplied-air suits should be selected, used, and maintained under the immediate supervision of persons knowledgeable in the limitations and potential life-endangering characteristics of supplied-air suits. Where supplied-air suits are used above a concentration which may be IDLH (concentration), an auxiliary positive-pressure self-contained breathing apparatus must also be worn.

As a guideline for inclusion of the supplied air-suit statement for substances that are sorbed through the skin, a single skin penetration LD<sub>50</sub> of 2 g/kg for any species is used.

#### 2.4.2 Poor Warning Properties (Refer to Table G-1)

It is important to realize that 30 CFR 11 approvals for air-purifying (organic vapor) devices prohibit use against organic vapors with poor warning properties.

Warning properties include odor, eye irritation, and respiratory irritation. Warning properties relying upon human senses are not foolproof. However, they provide some indication to the wearer of possible sorbent exhaustion or of poor facepiece fit or other respirator malfunction.

Adequate warning properties can be assumed when the substance odor, taste, or irritation effects are detectable and persistent at concentrations at or below the permissible exposure limit.

If the odor or irritation threshold of a substance is more than three times greater than the permissible exposure limit, this substance should be considered to have poor warning properties. If the substance odor or irritation threshold is somewhat above the permissible exposure limit (not in excess of three times the limit) and there is no ceiling limit, consideration is given to whether undetected exposure in this concentration range could cause serious or irreversible health effects. If not, the substance is considered to have adequate warning properties. Some substances have extremely low thresholds of odor and irritation in relation to the permissible exposure limit. Because of this, these substances can be detected by a worker within the face piece of the respirator even when the respirator is functioning properly. These substances are, therefore, considered to have poor warning properties.

Though 30 CFR 11 does not specifically eliminate air-purifying respirators for pesticides with poor warning properties, prudent practice dictates that a respirator should not be used to protect against any substance with poor warning properties.

### 2.4.3 Sorbents

There are certain limitations involved with the use of sorbents in cartridge/canister sorbents. When the following conditions occur, a sorbent cartridge is not recommended:

1. Where supporting evidence exists of immediate (less than 3 min.) breakthrough time at the IDLH concentration and below for a cartridge or canister sorbent, air-purifying devices shall not be allowed for any use, escape or otherwise. See Tables G-2-1 and G-2-2.
2. Where there is reason to suspect that commonly used sorbents (e.g., activated charcoal) do not provide adequate sorption efficiency against a specific contaminant, use of such sorbents shall not be allowed. However, where another sorbent material has been demonstrated to be effective against a specific contaminant, approved respirators using the effective sorbent material shall be allowed.
3. Where there is reason to suspect that a sorbent has a high heat of reaction with a substance, use of that sorbent is not allowed.
4. Where there is reason to suspect that a substance sorbed on a sorbent of a cartridge or canister is shock sensitive, use of air-purifying respirators is disallowed.

### 2.4.4 Eye Irritation

In addition to respiratory protection, it is important to consider a chemical's potential for producing eye irritation or damage. The following guidelines deal with eye protection:

1. For routine work operations, any perceptible eye irritation is considered unacceptable. Therefore, only full facepiece respirators are permissible in contaminant concentrations that produce eye irritation. Protection may be required in certain concentrations of gases and vapors. For escape, some eye irritation is permissible if it is determined that such irritation would not inhibit escape and such irritation is reversible.
2. Where quantitative eye irritation data cannot be found in literature references, and theoretical considerations indicate that substance should not be an eye irritant, half-facepiece respirators are allowed.
3. Where a review of the literature indicates a substance causes eye irritation but no eye irritation threshold is specified, the data will be evaluated to determine whether quarter- or half-facepiece respirators can be used.

### 2.4.5 IDLH

The definition of IDLH provided in 30 CFR 11.3(t) is as follows:

"Immediately dangerous to life or health" means conditions that pose an immediate threat to life or health or conditions that pose an immediate threat of severe exposure to contaminants, such as radioactive materials, which are likely to have adverse cumulative or delayed effects on health.



The purpose of establishing an IDLH exposure concentration is to ensure that the worker can escape without injury or irreversible health effects from an IDLH concentration in the event of failure of the respiratory protective equipment. The IDLH is considered a maximum concentration above which only highly reliable breathing apparatus providing maximum worker protection is permitted. Since IDLH values are conservatively set, any approved respirator may be used up to its maximum use concentration below the IDLH.

In establishing the IDLH concentration the following factors are considered:

1. Escape without loss of life or irreversible health effects. Thirty minutes is considered the maximum permissible exposure time for escape.
2. Severe eye or respiratory irritation or other reactions that would prevent escape without injury.

IDLH should be determined from the following sources:

1. Specific IDLH provided in the literature, such as the AIHA Hygienic Guides.
2. Human exposure data.
3. Acute animal exposure data.

Where such data are lacking, acute toxicological data from analogous substances may be considered.

The following guidelines should be used to interpret toxicological data reported in the literature for animal species:

1. Where acute animal exposure data are available (30 min. to 4-hr. exposures), the lowest exposure concentration causing death or irreversible health effects in any species is determined to be the IDLH concentration.
2. Chronic exposure data may have no relevance to the acute effects and should be used in determining the IDLH concentration only upon competent toxicologic judgment.
3. Where there is no toxicologic evidence of an IDLH concentration, 500 times the permissible exposure limit shall determine the upper limit above which only highly reliable breathing apparatus providing maximum worker protection is used.

#### 2.4.6 Lower Flammable Limit

In addition to toxic chemicals and irritants, it is necessary to consider flammable substances. In any atmosphere where there is a likelihood of a chemical fire, there is the risk of creating toxic vapors in the fire or of asphyxiation by reduction of the oxygen content by the products of combustion.

Contaminant concentrations in excess of the LFL are considered to be IDLH. At or above the LFL, the use of respirators is limited to those devices that provide the maximum protection (i.e., positive pressure self-contained breath-

ing apparatus (SCBA) and the combination positive pressure supplied-air respirators with auxiliary positive pressure SCBA).

#### 2.4.7 Protection Factors

The protection factors of respiratory protection devices are a useful numerical tool to assist in the choice of a protective system. Protection factors are a measure of the overall effectiveness of a respirator. Filtering efficiency is a part of the protection factor and becomes a significant consideration for less efficient air-purifying respirators.

The protection factor of a given respirator for a specific user times the PEL (or TLV) for a given substance is the maximum allowable concentration for that substance for which the respirator may be used. For example, say the protection factor for a full-face mask respirator will provide protection up to 1000 ppm. Note that there is a difference between "quantitative" protection factors and "qualitative" protection factors. The correct protection factor must be used in determining the maximum allowable concentration.

#### 2.4.8 Escape

Jordan provides and requires employees to carry an escape respirator where exposure may occur to extremely toxic substances. This escape respirator provides a 5-minute self-contained air supply. (An extremely toxic substance is defined as a gas or vapor having an  $LC_{50}$  of less than 10 ppm.)

STANDARD RESPIRATORY PROTECTION PROCEDURE NO. 3  
RESPIRATOR FIT TESTING - QUALITATIVE

3.1 RESPIRATOR QUALITATIVE FITTING METHODS

Despite the care that goes into respirator design and manufacture to give maximum protection, efficiency will be lost if there is an improper match between the facepiece and the user, or other improper wearing practices. The problem is twofold. Since more than one brand of particular type of facepiece is available, the first problem is to determine which fits best. The second problem is whether the user knows when the respirator fits properly. Both problems can be solved by the use of a fitting test, which is in fact an OSHA requirement. A number of tests and fitting procedures can be performed easily, as outlined below.

Note: During any fitting test, the respirator head straps must be as comfortable as possible. Tightening the straps will sometimes reduce the facepiece leakage, but the user may be unable to tolerate the respirator for any length of time.

3.1.1 Test 1 - Negative Pressure Test

The user will perform this test alone in the field. It consists of merely closing off the inlets of the canister, cartridge(s), or filter(s) by covering with the palm(s) or replacing the seals over the canister or cartridge inlets, or by squeezing breathing tubes so that air cannot pass; inhaling gently so the facepiece collapses slightly; and holding the breath for ten seconds. If the facepiece remains slightly collapsed and no inward leakage is detected, the respirator is probably tight enough.

Although this test is simple, it has several major drawbacks, primarily that the user must handle the respirator after it has supposedly been positioned on the face. Handling can modify the facepiece-to-face seal. When the respirator is to be used in a relatively toxic atmosphere, this test should be used only as a very gross determination of fit. The user will perform this test just before entering any toxic atmosphere.

3.1.2 Test 2 - Positive Pressure Test

This test is very much like the negative pressure test; it has the same advantages and limitations. It is conducted by closing off the exhalation valve and exhaling gently into the facepiece. The fit is considered satisfactory if slight positive pressure can be built up inside the facepiece without any evidence of outward leakage. For some respirators, this method requires the user to remove the exhalation valve cover and then carefully replace it after the test, often a most difficult task which can disturb the respirator fit even more than does the negative pressure test. If removing and replacing the valve cover is required, this test should be used sparingly. For respirators whose valve covers have a single small port that can be covered by the palm or finger, this test is easy. Where applicable, this test will be performed just before entering any hazardous atmosphere.

### 3.1.3 Test 3 - Isoamyl Acetate Vapor (Banana Oil) Test

The chemical isoamyl acetate has a pleasant, easily detectable odor, so it is used widely in checking respirator fit.

The test gives the user the required opportunity to wear the respirator in a test atmosphere. Generally, it consists of creating an atmosphere containing banana oil around the user of an atmosphere-supplying or air-purifying respirator with an organic vapor removing cartridge(s) or canister. If the hazard is particulate matter or a non-organic vapor or gas, the organic vapor cartridge(s) or canister must be replaced with a particulate filter(s) or proper cartridge(s) or canister after this test. Thus, this test can be used for any facepiece that has the capability of accepting chemical cartridges and particulate filters. It must be emphasized, however, that the correct cartridge, canister or filter must be replaced on the facepiece before the user enters the specific exposure area.

The isoamyl acetate test is performed with single use capsules, or may be performed by saturating a piece of cotton or cloth with the liquid and passing it close to the respirator near the sealing surface, taking care to avoid skin contact.

In general, the isoamyl acetate fitting test will be performed as follows:

1. The user puts on the respirator in a normal manner in an area where he/she cannot smell banana oil and thus not be influenced by the odor while performing the fitting test. If it is an air-purifying device, it must be equipped with a cartridge(s) or canister specifically designed for protection against organic vapors.
2. The capsule or saturated cloth is passed close to the respirator sealing surfaces.
3. If the user smells banana oil, he readjusts the facepiece and/or adjusts the head straps without unduly tightening them.
4. The user repeats step 2. If banana oil is not smelled, there is assumed to be a satisfactory seal. If the wearer smells the vapor, an attempt should be made to find the leakage point. If the leak cannot be located, another respirator of the same type and brand should be tried. If this leaks, another brand of respirator with a facepiece of the same type but slightly different shape or size should be tried.
5. After a fit is obtained, if the respirator is an air-purifying device, it must be equipped with the correct filter(s), cartridge(s) or canister for the anticipated hazard.

During the test, the subject must make movements that approximate a normal working situation. These will include, but not necessarily be limited to, the following:

1. Normal breathing.
2. Deep breathing like during a heavy exertion period: this should not be done long enough to cause hyper ventilation.

3. Slowly performing side-to-side and up-and-down head movements: these movements should be exaggerated, but should approximate those that take place on the job.
4. Talking: this is most easily accomplished by reading prepared text loudly enough to be understood by someone standing nearby.
5. Other exercises may be added depending upon the situation: for example, if users are going to spend a significant part of their time bent over at some task, it will include an exercise approximating this bending.

When the test is used in training workers and selecting the respirators that fit best, they will perform the complete set of exercises. However, the number of exercises may be reduced when the test is used as a quick field check before routine entry into a contaminated atmosphere.

#### 3.1.4 Test 4 - Irritant Smoke Test

This test is similar to the isoamyl acetate test in concept. It involves exposing the respirator wearer to an irritating aerosol produced by stannic chloride or titanium tetrachloride smoke tubes normally used to check the quality of ventilation systems. (Note: Other types of smoke tubes such as acetic acid are available, but should not be used for respirator fitting.) When the tube ends are broken and air is passed through it, the material inside reacts with the moisture in the air to produce a dense, highly irritating smoke, consisting of hydrochloric acid absorbed in small solid particles. As a qualitative means of determining respirator fit, this test has a distinct advantage in that the user usually reacts involuntarily to leakage by coughing or sneezing. The likelihood of this giving a false indication of proper fit is reduced. On the other hand, the aerosol is very irritating and must be used carefully to avoid injury.

This test can be used for both air-purifying and atmosphere-supplying respirators, but air-purifying respirators must have a high-efficiency filter(s). After the test, it may be necessary to replace the high-efficiency filter(s) on the air-purifying respirator with another type of air-purifying element(s) depending upon the hazard to which the respirator user is to be exposed. This test can be used for worker training or respirator selection.

The irritant smoke test must be performed with proper safeguards because the aerosol is highly irritating. The procedure is as follows:

1. The user puts on the respirator normally, taking care not to tighten the headstrap uncomfortably and stands with his/her back to a source of exhaust ventilation.
2. The tester tells the user to close his/her eyes, even if wearing a full facepiece respirator, and to keep them closed until told to open them.
3. The tester lightly puffs smoke over the respirator, holding the smoke tube at least two feet from it. At this time, the test should keep the amount of smoke minimal and pause between puffs to note the user's reaction.

4. If the user detects no leakage, the tester will increase the smoke density and move the smoke tube progressively closer to the subject, still remaining alert to any reactions.
5. When the smoke tube has been brought to within about 6 inches of the respirator with no leakage detected, the tester will start to direct smoke specifically at potential sources of leakage, around the sealing surfaces and exhalation valve, while the subject's head is still.
6. At this point, if no leakage has been detected, the user may cautiously begin the head movements described in the isoamyl acetate test. The tester should remain especially alert and be prepared to stop producing smoke immediately.
7. If leakage is detected at any time, the tester should stop the smoke and let the user readjust the facepiece or head strap tension. The tester should then start the test at step 2.

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STANDARD RESPIRATORY PROTECTION PROCEDURE NO. 4  
INSPECTION/MAINTENANCE/STORAGE

4.1 INTRODUCTION

Respirator maintenance is an integral part of the overall respirator program. Wearing a poorly maintained or malfunctioning respirator is, in one sense, more dangerous than not wearing a respirator at all. Personnel wearing defective devices think they are protected when, in reality, they are not. Emergency escape and rescue devices are particularly vulnerable to poor maintenance as they generally are used infrequently, and then in the most hazardous and demanding circumstances. Serious injury or death can result from wearing a defective device during emergency escape or rescue.

This program includes:

1. Inspection for defects (including a leak check).
2. Cleaning and disinfecting.
3. Repair as required.
4. Proper and sanitary storage of equipment.

4.2 INSPECTION FOR DEFECTS

The most important part of a respirator maintenance program is continual inspection of the devices. If properly performed, inspections will identify damaged or malfunctioning respirators before they can be used. Two types of inspections will be performed.

1. While the respirator is in use.
2. While it is being cleaned.

Since the use and cleaning will, to a large extent, be performed by the same personnel, these inspections may become concurrent.

4.3 FREQUENCY OF INSPECTION

OSHA requires that "All respirators be inspected before and after each use" and that those not used routinely, i.e., emergency escape and rescue devices, "shall be inspected after each use and at least montly..." Obviously, emergency escape and rescue devices do not require inspection before each use. Records of inspections are kept on forms presented in Section VI-Program Administration and Documentation.

4.4 INSPECTION PROCEDURES

Respirator inspection shall include checking of:

1. Tightness of the connections.
2. Facepiece.
3. Valves.

4. Connecting tubes.
5. Canisters, filters, or cartridges.

In addition, the regulator and warning devices on a SCBA shall be checked for proper functions.

#### 4.5 FIELD INSPECTION OF AIR-PURIFYING RESPIRATORS

Routinely used air-purifying respirators will be checked as follows before and after each use:

1. Examine the facepiece for:
  - a. Excessive dirt.
  - b. Cracks, tears, holes or physical distortion of shape from improper storage.
  - c. Inflexibility of rubber facepiece (stretch and knead to restore flexibility).
  - d. Cracked or badly scratched lenses in full facepieces.
  - e. Incorrectly mounted full facepiece lenses, or broken or missing mounting clips.
  - f. Cracked or broken air-purifying element holder(s), badly worn threads or missing gasket(s).
2. Examine the head straps or head harness for:
  - a. Breaks.
  - b. Loss of elasticity.
  - c. Broken or malfunctioning buckles and attachments.
  - d. Excessively worn serrations on head harness, which might permit slippage (full facepieces only).
3. Examine the exhalation valve for the following after removing its cover:
  - a. Foreign material, such as detergent residue, dust particles or human hair under valve seat.
  - b. Cracks, tears or distortion in the valve material.
  - c. Improper insertion of the valve body in the facepiece.
  - d. Cracks, breaks or chips in the valve body, particularly the sealing surface.
  - e. Missing or defective valve cover.
  - f. Improper installation of the valve in the valve body.
4. Examine the air-purifying element(s) for:

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- a. Incorrect cartridge, canister or filter for the hazard.
- b. Incorrect installation, loose connections, missing or worn gasket or cross threading in the holder.
- c. Expired shelf-life date on the cartridge or canister.
- d. Cracks or dents in the outside case of the filter, cartridge or canister, indicated by the absence of sealing material, tape, foil, etc. over the inlet.
- e. Identical cartridges if more than one are used.

#### 4.6 CARE AND CLEANING OF SELF-CONTAINED BREATHING APPARATUS (SCBA)

The proper care of SCBAs involves:

1. Inspection for defects.
2. Cleaning and disinfecting.
3. Repair.
4. Storage.

The following checklist is to be used by personnel whenever they have to check out an SCBA. (Note: Any discrepancy found should be cause to set the unit aside until it can be repaired by a certified repair-person.)

1. Preliminary inspection. Check to ensure that:
  - a. High-pressure hose connector is tight on cylinder fitting.
  - b. Bypass valve is closed.
  - c. Mainline valve is closed.
  - d. There is no cover or obstruction on regulator outlet.
  - e. Pressure in the tank is at least 1800 psi.
2. Backpack and harness assembly.
  - a. Straps
    1. Visually inspect for complete set.
    2. Visually inspect for frayed or damaged straps that may break during use.
  - b. Buckles
    1. Visually inspect for mating ends.
    2. Check locking function.
  - c. Backplate and cylinder lock
    1. Visually inspect backplate for cracks and for missing rivets or screws.
    2. Visually inspect cylinder hold-down strap and physically check strap tightener and lock to ensure that it is fully engaged.

3. Cylinder and cylinder valve assembly

a. Cylinder

1. Physically check cylinder to ensure that it is tightly fastened to backplate.
2. Check hydrostatic test date to ensure that it is current.<sup>1</sup>
3. Visually inspect cylinder for large dents or gouges in metal.

b. Head and valve assembly

1. Visually inspect cylinder valve lock for presence.
2. Visually inspect cylinder gauge for condition of face, needle, and lens.
3. Open cylinder valve and listen or feel for leakage around packing. (If leakage is noted, do not use until repaired.). Note function of valve lock.

4. Regulator and high-pressure hose

a. High-pressure hose and connector

Listen or feel for leakage in hose or at hose-to-cylinder connector. (Bubble in outer hose covering may be caused by seepage of air through hose when stored under pressure. This does not necessarily mean a faulty hose.)

b. Regulator and low-pressure alarm

1. Cover outlet of regulator with palm of hand. Open mainline valve and read regulator gauge (must read at least 1800 psi and not more than rated cylinder pressure).
2. Close cylinder valve and slowly move hand from regulator outlet to allow slow flow of air. Gauge should begin to show immediate loss of pressure as air flows. Low-pressure alarm should sound between 650 and 550 psi. Remove hand completely from outlet and close mainline valve.
3. Place mouth onto or over regulator outlet and blow. A positive pressure should be created and maintained for 5 to 10 seconds without any loss of air. Next, establish a slight negative pressure in regulator and hold for 5 to 10 sec. Vacuum should remain constant. This tests the integrity of the diaphragm. Any loss of pressure or vacuum during this test indicates a leak in the apparatus.

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<sup>1</sup>Monthly inspection only.

4. Open cylinder valve.
  5. Place hand over regulator outlet and open mainline valve. Remove hand from outlet and replace in rapid movement. Repeat twice. Air should escape when hand is removed each time, indicating a positive pressure in chamber. Close mainline valve and remove hand from outlet.
  6. Ascertain that no obstruction is in or over the regulator outlet. Open and close the bypass valve momentarily to ensure flow of air through bypass system.
5. Facepiece and corrugated breathing tube.
- a. Facepiece
    1. Visually inspect head harness for damaged serrations and deteriorated rubber. Visually inspect rubber facepiece body for signs of deterioration or extreme distortion.
    2. Visually inspect lens for proper seal in rubber facepiece, retaining clamp properly in place, and cracks or large scratches.
    3. Visually inspect exhalation valve for visible deterioration or foreign materials buildup.
  - b. Breathing tube and connector
    1. Stretch breathing tube and visually inspect for deterioration and holes.
    - (2) Visually inspect connector to ensure good condition of threads and for presence and proper condition of "O" ring or rubber gasket seal.
    - (3) Negative pressure test on facepiece.<sup>2</sup>
      - (a) Don backpack and facepiece.
      - (b) With facepiece held tightly to face or facepiece properly donned, stretch breathing tube to open corrugations and place thumb or hand over end of connector.
      - (c) Inhale. Negative pressure should be created inside mask, causing it to pull tightly to face. This negative pressure should be maintained for 5 to 10 sec. If negative pressure leaks down, the facepiece assembly is not adequate and should not be worn.

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<sup>2</sup>For regular monthly inspection, only steps (b) and (c) of procedure are necessary.

6. Storage of units. Check that:
- a. Cylinder is refilled as necessary and unit is cleaned and inspected.
  - b. Cylinder valve is closed.
  - c. High-pressure hose connector is tight on cylinder.
  - d. Pressure is bled off high-pressure hose and regulator.
  - e. Bypass valve is closed.
  - f. Mainline valve is closed.
  - g. All straps are completely loosened and laid straight.
  - h. Facepiece is properly stored to protect against dust, sunlight, heat, extreme cold, excess moisture, and damaging chemicals.

#### 4.7 CLEANING AND SANITIZING

Any good detergent may be used followed by a disinfecting rinse or a combination disinfectant-detergent for a one step operation. Reliable, effective disinfectants may be made from readily available household solutions, including:

1. Hypochlorite solution (50 ppm of chlorine) made by adding approximately two milliliters of bleach (such as Clorox) to one liter of water, or two tablespoons of bleach per gallon of water. A two-minute immersion disinfects the respirators.
2. Aqueous solution of iodine (50 ppm of iodine) made by adding approximately 0.8 milliliters of tincture of iodine per liter of water, or one teaspoon of tincture of iodine per gallon of water. Again, a two-minute immersion is sufficient.

To prevent damaging the rubber and plastic in the respirator facepieces, the cleaning water should not exceed 140°F, but it should not be less than 120°F to ensure adequate cleaning.

#### 4.8 RINSING

The cleaned and disinfected respirators should be rinsed thoroughly in water (140°F maximum) to remove all traces of detergent and disinfectant. This is very important for preventing dermatitis.

#### 4.9 DRYING

The respirators may be allowed to dry in room air on a clean surface. They may also be hung from a horizontal wire, like drying clothes, but care must be taken not to damage or distort the facepieces.

#### 4.10 REASSEMBLY AND INSPECTION

The clean, dry respirator facepieces should be reassembled and inspected in an area separate from the disassembly area to avoid contamination. The inspection procedures have been discussed; special emphasis should be given to inspecting the respirators for detergent or soap residue left by inadequate rinsing. This appears most often under the seat of the exhalation valve, and can cause valve leakage or sticking.

The respirator should be thoroughly inspected and all defects corrected. New or retested cartridges and canisters should be installed, and the completely reassembled respirator should be tested for leaks.

For SCBA devices, the facepiece should be combined with the tested regulator and the fully charged cylinder, and an operational check performed.

#### 4.11 MAINTENANCE AND REPAIR

Replacement or repair shall be done only by trained, experienced persons with parts designed for the respirator. Besides being contrary to OSHA requirements, substitution of parts from a different brand or type of respirator invalidates approval of the device.

This restriction applies particularly to maintenance of the more complicated devices, especially SCBA, and more specifically, regulator valves and low pressure warning devices. These devices should be returned to the manufacturer or to a trained technician for adjustment or repair.

No problems are anticipated in repairing and maintaining most simple respirators, particularly the commonly used air-purifying type.

#### 4.12 RESPIRATOR STORAGE

Respirators must be stored to protect against:

1. Dust.
2. Sunlight.
3. Heat.
4. Extreme cold.
5. Excessive moisture.
6. Damaging chemicals.
7. Mechanical damage.

Damage and contamination of respirators may take place if they are stored on a workbench, or in a tool cabinet or toolbox, among heavy tools, greases and dirt or in a vehicle.

Freshly cleaned respirators should be placed in reusable plastic bags until reissue. They should be stored in a clean, dry location away from direct sunlight. They should be placed in a single layer with the facepiece and exhalation valve in an undistorted position to prevent rubber or plastic from taking a permanent distorted "set".

APPENDIX H  
TABLE OF CHEMICAL TOXICITY  
AND OTHER INFORMATION

11.86.71  
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APPENDIX H  
VAPOR EMISSION RESPONSE PLAN

The vapor emission response plan is divided into three sections, the minor and major emission responses and a borehole location evacuation plan.

Minor Emission Response Plan

If the ambient air concentration of organic vapors exceeds 5 ppm above background in the breathing zone at the work zone perimeter (i.e., approximately 3-5 feet from and above borehole), the drilling activities will be halted and monitoring continued. If the organic level decreases below 5 ppm, then drilling activities can resume with increased monitoring.

Drilling activities can also resume (with appropriate personnel protection) if the organic level is above 5 ppm and below 50 ppm at the work zone perimeter, other parameters permitting (e.g., the LEL at the wellhead is below 20 percent, and the H<sub>2</sub>S level is below 10 ppm). However, the organic level 200 feet downwind of the work zone must not exceed 5 ppm above background.

If the organic level is above 50 ppm, or the H<sub>2</sub>S level is above 10 ppm at the work zone perimeter, then the Site Safety Officer must be notified and well drilling activities stopped.

If the LEL level exceeds 20 percent all drilling activities shall be stopped immediately and all engines (ignition sources) will be turned off. Drilling personnel will leave the area and notify the Site Safety Officer.

Major Emission Response Plan

If any of the following levels are identified approximately 200 feet downwind from the work zone perimeter, all drilling activities must stop:

- 1) organic levels greater than 5 ppm above background.
- 2) LEL greater than 20 percent or
- 3) H<sub>2</sub>S levels greater than 10 ppm.

If any of the above levels persist after cessation of drilling activities, then the following contingency plan shall be placed into effect.

1. The perimeter of the closest downwind residential or commercial property will be monitored. If organic vapor levels approach 5 ppm, or if H<sub>2</sub>S levels approach 10 ppm above background, then the local police authorities will be immediately contacted by the Site Safety Officer.
2. The appropriate personnel listed on the Master Phone List are to be notified by the Site Safety Officer.

In the event of a significant gas release (sudden visual and/or audible release) or excessive volatile emissions (organic level greater than 5 ppm above background located 200 feet downwind) during the well drilling program, the response action described below will be carried out.

Response Action

The well drillers will immediately proceed as follows:

- 1) Break the drill rods at the nearest joint unless the rods can be removed from the hole in one lift.
- 2) As soon as possible, leave the site and notify the Site Safety Officer. The well drillers shall not proceed with remedial efforts until instructed to do so by the Site Safety Officer.

The Site Safety Officer will determine if a minor or major vapor emission condition (as defined in the previous Section) exists and will activate the appropriate Vapor Emission Response Plan.

If a major emission response action is warranted, the drillers, wearing the proper level of protection, will then seal off the borehole using a bentonite slurry grout and abandon the hole.

11.86.71  
0119.0.0

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001  
0158



# BENZENE

BNZ

<p><b>Common Synonyms</b> Benzol Benzole</p>		<p><b>Wetery liquid</b></p>	<p><b>Colorless</b></p>	<p><b>Gasoline-like odor</b></p>
<p>Flies on water. Flammable, irritating vapor is produced. Freezing point is 42°F.</p>				
<p>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.</p>				
<p><b>Fire</b></p>		<p><b>FLAMMABLE</b> 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.</p>		
<p><b>Exposure</b></p>		<p><b>CALL FOR MEDICAL AID</b> <b>VAPOR</b> 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. <b>LIQUID</b> 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.</p>		
<p><b>Water Pollution</b></p>		<p><b>HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS</b> May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.</p>		
<p><b>1. RESPONSE TO DISCHARGE</b> (See Response Methods Handbook) Issue warning-high flammability. Restrict access.</p>		<p><b>2. LABEL</b> 2.1 Category: Flammable liquid 2.2 Class: 3</p>		
<p><b>3. CHEMICAL DESIGNATIONS</b> 3.1 CG Compatibility Class: Aromatic Hydrocarbon 3.2 Formula: C<sub>6</sub>H<sub>6</sub> 3.3 IMO/IUN Designator: 3.2/1114 3.4 DOT ID No.: 1114 3.5 CAS Registry No.: 71-43-2</p>		<p><b>4. OBSERVABLE CHARACTERISTICS</b> 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Aromatic; rather pleasant aromatic odor; characteristic odor</p>		
<p><b>5. HEALTH HAZARDS</b></p> <p>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 Limit: 75 ppm for 30 min. 5.6 Toxicity by Ingestion: Grade 3; LD<sub>50</sub> = 50 to 800 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: Mucous 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</p>				

<p><b>6. FIRE HAZARDS</b></p> <p>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</p>		<p><b>10. HAZARD ASSESSMENT CODE</b> (See Hazard Assessment Handbook) A-T-4J-V-W</p>																																					
<p><b>7. CHEMICAL REACTIVITY</b></p> <p>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</p>		<p><b>11. HAZARD CLASSIFICATIONS</b></p> <p>11.1 Code of Federal Regulations: Flammable liquid 11.2 NAB Hazard Rating for Bulk Water Transportations:</p> <table border="1"> <thead> <tr> <th>Category</th> <th>Rating</th> </tr> </thead> <tbody> <tr> <td>Fire</td> <td>3</td> </tr> <tr> <td>Health</td> <td></td> </tr> <tr> <td>Vapor Irritant</td> <td>1</td> </tr> <tr> <td>Liquid or Solid Irritant</td> <td>1</td> </tr> <tr> <td>Poisons</td> <td>3</td> </tr> <tr> <td>Water Pollution</td> <td></td> </tr> <tr> <td>Human Toxicity</td> <td>3</td> </tr> <tr> <td>Aquatic Toxicity</td> <td>1</td> </tr> <tr> <td>Aesthetic Effect</td> <td>3</td> </tr> <tr> <td>Reactivity</td> <td></td> </tr> <tr> <td>Other Chemicals</td> <td>2</td> </tr> <tr> <td>Water</td> <td>1</td> </tr> <tr> <td>Self Reaction</td> <td>0</td> </tr> </tbody> </table> <p>11.3 NFPA Hazard Classification:</p> <table border="1"> <thead> <tr> <th>Category</th> <th>Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td> <td>2</td> </tr> <tr> <td>Flammability (Red)</td> <td>3</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td>C</td> </tr> </tbody> </table>		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	Category	Classification	Health Hazard (Blue)	2	Flammability (Red)	3	Reactivity (Yellow)	C
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<p><b>8. WATER POLLUTION</b></p> <p>8.1 Aquatic Toxicity: 5 ppm/6 hr/minnow/lethal/dissolved water 20 ppm/24 hr/minnow/TL<sub>50</sub>/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</p>		<p><b>12. PHYSICAL AND CHEMICAL PROPERTIES</b></p> <p>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 = 4.86 MN/m<sup>2</sup> 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): 1.051 12.12 Latent Heat of Vaporization: 189 Btu/lb = 84.1 cal/g = 3.94 x 10<sup>5</sup> J/kg 12.13 Heat of Combustion: -17,460 Btu/lb = -8098 cal/g = -408.0 x 10<sup>3</sup> J/kg 12.14 Heat of Decomposition: Not pertinent 12.15 Heat of Solution: Not pertinent 12.16 Heat of Polymerization: Not pertinent 12.18 Heat of Fusion: 30.45 cal/g 12.19 Limiting Value: Data not available 12.27 Reid Vapor Pressure: 3.22 psia</p>																																					
<p><b>9. SHIPPING INFORMATION</b></p> <p>9.1 Grades of Purity: Industrial pure ..... 99+ % Thiourene-free ..... 99+ % Nitrosen ..... 99+ % Industrial 90% ..... 95+ % Reagent ..... 99+ % 9.2 Storage Temperature: Open 9.3 Inert Atmosphere: No requirement 9.4 Venting: Pressure-relieff</p>		<p><b>NOTES</b></p>																																					

IMP 001 0159

# 1,1-DICHLOROETHANE

DCH

<p><b>Common Synonyms</b>                  Ethylene chloride                  Ethylene dichloride                  Chlorinated hydrocarbon ether</p>	<p><b>Oil liquid</b>                  Colorless                  Chloroform like ether</p>	<p>Sinks and mixes with water.</p>
<p>Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves).                  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.</p>		
<p style="text-align: center;"><b>Fire</b></p>	<p>Flammable.  <b>POISONOUS GAS MAY BE PRODUCED IN FIRE OR WHEN HEATED.</b>                  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.</p>	
<p style="text-align: center;"><b>Exposure</b></p>	<p>CALL FOR MEDICAL AID.  <b>LIQUID</b>                  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.</p>	
<p style="text-align: center;"><b>Water Pollution</b></p>	<p>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.</p>	
<p style="text-align: center;"><b>1. RESPONSE TO DISCHARGE</b>                  (See Response Methods Handbook)                  Issue warning-high flammability.                  Restrict access.                  Chemical and physical treatment.</p>		<p style="text-align: center;"><b>2. LABEL</b>                  2.1 Category: None                  2.2 Class: Not pertinent</p>
<p style="text-align: center;"><b>3. CHEMICAL DESIGNATIONS</b></p> <p>3.1 CG Competibility Class: Halogenated hydrocarbon                  3.2 Formula: C<sub>2</sub>H<sub>2</sub>Cl<sub>2</sub>                  3.3 IMO/IUN Designator: Not listed                  3.4 DOT ID No.: 2362                  3.5 CAS Registry No.: 75-34-3</p>		<p style="text-align: center;"><b>4. OBSERVABLE CHARACTERISTICS</b></p> <p>4.1 Physical State (as shipped):                  Oil liquid                  4.2 Color: Colorless                  4.3 Odor: Chloroform</p>
<p style="text-align: center;"><b>5. HEALTH HAZARDS</b></p> <p>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: <b>INHALATION:</b> Irritation of respiratory tract. Sore throat, sneezing, coughing, dizziness, nausea, and vomiting. <b>EYES:</b> Irritation, lacrimation, and reddening of conjunctiva. <b>SKIN:</b> Irritation. Prolonged or repeated skin contact can produce a slight burn. <b>INGESTION:</b> 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. <b>INHALATION:</b> Remove from contaminated area; keep warm and quiet. If breathing has stopped, give artificial respiration. Administer oxygen. <b>EYES:</b> Flush with large amounts of water or weak bicarbonate of soda solution. <b>SKIN:</b> Dilute with large amounts of water. Remove contaminated clothing. <b>INGESTION:</b> 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 Limit: 250 ppm.                  5.6 Toxicity by Ingestion: Grade 2; LD<sub>50</sub> = 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</p>		

<p style="text-align: center;"><b>6. FIRE HAZARDS</b></p> <p>6.1 Flash Point: 57°F O.C. = 22°F C.C.                  6.2 Flammable Limits in Air: 5.8% to 11.4%                  6.3 Fire Extinguishing Agents: Alcohol foam, water, foam, CO<sub>2</sub>, 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</p>	<p style="text-align: center;"><b>10. HAZARD ASSESSMENT CODE</b>                  (See Hazard Assessment Handbook)  <b>A-P-O-R-S</b></p>
<p style="text-align: center;"><b>7. CHEMICAL REACTIVITY</b></p> <p>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: Data not available                  7.7 Molar Ratio (Reactant to Product): Data not available                  7.8 Reactivity Group: 36</p>	<p style="text-align: center;"><b>11. HAZARD CLASSIFICATIONS</b></p> <p>11.1 Code of Federal Regulations: Not listed                  11.2 NIOSH Hazard Rating for Bulk Water Transportation: Not listed                  11.3 NFPA Hazard Classification:                  Health Hazard (Blue) ..... 2                  Flammability (Red) ..... 3                  Reactivity (Yellow) ..... 0</p>
<p style="text-align: center;"><b>8. WATER POLLUTION</b></p> <p>8.1 Aquatic Toxicity:                  TL<sub>50</sub> (Marine perch) 250 to 275 mg/l                  24-hour TL<sub>50</sub> Brevi shrewp: 320 mg/l                  24-hour TL<sub>50</sub> Perch: 180 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</p>	<p style="text-align: center;"><b>12. PHYSICAL AND CHEMICAL PROPERTIES</b></p> <p>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 = -87.4°C = 176.75°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<sup>2</sup>                  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 (86°F)                  12.12 Latent Heat of Vaporization:                  131.6 Btu/lb = 73.1 cal/g = 3.06 X 10<sup>4</sup> J/kg                  12.13 Heat of Combustion: -4,774 Btu/lb = -2,852 cal/g = -111 X 10<sup>4</sup> 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: 7.25 psia</p>
<p style="text-align: center;"><b>9. SHIPPING INFORMATION</b></p> <p>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</p>	
<p>NOTES</p>	

IMP 001 0160

# ETHYLENE DICHLORIDE

EDC

<p><b>Common Synonyms</b></p> <p>1, 2-Dichloroethane Ethylene chloride EDC Brocade Dutch liquid Glycol dichloride</p>	<p><b>Liquid</b></p> <p>Sinks in water. Flammable, irritating vapor is produced.</p>	<p><b>Colorless</b></p>	<p><b>Sweet odor</b></p>
<p>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.</p>			
<b>Fire</b>	<p><b>FLAMMABLE. POISONOUS GASES ARE PRODUCED IN FIRE.</b> 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.</p>		
<b>Exposure</b>	<p><b>CALL FOR MEDICAL AID</b></p> <p><b>VAPOR</b> 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.</p> <p><b>LIQUID</b> 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.</p>		
<b>Water Pollution</b>	<p>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.</p>		
<p><b>1. RESPONSE TO DISCHARGE</b> (See Response Methods Handbook) Issue warning-high flammability Dispense and flush</p>		<p><b>2. LABEL</b></p> <p>2.1 Category: Flammable liquid 2.2 Class: 3</p>	
<p><b>3. CHEMICAL DESIGNATIONS</b></p> <p>3.1 CG Compatibility Class: Halogenated hydrocarbon 3.2 Formula: C<sub>2</sub>H<sub>2</sub>Cl<sub>2</sub> 3.3 IMO/UN Designation: 3.2/1184 3.4 DOT ID No.: 1184 3.5 CAS Registry No.: 107-06-2</p>		<p><b>4. OBSERVABLE CHARACTERISTICS</b></p> <p>4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Etheral; chloroform-like; ether-like</p>	
<p><b>5. HEALTH HAZARDS</b></p>			
<p>6.1 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.</p> <p>6.2 Symptoms Following Exposure: Inhalation of vapors causes nausea, dizziness, depression. Contact of liquid with eyes may produce corneal injury. Prolonged contact with skin may cause a burn.</p> <p>6.3 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.</p> <p>6.4 Threshold Limit Value: 10 ppm</p> <p>6.5 Short Term Inhalation Limits: 200 ppm for 5 min. during any 3-hour period.</p> <p>6.6 Toxicity by Ingestion: Grade 2, LD<sub>50</sub> = 0.5 to 5 g/kg (rat)</p> <p>6.7 Late Toxicity: Data not available</p> <p>6.8 Vapor (Gas) Irritant Characteristics: Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.</p> <p>6.9 Liquid or Solid Irritant Characteristics: Causes stinging of the skin and first-degree burns on short exposure; may cause secondary burns on long exposure.</p> <p>6.10 Odor Threshold: 100 ppm</p> <p>6.11 IDLH Value: 1,000 ppm</p>			

<p><b>6. FIRE HAZARDS</b></p> <p>6.1 Flash Point: 60°F O.C.; 56°F C.C.</p> <p>6.2 Flammable Limits in Air: 6.2%-15.8%</p> <p>6.3 Fire Extinguishing Agents: Foam, carbon dioxide, dry chemical</p> <p>6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective.</p> <p>6.5 Special Hazards of Combustion Products: Toxic and irritating gases (hydrogen chloride, phosgene) are generated.</p> <p>6.8 Behavior in Fire: Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back.</p> <p>6.7 Ignition Temperature: 775°F</p> <p>6.8 Electrical Hazard: Class I, group D</p> <p>6.9 Burning Rate: 1.6 mm/min</p> <p>6.10 Adiabatic Flame Temperature: Data Not Available</p> <p style="text-align: right;"><i>(Continued)</i></p>	<p><b>10. HAZARD ASSESSMENT CODE</b> (See Hazard Assessment Handbook)</p> <p style="text-align: center;"><b>A-X</b></p>																																				
<p><b>7. CHEMICAL REACTIVITY</b></p> <p>7.1 Reactivity With Water: No reaction</p> <p>7.2 Reactivity with Common Materials: No reaction</p> <p>7.3 Stability During Transport: Stable</p> <p>7.4 Neutralizing Agents for Acids and Caustics: Not pertinent</p> <p>7.5 Polymerization: Not pertinent</p> <p>7.6 Inhibitor of Polymerization: Not pertinent</p> <p>7.7 Molar Ratio (Reactant to Product): Data Not Available</p> <p>7.8 Reactivity Group: 30</p>	<p><b>11. HAZARD CLASSIFICATIONS</b></p> <p>11.1 Code of Federal Regulations: Flammable liquid</p> <p>11.2 NIOSH Hazard Rating for Bulk Water Transportation:</p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Category</th> <th style="text-align: left;">Rating</th> </tr> </thead> <tbody> <tr> <td>Fire</td> <td>3</td> </tr> <tr> <td>Health</td> <td>2</td> </tr> <tr> <td>Vapor Irritant</td> <td>2</td> </tr> <tr> <td>Liquid or Solid Irritant</td> <td>2</td> </tr> <tr> <td>Poisons</td> <td>3</td> </tr> <tr> <td>Water Pollution</td> <td>3</td> </tr> <tr> <td>Human Toxicity</td> <td>2</td> </tr> <tr> <td>Aquatic Toxicity</td> <td>3</td> </tr> <tr> <td>Aesthetic Effect</td> <td>2</td> </tr> <tr> <td>Reactivity</td> <td>1</td> </tr> <tr> <td>Other Chemicals</td> <td>0</td> </tr> <tr> <td>Water</td> <td>0</td> </tr> <tr> <td>Self Reaction</td> <td>0</td> </tr> </tbody> </table> <p>11.3 NFPA Hazard Classification:</p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Category</th> <th style="text-align: left;">Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td> <td>2</td> </tr> <tr> <td>Flammability (Red)</td> <td>3</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td>1</td> </tr> </tbody> </table>	Category	Rating	Fire	3	Health	2	Vapor Irritant	2	Liquid or Solid Irritant	2	Poisons	3	Water Pollution	3	Human Toxicity	2	Aquatic Toxicity	3	Aesthetic Effect	2	Reactivity	1	Other Chemicals	0	Water	0	Self Reaction	0	Category	Classification	Health Hazard (Blue)	2	Flammability (Red)	3	Reactivity (Yellow)	1
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<p><b>8. WATER POLLUTION</b></p> <p>8.1 Aquatic Toxicity: 150 ppm*/ppm perch./TL<sub>50</sub>/soft water *Time period not specified</p> <p>8.2 Waterway Toxicity: Data not available</p> <p>8.3 Biological Oxygen Demand (BOD): 0.002 lb/lb, 5 days</p> <p>8.4 Food Chain Concentration Potential: None</p>	<p><b>12. PHYSICAL AND CHEMICAL PROPERTIES</b></p> <p>12.1 Physical State at 15°C and 1 atm: Liquid</p> <p>12.2 Molecular Weight: 98.96</p> <p>12.3 Boiling Point at 1 atm: 182.3°F = 83.5°C = 356.7°K</p> <p>12.4 Freezing Point: -32.3°F = -35.7°C = 237.5°K</p> <p>12.5 Critical Temperature: 550°F = 288°C = 561°K</p> <p>12.6 Critical Pressure: 735 psia = 50 atm = 5.1 MN/m<sup>2</sup></p> <p>12.7 Specific Gravity: 1.253 at 20°C (liquid)</p> <p>12.8 Liquid Surface Tension: 32.2 dynes/cm = 0.0322 N/m at 20°C</p> <p>12.9 Liquid Water Interfacial Tension: (est.) 30 dynes/cm = 0.03 N/m at 25°C</p> <p>12.10 Vapor (Gas) Specific Gravity: 3.4</p> <p>12.11 Ratio of Specific Heats of Vapor (Gas): 1.118</p> <p>12.12 Latent Heat of Vaporization: 136 Btu/lb = 78.4 cal/g = 3.2 x 10<sup>4</sup> J/kg</p> <p>12.13 Heat of Combustion: (est.) 3400 Btu/lb</p> <p>12.14 Heat of Decomposition: Not pertinent</p> <p>12.15 Heat of Solution: Not pertinent</p> <p>12.16 Heat of Polymerization: Not pertinent</p> <p>12.25 Heat of Fusion: 21.12 cal/g</p> <p>12.26 Limiting Value: Data Not Available</p> <p>12.27 Reid Vapor Pressure: 2.7 psia</p>																																				
<p><b>9. SHIPPING INFORMATION</b></p> <p>9.1 Grades of Purity: Commercial</p> <p>9.2 Storage Temperature: Ambient</p> <p>9.3 Inert Atmosphere: No requirement</p> <p>9.4 Venting: Pressure-vacuum</p>	<p><b>6. FIRE HAZARDS (Continued)</b></p> <p>6.11 Stoichiometric Air to Fuel Ratio: Data Not Available</p> <p>6.12 Flame Temperature: Data Not Available</p>																																				

IMP 001 0161

# 1,2-DICHLOROETHYLENE

DEL

<p><b>Common Synonyms</b>                  Acetylene dichloride                  ethy-dichloroethylene                  Dielom                  di-1, 2-dichloroethylene                  trans-1, 2-dichloroethylene</p>		<p>Liquid      Colorless      Sweet pleasant odor</p>
<p>Sinks in water. Flammable, irritating vapor is produced.</p>		
<p>Wear goggles and self-contained breathing apparatus                  Shut off ignition sources. Call fire department!                  Stop discharge if possible. Keep people away                  Isolate and remove discharged material                  Notify local health and pollution control agencies</p>		
<p><b>Fire</b></p>	<p><b>FLAMMABLE.</b>  <b>POISONOUS GASES MAY BE PRODUCED IN FIRE.</b>                  Containers may explode in fire.                  Flashback along vapor trail may occur.                  Vapor may explode if ignited in an enclosed area.                  Extinguish with dry chemicals, foam or carbon dioxide.                  Water may be ineffective on fire.                  Cool exposed containers with water.</p>	
<p><b>Exposure</b></p>	<p><b>CALL FOR MEDICAL AID.</b></p> <p><b>VAPOR</b>                  If inhaled will cause dizziness, nausea, vomiting, or                  difficult breathing.                  Move victim to fresh air.                  If breathing has stopped, give artificial respiration.                  If breathing is difficult, give oxygen.</p> <p><b>LIQUID</b>                  Harmful if swallowed.                  If SWALLOWED and victim is CONSCIOUS, have victim drink water                  or milk.</p>	
<p><b>Water Pollution</b></p>	<p>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.</p>	
<p><b>1. RESPONSE TO DISCHARGE</b>                  (See Response Methods Handbook)                  Issue warning-high flammability                  Restrict access                  Evacuate area                  Should be removed                  Chemical and physical treatment</p>	<p><b>2. LABEL</b></p> <p>2.1 Category: Flammable liquid                  2.2 Class: 3</p>	
<p><b>3. CHEMICAL DESIGNATIONS</b></p> <p>3.1 CG Compatibility Class: Not listed                  3.2 Formula: C<sub>2</sub>H<sub>2</sub>Cl<sub>2</sub>                  3.3 IMO/IUN Designation: 3.2/1150                  3.4 DOT ID No.: 1150                  3.5 CAS Registry No.: 540-58-0</p>	<p><b>4. OBSERVABLE CHARACTERISTICS</b></p> <p>4.1 Physical State (as shipped): Liquid                  4.2 Color: Colorless                  4.3 Odor: Ethereal, slightly acid, pleasant,                  chloroform-like</p>	
<p><b>5. HEALTH HAZARDS</b></p> <p>5.1 Personal Protective Equipment: Rubber gloves, safety goggles, air supply mask or self-contained breathing apparatus.                  5.2 Symptoms Following Exposure: Inhalation causes nausea, vomiting, weakness, tremor, epigastric cramps, central nervous depression. Contact with liquid causes irritation of eyes and (on prolonged contact) skin. Ingestion causes slight depression to deep necrosis.                  5.3 Treatment of Exposure: <b>INHALATION:</b> remove from further exposure; if breathing is difficult, give oxygen; if victim is not breathing, give artificial respiration, preferably mouth-to-mouth; give oxygen when breathing is resumed; call a physician. <b>EYES:</b> flush with water for at least 15 min. <b>SKIN:</b> wash well with soap and water. <b>INGESTION:</b> give gastric lavage and cathartics.                  5.4 Threshold Limit Value: 200 ppm                  5.5 Short Term Inhalation Limits: Data not available                  5.6 Toxicity by Ingestion: Grade 2; oral LD<sub>50</sub> = 770 mg/kg (rat)                  5.7 Late Toxicity: Produces liver and kidney injury in experimental animals                  5.8 Vapor (Gas) Irritant Characteristics: Data not available                  5.9 Liquid or Solid Irritant Characteristics: Data not available                  5.10 Odor Threshold: Data not available                  5.11 IDLH Value: 4,000 ppm</p>		

<p><b>6. FIRE HAZARDS</b></p> <p>6.1 Flash Point: 57°F C.C.                  6.2 Flammable Limits in Air: 9.7%-12.8%                  6.3 Fire Extinguishing Agents: Dry chemical, foam, carbon dioxide                  6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective.                  6.5 Special Hazards of Combustion Products: Phosgene and hydrogen chloride fumes may form in fires.                  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: 860°F                  6.8 Electrical Hazard: Data not available                  6.9 Burning Rate: 2.6 mm/min.                  6.10 Adiabatic Flame Temperature: Data not available</p> <p style="text-align: right;">(Continued)</p>	<p><b>10. HAZARD ASSESSMENT CODE</b>                  (See Hazard Assessment Handbook)                  A-X-Y</p> <p><b>11. HAZARD CLASSIFICATIONS</b></p> <p>11.1 Code of Federal Regulations: Flammable liquid                  11.2 MAS Hazard Rating for Bulk Water Transportation: Not listed                  11.3 NFPA Hazard Classification:                  Category      Classification                  Health Hazard (Blue) ..... 2                  Flammability (Red) ..... 3                  Reactivity (Yellow) ..... 2</p>
<p><b>7. CHEMICAL REACTIVITY</b></p> <p>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: Will not occur under ordinary conditions of shipment. The reaction is not vigorous.                  7.6 Inhibitor of Polymerization: None used                  7.7 Molar Ratio (Reactant to Product): Data not available                  7.8 Reactivity Group: Data not available</p>	<p><b>12. PHYSICAL AND CHEMICAL PROPERTIES</b></p> <p>12.1 Physical State at 15°C and 1 atm: Liquid                  12.2 Molecular Weight: 97.0                  12.3 Boiling Point at 1 atm:                  cis: 140°F = 60°C = 333°K                  trans: 118°F = 48°C = 321°K                  12.4 Freezing Point:                  cis: -114°F = -81°C = 192°K                  trans: -58°F = -50°C = 223°K                  12.5 Critical Temperature: Not pertinent                  12.6 Critical Pressure: Not pertinent                  12.7 Specific Gravity:                  1.27 at 25°C (liquid)                  12.8 Liquid Surface Tension:                  24 dynes/cm = 0.024 N/m at 20°C                  12.9 Liquid Water Interfacial Tension:                  (est.)                  30 dynes/cm = 0.030 N/m at 20°C                  12.10 Vapor (Gas) Specific Gravity: 3.34                  12.11 Ratio of Specific Heats of Vapor (Gas): 1.1468                  12.12 Latent Heat of Vaporization:                  130 Btu/lb = 72 cal/g =                  3.0 X 10<sup>4</sup> J/kg                  12.13 Heat of Combustion: -4,847.2 Btu/lb =                  -2,692.9 cal/g = -112.87 X 10<sup>4</sup> 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: Data not available</p>
<p><b>8. WATER POLLUTION</b></p> <p>8.1 Aquatic Toxicity: Data not available                  8.2 Water/Land Toxicity: Data not available                  8.3 Biological Oxygen Demand (BOD): Data not available                  8.4 Food Chain Concentration Potential: None</p>	<p><b>9. SHIPPING INFORMATION</b></p> <p>9.1 Grades of Purity: Commercial                  9.2 Storage Temperature: Ambient                  9.3 Inert Atmosphere: No requirement                  9.4 Venting: Pressure-vacuum</p>
<p><b>6. FIRE HAZARDS (Continued)</b></p> <p>6.11 Stoichiometric Air to Fuel Ratio: Data not available                  6.12 Flame Temperature: Data not available</p>	

IMP 001 0162

# 1,2-DICHLOROPROPANE

DPP

<p><b>Common Synonyms</b> Propylene dichloride Dichloropropane</p>		<p><b>Wettable liquid</b>      <b>Colorless</b>      <b>Sweet odor</b></p> <p>Sinks in water. Flammable, irritating vapor is produced.</p>
<p>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.</p>		
<p><b>Fire</b></p>	<p><b>FLAMMABLE GASES ARE PRODUCED IN FIRE.</b> Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles and self-contained breathing apparatus. Extinguish with foam, dry chemical, or carbon dioxide. Cool exposed containers with water.</p>	
<p><b>Exposure</b></p>	<p><b>CALL FOR MEDICAL AID.</b></p> <p><b>VAPOR</b> Irritating to eyes, nose and throat. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.</p> <p><b>LIQUID</b> 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.</p>	
<p><b>Water Pollution</b></p>	<p>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.</p>	
<p><b>1. RESPONSE TO DISCHARGE</b> (See Response Methods Handbook) Issue warning-high flammability. Evacuate area.</p>		<p><b>2. LABEL</b> 2.1 Category: Flammable liquid 2.2 Class: 3</p>
<p><b>3. CHEMICAL DESIGNATIONS</b> 3.1 CG Compatibility Class: Halogenated hydrocarbon 3.2 Formula: CH<sub>2</sub>ClCHCl<sub>2</sub> 3.3 IMO/UN Designation: 3.2/1279 3.4 DOT ID No.: 1279 3.5 CAS Registry No.: 78-87-6</p>		<p><b>4. OBSERVABLE CHARACTERISTICS</b> 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Sweet</p>
<p><b>5. HEALTH HAZARDS</b></p> <p>5.1 Personal Protective Equipment: Air supply in confined area, rubber gloves, chemical goggles, protective coveralls and rubber footwear. 5.2 Symptoms Following Exposure: Contact with skin or eyes may cause irritation. 5.3 Treatment of Exposure: <b>INHALATION:</b> remove to fresh air. <b>CONTACT WITH SKIN OR EYES:</b> wash skin thoroughly with soap and water. Flush eyes with water for 15 min. Call a doctor. 5.4 Threshold Limit Value: 75 ppm 5.5 Short Term Inhalation Limit: Data not available 5.6 Toxicity by Ingestion: Grade 2; LD<sub>50</sub> = 0.5 to 5 g/kg (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: Data not available 5.11 IDLH Value: 2,000 ppm</p>		

<p><b>6. FIRE HAZARDS</b></p> <p>6.1 Flash Point: 70°F O.C.; 80°F C.C. 6.2 Flammable Limits in Air: 3.4%-14.5% 6.3 Fire Extinguishing Agents: Foam, carbon dioxide, dry chemical. 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Toxic and irritating gases may be generated. 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: 1036°F 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: (est.) 3.2 mm/min. 6.10 Adiabatic Flame Temperature: Data not available 6.11 Steam/Smoke/Air to Fuel Ratio: Data not available 6.12 Flame Temperature: Data not available</p>	<p><b>7. CHEMICAL REACTIVITY</b></p> <p>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 Bases: 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: 33</p>	<p><b>8. HAZARD ASSESSMENT CODE</b> (See Hazard Assessment Handbook) A-X-Y</p>
<p><b>9. WATER POLLUTION</b></p> <p>9.1 Aquatic Toxicity: &gt;100 ppm/crustaceans/TL<sub>50</sub>/soft water 9.2 Waterfowl Toxicity: Data not available 9.3 Biological Oxygen Demand (BOD): Data not available 9.4 Food Chain Concentration Potential: None</p>		<p><b>10. HAZARD CLASSIFICATIONS</b></p> <p>10.1 Code of Federal Regulations: Flammable liquid 10.2 NAB 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 10.3 NFPA Hazard Classification: Category      Classification Health Hazard (Blue)                      2 Flammability (Red)                      3 Reactivity (Yellow)                      0</p>
<p><b>11. SHIPPING INFORMATION</b></p> <p>11.1 Grades of Purity: Refined 11.2 Storage Temperature: Ambient 11.3 Inert Atmosphere: No requirement 11.4 Venting: Pressure-vacuum</p>		<p><b>12. PHYSICAL AND CHEMICAL PROPERTIES</b></p> <p>12.1 Physical State at 15°C and 1 atm: Liquid 12.2 Molecular Weight: 102.9 12.3 Boiling Point at 1 atm: 206°F = 96.4°C = 369.6°K 12.4 Freezing Point: -148°F = -100°C = 173°K 12.5 Critical Temperature: Not pertinent 12.6 Critical Pressure: Not pertinent 12.7 Specific Gravity: 1.156 at 20°C (liquid) 12.8 Liquid Surface Tension: 29 dynes/cm = 0.029 N/m at 20°C 12.9 Liquid Water Intertacial Tension: 37.9 dynes/cm = 0.0379 N/m at 22.7°C 12.10 Vapor (Gas) Specific Gravity: 3.5 12.11 Ratio of Specific Heats of Vapor (Gas): 1.094 12.12 Latent Heat of Vaporization: 122 Btu/lb = 67.7 cal/g = 2.83 x 10<sup>4</sup> J/kg 12.13 Heat of Combustion: (est.) 7300 Btu/lb = 4100 cal/g = 170 x 10<sup>4</sup> J/kg 12.14 Heat of Decomposition: Not pertinent 12.15 Heat of Solution: Not pertinent 12.16 Heat of Polymerization: Not pertinent 12.17 Heat of Fusion: 13.53 cal/g 12.18 Limiting Value: Data not available 12.19 Reid Vapor Pressure: 1.9 psia</p>
<p>NOTES</p>		

IMP 001 0163

# ETHYLBENZENE

ETB

Common Synonyms Phenyltoluene EB	Liquid Flots on water. Flammable, irritating vapor is produced	Colorless	Sweet, gasoline-like odor
<p>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.</p>			
<b>Fire</b>	<p><b>FLAMMABLE.</b> 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.</p>		
<b>Exposure</b>	<p><b>CALL FOR MEDICAL AID.</b> <b>VAPOR</b> 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. <b>LIQUID</b> 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. <b>DO NOT INDUCE VOMITING.</b></p>		
<b>Water Pollution</b>	<p><b>HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.</b> Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.</p>		
<b>1. RESPONSE TO DISCHARGE</b> (See Response Methods Handbook) Mechanical containment Should be removed Chemical and physical treatment		<b>2. LABEL</b> 2.1 Category: Flammable liquid 2.2 Class: 3	
<b>1. CHEMICAL DESIGNATIONS</b> 3.1 CG Compatibility Class: Aromatic hydrocarbon 3.2 Formula: C <sub>8</sub> H <sub>10</sub> CH <sub>3</sub> 3.3 BPO/UN Designation: 3.3/1175 3.4 DOT ID No.: 1175 3.5 CAS Registry No.: 100-41-4		<b>4. OBSERVABLE CHARACTERISTICS</b> 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Aromatic	
<b>5. HEALTH HAZARDS</b>			
<p>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: <b>INHALATION:</b> If effects occur, remove victim to fresh air, keep him warm and quiet, and get medical help promptly; if breathing stops, give artificial respiration. <b>INGESTION:</b> induce vomiting only upon physician's approval; material in lung may cause chemical pneumonitis. <b>SKIN AND EYES:</b> 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 Limit: 200 ppm for 30 min. 5.6 Toxicity by Ingestion: Grade 2; LD<sub>50</sub> = 0.5 to 5 g/kg (rat) 5.7 Lethal 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 smearing 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</p>			

<b>6. FIRE HAZARDS</b> 6.1 Flash Point: 80°F O.C.; 89°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: 880°F 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: 5.8 mm/min. 6.10 Adiabatic Flame Temperature: Data Not Available <i>(Continued)</i>	<b>10. HAZARD ASSESSMENT CODE</b> (See Hazard Assessment Handbook) A-T-U																																				
<b>7. CHEMICAL REACTIVITY</b> 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 Bases: 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	<b>11. HAZARD CLASSIFICATIONS</b> 11.1 Code of Federal Regulation: Flammable liquid 11.2 HAS Hazard Rating for Bulk Water Transportation: <table border="1"> <thead> <tr> <th>Category</th> <th>Rating</th> </tr> </thead> <tbody> <tr> <td>Fire</td> <td>3</td> </tr> <tr> <td>Health</td> <td>2</td> </tr> <tr> <td>Vapor Irritant</td> <td>2</td> </tr> <tr> <td>Liquid or Solid Irritant</td> <td>2</td> </tr> <tr> <td>Poisons</td> <td>2</td> </tr> <tr> <td>Water Pollution</td> <td>1</td> </tr> <tr> <td>Human Toxicity</td> <td>1</td> </tr> <tr> <td>Aquatic Toxicity</td> <td>3</td> </tr> <tr> <td>Aesthetic Effect</td> <td>2</td> </tr> <tr> <td>Reactivity</td> <td>0</td> </tr> <tr> <td>Other Chemicals</td> <td>1</td> </tr> <tr> <td>Water</td> <td>0</td> </tr> <tr> <td>Self Reaction</td> <td>0</td> </tr> </tbody> </table> 11.3 NFPA Hazard Classification: <table border="1"> <thead> <tr> <th>Category</th> <th>Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td> <td>2</td> </tr> <tr> <td>Flammability (Red)</td> <td>3</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td>0</td> </tr> </tbody> </table>	Category	Rating	Fire	3	Health	2	Vapor Irritant	2	Liquid or Solid Irritant	2	Poisons	2	Water Pollution	1	Human Toxicity	1	Aquatic Toxicity	3	Aesthetic Effect	2	Reactivity	0	Other Chemicals	1	Water	0	Self Reaction	0	Category	Classification	Health Hazard (Blue)	2	Flammability (Red)	3	Reactivity (Yellow)	0
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Reactivity (Yellow)	0																																				
<b>8. WATER POLLUTION</b> 8.1 Aquatic Toxicity: 20 ppm/86 hr/daugl/TL <sub>50</sub> /fresh water 8.2 Waterway Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): 2.6% (theor.), 5 days 8.4 Food Chain Concentration Potential: None	<b>12. PHYSICAL AND CHEMICAL PROPERTIES</b> 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: -129°F = -85°C = 178°K 12.5 Critical Temperature: 651.0°F = 343.8°C = 617.1°K 12.6 Critical Pressure: 523 psia = 35.8 atm = 3.81 MN/m <sup>2</sup> 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 = 3.25 X 10 <sup>4</sup> J/kg 12.13 Heat of Combustion: -17,780 Btu/lb = -8177 cal/g = -413.5 X 10 <sup>4</sup> 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																																				
<b>9. SHIPPING INFORMATION</b> 9.1 Grades of Purity: Research grade: 99.99%; pure grade: 99.5%; technical grade: 99.0% 9.2 Storage Temperature: Ambient 9.3 Inert Atmosphere: No requirement 9.4 Venting: Open (Name arrester) or pressure-vacuum	<b>6. FIRE HAZARDS (Continued)</b> 6.11 Stoichiometric Air to Fuel Ratio: Data Not Available 6.12 Flame Temperature: Data Not Available																																				

IMP 001 0164

# TETRACHLOROETHANE

TEC

<b>Common Synonyms</b> 1, 1, 2, 2-Tetrachloroethane Acetylene tetrachloride	Liquid  Colorless to pale yellow  Sweet odor  Sinks in water.	
AVOID CONTACT WITH LIQUID AND VAPOR. KEEP PEOPLE AWAY. Wear rubber overclothing (including gloves). Stop discharge if possible. Isolate and remove discharged material. Notify local health and pollution control agencies.		
<b>Fire</b>	Not flammable Poisonous gases may be produced when heated.	
<b>Exposure</b>	CALL FOR MEDICAL AID.  <b>VAPOR</b> Irritating to eyes, nose and throat. Harmful if inhaled. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.  <b>LIQUID</b> POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED. Irritating to skin and eyes. If swallowed will cause nausea and vomiting. 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.	
<b>Water Pollution</b>	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.	
<b>1. RESPONSE TO DISCHARGE</b> (See Response Methods Handbook) Issue warning-poison, air contaminant Restrict access Should be removed Chemical and physical treatment	<b>2. LABEL</b> 2.1 Category: None 2.2 Class: Not pertinent	
<b>3. CHEMICAL DESIGNATIONS</b> 3.1 CG Compatibility Class: Halogenated hydrocarbon 3.2 Formula: Cl <sub>2</sub> CH-CHCl <sub>2</sub> 3.3 IMO/UN Designation: Not listed 3.4 DOT ID No.: 1702 3.5 CAS Registry No.: 1298-90-7	<b>4. OBSERVABLE CHARACTERISTICS</b> 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless yellowish green 4.3 Odor: Chloroform-like, pleasant like carbon tetrachloride; mild, sweetish, similar to several other chlorinated hydrocarbons.	
<b>5. HEALTH HAZARDS</b> 5.1 Personal Protective Equipment: Chemical safety goggles; plastic face shield; air- or oxygen-supplied mask; safety hat with brim; solvent-proof apron; synthetic rubber gloves 5.2 Symptoms Following Exposure: Compound is a powerful narcotic and liver poison; may also cause changes in blood composition and neurological disturbances. Repeated exposure by inhalation can be fatal. Ingestion causes vomiting, diarrhea, severe mucosal injury, liver necrosis, cyanosis, unconsciousness, loss of reflexes, and death. Contact with eyes causes irritation and lachrymation. Can be absorbed through the skin and may produce severe skin lesions. 5.3 Treatment of Exposure: INHALATION: remove victim from exposure; begin artificial respiration if breathing has ceased. INGESTION: induce vomiting; call a physician. EYES: irrigate with water for 15 min. SKIN: remove clothing; wash skin thoroughly with warm water and soap. 5.4 Threshold Limit Value: 1 ppm 5.5 Short Term Inhalation Limit: 10 ppm, 30 min. 5.6 Toxicity by Ingestion: Grade 3; oral LD <sub>50</sub> = 200 mg/kg (rat) 5.7 Late Toxicity: Liver poisoning, nervous disorders 5.8 Vapor (Gas) Irritant Characteristics: Vapor is moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If applied on clothing and allowed to remain, may cause smarting and reddening of the skin. 5.10 Odor Threshold: 0.5 ppm 5.11 IDLH Value: 180 ppm		

<b>6. FIRE HAZARDS</b> 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: Irritating hydrogen chloride vapor may form in fire. 6.6 Behavior in Fire: Data not available 6.7 Ignition Temperature: Not pertinent 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	<b>10. HAZARD ASSESSMENT CODE</b> (See Hazard Assessment Handbook)  A-X
<b>7. CHEMICAL REACTIVITY</b> 7.1 Reactivity With Water: No reaction 7.2 Reactivity with Common Materials: May attack some forms of plastics 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 Water Ratio (Reactant to Product): Data not available 7.8 Reactivity Group: 30	<b>11. HAZARD CLASSIFICATIONS</b> 11.1 Code of Federal Regulations: OSM-A 11.2 HAS Hazard Rating for Bulk Water Transportation: Not listed 11.3 NFPA Hazard Classification: Not listed
<b>8. WATER POLLUTION</b> 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Feed Chain Concentration Potential: Data not available	<b>12. PHYSICAL AND CHEMICAL PROPERTIES</b> 12.1 Physical State at 15°C and 1 atm: Liquid 12.2 Molecular Weight: 167.85 12.3 Boiling Point at 1 atm: 295.3°F = 146.3°C = 418.5°K 12.4 Freezing Point: -48.6°F = -43.8°C = 229.4°K 12.5 Critical Temperature: Data not available 12.6 Critical Pressure: Data not available 12.7 Specific Gravity: 1.595 at 20°C (liquid) 12.8 Liquid Surface Tension: 37.85 dynes/cm = 0.03785 N/m at 20°C 12.9 Liquid Water Intercatal Tension: Data not available 12.10 Vapor (Gas) Specific Gravity: 5.79 12.11 Ratio of Specific Heats of Vapor (Gas): 1.080 at 25°C 12.12 Latent Heat of Vaporization: 89.2 Btu/lb = 55.1 cal/g = 2.30 X 10 <sup>4</sup> 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 12.17 Heat of Fusion: Data not available 12.18 Limiting Value: Data not available 12.19 Reid Vapor Pressure: 0.6 psia
<b>9. SHIPPING INFORMATION</b> 9.1 Grades of Purity: Technical, 99% 9.2 Storage Temperature: Ambient 9.3 Inert Atmosphere: No requirement 9.4 Venting: Open	
NOTES	

IMP 001 0165

# TRICHLOROETHANE

TCE

<p><b>Common Synonyms</b> 1,1,1-Trichloroethane Methylchloroform Aerothene Chlorothene</p>	<p><b>Watery liquid</b>      <b>Colorless</b>      <b>Sweet odor</b></p> <p>Sinks in water. Irritating vapor is produced.</p>
<p>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.</p>	
<p><b>Fire</b></p>	<p><b>Combustible</b> <b>POISONOUS GASES ARE PRODUCED IN FIRE.</b> Wear goggles and self-contained breathing apparatus. Extinguish with dry chemical, carbon dioxide, or foam.</p>
<p><b>Exposure</b></p>	<p><b>CALL FOR MEDICAL AID.</b> <b>VAPOR</b> 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. <b>LIQUID</b> 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.</p>
<p><b>Water Pollution</b></p>	<p>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.</p>
<p><b>1. RESPONSE TO DISCHARGE</b> (See Response Methods Handbook) Should be removed Chemical and physical treatment</p>	<p><b>2. LABEL</b> 2.1 Category: None 2.2 Class: Not pertinent</p>
<p><b>3. CHEMICAL DESIGNATIONS</b> 3.1 CB Compatibility Class: Halogenated hydrocarbon 3.2 Formula: CH<sub>2</sub>Cl<sub>3</sub> 3.3 BRQ/UN Designation: Not listed 3.4 DOT ID No.: 2831 3.5 CAS Registry No.: 71-66-6</p>	<p><b>4. OBSERVABLE CHARACTERISTICS</b> 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Chloroform-like, sweetish</p>
<p><b>5. HEALTH HAZARDS</b></p> <p>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.</p> <p>5.2 Symptoms Following Exposure: <b>INHALATION:</b> 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. <b>INGESTION:</b> produces effects similar to inhalation and may cause some feeling of nausea. <b>EYES:</b> slightly irritating and lachrymatory. <b>SKIN:</b> defatting action may cause dermatitis.</p> <p>5.3 Treatment of Exposure: Get medical attention for all eye exposures and any other serious exposures. Do NOT administer adrenalin or epinephrine; otherwise, treatment is symptomatic. <b>INHALATION:</b> remove victim to fresh air; if necessary, apply artificial respiration and/or administer oxygen. <b>INGESTION:</b> have victim drink water and induce vomiting. <b>EYES:</b> flush thoroughly with water. <b>SKIN:</b> remove contaminated clothing and wash exposed area thoroughly with soap and warm water.</p> <p>5.4 Threshold Limit Value: 300 ppm 5.5 Short Term Inhalation Limit: 1,000 ppm for 80 min. in man 5.6 Toxicity by Ingestion: Grade 1; LD<sub>50</sub> = 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</p>	

<p><b>6. FIRE HAZARDS</b></p> <p>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: 532°F 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate (est.): 2.8 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</p>	<p><b>10. HAZARD ASSESSMENT CODE</b> (See Hazard Assessment Handbook) A-X-Y</p>																																				
<p><b>7. CHEMICAL REACTIVITY</b></p> <p>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 Oxidation (Resistant to Product): Data not available 7.8 Reactivity Group: 3B</p>	<p><b>11. HAZARD CLASSIFICATIONS</b></p> <p>11.1 Code of Federal Regulations: OSHA 11.2 NIOSH Hazard Rating for Bulk Water Transportation:</p> <table border="1"> <thead> <tr> <th>Category</th> <th>Rating</th> </tr> </thead> <tbody> <tr> <td>Fire</td> <td>1</td> </tr> <tr> <td>Health</td> <td></td> </tr> <tr> <td>Vapor Irritant</td> <td>1</td> </tr> <tr> <td>Liquid or Solid Irritant</td> <td>1</td> </tr> <tr> <td>Poisons</td> <td>2</td> </tr> <tr> <td>Water Pollution</td> <td></td> </tr> <tr> <td>Human Toxicity</td> <td>1</td> </tr> <tr> <td>Aquatic Toxicity</td> <td>3</td> </tr> <tr> <td>Aesthetic Effect</td> <td>2</td> </tr> <tr> <td>Reactivity</td> <td></td> </tr> <tr> <td>Other Chemicals</td> <td>1</td> </tr> <tr> <td>Water</td> <td>0</td> </tr> <tr> <td>Self Reaction</td> <td>0</td> </tr> </tbody> </table> <p>11.3 NFPA Hazard Classification:</p> <table border="1"> <thead> <tr> <th>Category</th> <th>Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td> <td>2</td> </tr> <tr> <td>Flammability (Red)</td> <td>1</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td>0</td> </tr> </tbody> </table>	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	Category	Classification	Health Hazard (Blue)	2	Flammability (Red)	1	Reactivity (Yellow)	0
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<p><b>8. WATER POLLUTION</b></p> <p>8.1 Aquatic Toxicity: 75-150 ppm*/pantel/TL<sub>50</sub>/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</p>	<p><b>12. PHYSICAL AND CHEMICAL PROPERTIES</b></p> <p>12.1 Physical State at 15°C and 1 atm: Liquid 12.2 Molecular Weight: 133.41 12.3 Boiling Point at 1 atm: 185°F = 74°C = 347°K 12.4 Freezing Point: &lt;-38°F = &lt;-39°C = &lt;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: 4.8 12.11 Ratio of Specific Heats of Vapor (Gas): 1.104 12.12 Latent Heat of Vaporization: 100 Btu/lb = 58 cal/g = 2.4 x 10<sup>6</sup> J/kg 12.13 Heat of Combustion (est.): 4700 Btu/lb = 2600 cal/g = 110 x 10<sup>6</sup> J/kg 12.14 Heat of Decomposition: Not pertinent 12.15 Heat of Solution: Not pertinent 12.16 Heat of Polymerization: Not pertinent 12.15 Heat of Fusion: Data not available 12.16 Limiting Value: Data not available 12.17 Reid Vapor Pressure: 4.0 psia</p>																																				
<p><b>9. SHIPPING INFORMATION</b></p> <p>9.1 Grades of Purity: Uninhibited; inhibited; industrial inhibited; white room; cold clearing 9.2 Storage Temperature: Ambient 9.3 Inert Atmosphere: No requirement 9.4 Venting: Pressure-vacuum</p>	<p><b>NOTES</b></p>																																				

IMP 001 0166



# TRICHLOROETHYLENE

TCL

<p><b>Common Synonyms</b></p> <p>Trichloroethylene Triclene, Algylen Chloroilen Gasmalgene Tresylene Tricloron: Trilene</p>		<p><b>Volatile liquid</b></p> <p>Colorless</p> <p>Sweet odor</p> <p>Sinks in water. Irritating vapor is produced.</p>
<p>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.</p>		
<p><b>Fire</b></p>	<p>Combustible. <b>POISONOUS GASES ARE PRODUCED IN FIRE.</b> Wear goggles and self-contained breathing apparatus. Extinguish with dry chemical, carbon dioxide, or foam.</p>	
<p><b>Exposure</b></p>	<p><b>CALL FOR MEDICAL AID.</b> <b>VAPOR</b> 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. <b>LIQUID</b> 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. <b>IF IN EYES,</b> hold eyelids open and flush with plenty of water. <b>IF SWALLOWED</b> and victim is <b>CONSCIOUS,</b> have victim drink water or milk and have victim induce vomiting. <b>IF SWALLOWED</b> and victim is <b>UNCONSCIOUS OR HAVING CONVULSIONS,</b> do nothing except keep victim warm.</p>	
<p><b>Water Pollution</b></p>	<p>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.</p>	
<p><b>1. RESPONSE TO DISCHARGE</b> (See Response Methods Handbook) Should be removed Chemical and physical treatment</p>		<p><b>2. LABEL</b></p> <p>2.1 Category: None 2.2 Class: Not pertinent</p>
<p><b>3. CHEMICAL DESIGNATIONS</b></p> <p>3.1 CG Compatibility Class: Halogenated hydrocarbon 3.2 Formula: <math>\text{CHCl}_2\text{-CCl}_2</math> 3.3 IMO/UN Designation: 9.0/1710 3.4 DOT ID No.: 1710 3.5 CAS Registry No.: 79-01-6</p>		<p><b>4. OBSERVABLE CHARACTERISTICS</b></p> <p>4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Chloroform-like; ethereal</p>
<p><b>5. HEALTH HAZARDS</b></p> <p>5.1 Personal Protective Equipment: Goggles, 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: <b>INHALATION:</b> 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. <b>INGESTION:</b> symptoms similar to inhalation. <b>SKIN:</b> defatting action can cause dermatitis. <b>EYES:</b> slightly irritating sensation and lachrymation. 5.3 Treatment of Exposure: Do NOT administer adrenalin or epinephrine; get medical attention for all cases of overexposure. <b>INHALATION:</b> remove victim to fresh air; if necessary, apply artificial respiration and/or administer oxygen. <b>INGESTION:</b> have victim drink water and induce vomiting; repeat three times; then give 1 tablespoon sodium salts in water. <b>EYES:</b> flush thoroughly with water. <b>SKIN:</b> 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; <math>\text{LD}_{50} = 80</math> to 800 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</p>		

<p><b>6. FIRE HAZARDS</b></p> <p>6.1 Flash Point: 80°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 Asbestos Flame Temperature: Data not available 6.11 Stochiometric Air to Fuel Ratio: Data not available 6.12 Flame Temperature: Data not available</p>	<p><b>10. HAZARD ASSESSMENT CODE</b> (See Hazard Assessment Handbook) A-X-Y</p>																																				
<p><b>7. CHEMICAL REACTIVITY</b></p> <p>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 Oxidizer Ratio (Resistant to Product): Data not available 7.8 Reactivity Group: 30</p>	<p><b>11. HAZARD CLASSIFICATIONS</b></p> <p>11.1 Code of Federal Regulations: ORM-A 11.2 NAB Hazard Rating for Bulk Water Transportation:</p> <table border="1"> <thead> <tr> <th>Category</th> <th>Rating</th> </tr> </thead> <tbody> <tr> <td>Fire</td> <td>1</td> </tr> <tr> <td>Health</td> <td></td> </tr> <tr> <td>Vapor Irritant</td> <td>1</td> </tr> <tr> <td>Liquid or Solid Irritant</td> <td>1</td> </tr> <tr> <td>Poisons</td> <td>2</td> </tr> <tr> <td>Water Pollution</td> <td></td> </tr> <tr> <td>Human Toxicity</td> <td>1</td> </tr> <tr> <td>Aquatic Toxicity</td> <td>2</td> </tr> <tr> <td>Aesthetic Effect</td> <td>2</td> </tr> <tr> <td>Reactivity</td> <td></td> </tr> <tr> <td>Other Chemicals</td> <td>1</td> </tr> <tr> <td>Water</td> <td>0</td> </tr> <tr> <td>Self Reaction</td> <td>1</td> </tr> </tbody> </table> <p>11.3 NFPA Hazard Classification:</p> <table border="1"> <thead> <tr> <th>Category</th> <th>Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td> <td>2</td> </tr> <tr> <td>Flammability (Red)</td> <td>1</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td>0</td> </tr> </tbody> </table>	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	Category	Classification	Health Hazard (Blue)	2	Flammability (Red)	1	Reactivity (Yellow)	0
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<p><b>8. WATER POLLUTION</b></p> <p>8.1 Aquatic Toxicity: 800 mg/L/40 hr/daphnia/ttl/fresh water 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Feed Chain Concentration Potential: None</p>	<p><b>12. PHYSICAL AND CHEMICAL PROPERTIES</b></p> <p>12.1 Physical State at 18°C and 1 atm: Liquid 12.2 Molecular Weight: 131.30 12.3 Boiling Point at 1 atm: 180°F = 87°C = 380°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): 1.118 12.12 Latent Heat of Vaporization: 103 Btu/lb = 57.2 cal/g = <math>2.4 \times 10^4</math> 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</p>																																				
<p><b>9. SHIPPING INFORMATION</b></p> <p>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</p>	<p><b>NOTES</b></p>																																				

IMP 001 0167

# TOLUENE

TOL

<p><b>Common Synonyms</b> Toluol Methylbenzene Methylbenzol</p>		<p><b>Watery liquid</b> Colorless Pleasant odor</p>
<p>Floats on water. Flammable, irritating vapor is produced.</p>		
<p>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.</p>		
<p><b>Fire</b></p>	<p><b>FLAMMABLE</b> 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.</p>	
<p><b>Exposure</b></p>	<p><b>CALL FOR MEDICAL AID</b> <b>VAPOR</b> 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. <b>LIQUID</b> 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. <b>DO NOT INDUCE VOMITING.</b></p>	
<p><b>Water Pollution</b></p>	<p>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.</p>	
<p><b>1. RESPONSE TO DISCHARGE</b> (See Response Methods Handbook) Isolate warning-high flammability. Evacuate area.</p>		<p><b>2. LABEL</b> 2.1 Category: Flammable liquid 2.2 Class: 3</p>
<p><b>3. CHEMICAL DESIGNATIONS</b> 3.1 CG Competibility Class: Aromatic Hydrocarbon 3.2 Formula: C<sub>7</sub>H<sub>8</sub> 3.3 IMO/IUN Designation: 3.2/1204 3.4 DOT ID No.: 1204 3.5 CAS Registry No.: 108-88-3</p>		<p><b>4. OBSERVABLE CHARACTERISTICS</b> 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Pungent, aromatic, benzene-like, distinct, pleasant</p>
<p><b>5. HEALTH HAZARDS</b> 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 inhaled, causes coughing, gagging, distress, and rapidly developing pulmonary edema. If ingested causes vomiting, griping, diarrhea, depressed respiration. 5.3 Treatment of Exposure: <b>INHALATION:</b> remove to fresh air, give artificial respiration and oxygen if needed; call a doctor. <b>INGESTION:</b> do NOT induce vomiting; call a doctor. <b>EYES:</b> flush with water for at least 15 min. <b>SKIN:</b> 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<sub>50</sub> = 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</p>		

<p><b>6. FIRE HAZARDS</b> 6.1 Flash Point: 40°F C.C.; 65°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: 897°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</p> <p style="text-align: right;">(Continued)</p>	<p><b>10. HAZARD ASSESSMENT CODE</b> (See Hazard Assessment Handbook) A-T-U</p>																												
<p><b>7. CHEMICAL REACTIVITY</b> 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</p>	<p><b>11. HAZARD CLASSIFICATIONS</b> 11.1 Code of Federal Regulations: Flammable liquid 11.2 IAS Hazard Rating for Bulk Water Transportation:  <table border="1"> <thead> <tr> <th>Category</th> <th>Rating</th> </tr> </thead> <tbody> <tr> <td>Fire</td> <td>3</td> </tr> <tr> <td>Health</td> <td></td> </tr> <tr> <td>Vapor Irritant</td> <td>1</td> </tr> <tr> <td>Liquid or Solid Irritant</td> <td>1</td> </tr> <tr> <td>Poisons</td> <td>2</td> </tr> <tr> <td>Water Pollution</td> <td></td> </tr> <tr> <td>Human Toxicity</td> <td>1</td> </tr> <tr> <td>Aquatic Toxicity</td> <td>3</td> </tr> <tr> <td>Aesthetic Effect</td> <td>2</td> </tr> <tr> <td>Reactivity</td> <td></td> </tr> <tr> <td>Other Chemicals</td> <td>1</td> </tr> <tr> <td>Water</td> <td>0</td> </tr> <tr> <td>Self Reaction</td> <td>0</td> </tr> </tbody> </table> </p>	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
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<p><b>8. WATER POLLUTION</b> 8.1 Aquatic Toxicity: 1180 mg/L/96 hr/aeribh/TL<sub>01</sub>/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</p>	<p><b>11.3 NFPA Hazard Classification:</b>  <table border="1"> <thead> <tr> <th>Category</th> <th>Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td> <td>2</td> </tr> <tr> <td>Flammability (Red)</td> <td>3</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td>0</td> </tr> </tbody> </table> </p>	Category	Classification	Health Hazard (Blue)	2	Flammability (Red)	3	Reactivity (Yellow)	0																				
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<p><b>9. SHIPPING INFORMATION</b> 9.1 Grades of Purity: Research, reagent, mixture of 99.5 + %, industrial, contains 94 + %, with 5% toluene and small amounts of benzene and nonaromatic hydrocarbons; 90/120: less pure than industrial. 9.2 Storage Temperature: Ambient 9.3 Inert Atmosphere: No requirements 9.4 Venting: Open (flame arrester) or pressure-vacuum</p>	<p><b>12. PHYSICAL AND CHEMICAL PROPERTIES</b> 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: -130°F = -85.0°C = 178.2°K 12.5 Critical Temperature: 605.4°F = 318.6°C = 581.8°K 12.6 Critical Pressure: 596.1 psi = 40.55 atm = 4.108 MN/m<sup>2</sup> 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 X 10<sup>5</sup> J/kg 12.13 Heat of Combustion: -17,430 Btu/lb = -8086 cal/g = -405.5 X 10<sup>3</sup> J/kg 12.14 Heat of Decomposition: Not pertinent 12.15 Heat of Solution: Not pertinent 12.16 Heat of Polymerization: Not pertinent 12.18 Heat of Fusion: 17.17 cal/g 12.19 Limiting Value: Data not available 12.27 Reid Vapor Pressure: 1.1 psi</p>																												
<p><b>6. FIRE HAZARDS (Continued)</b> 6.11 Stoichiometric Air to Fuel Ratio: Data not available 6.12 Flame Temperature: Data not available</p>																													

IMP 001 0168

# p-XYLENE

XLP

<p><b>Common Synonyms</b> 1,4-Dimethylbenzene Xylol</p>	<p><b>Watery liquid</b>      <b>Colorless</b>      <b>Sweet odor</b></p> <p>Floats on water. Flammable, irritating vapor is produced. Freezing point is 66°F.</p>
<p>Stop discharge if possible. Keep people away. Call fire department. Avoid contact with liquid and vapor. Isolate and remove discharged material. Notify local health and pollution control agencies.</p>	
<b>Fire</b>	<p><b>FLAMMABLE</b> Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear self-contained breathing apparatus. Extinguish with foam, dry chemical, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.</p>
<b>Exposure</b>	<p><b>CALL FOR MEDICAL AID</b></p> <p><b>VAPOR</b> Irritating to eyes, nose and throat. If inhaled, will cause dizziness, difficult breathing, or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.</p> <p><b>LIQUID</b> Irritating to skin and eyes. If swallowed, will cause nausea, vomiting, loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. <b>IF IN EYES</b>, hold eyes open and flush with plenty of water. <b>IF SWALLOWED</b> and victim is <b>CONSCIOUS</b>, have victim drink water or milk. <b>DO NOT INDUCE VOMITING.</b></p>
<b>Water Pollution</b>	<p><b>HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.</b> Floating to shorelines. May be dangerous if it enters water intakes.</p> <p>Notify local health and wildlife officials. Notify operators of nearby water intakes.</p>
<p><b>1. RESPONSE TO DISCHARGE</b> (See Response Methods Handbook) Issue warning-high flammability. Evacuate area. Should be removed. Chemical and physical treatment.</p>	<p><b>2. LABEL</b> 2.1 Category: Flammable liquid 2.2 Class: 3</p>
<p><b>3. CHEMICAL DESIGNATIONS</b></p> <p>3.1 CG Compatibility Class: Aromatic Hydrocarbon 3.2 Formula: <math>C_8H_{10}(CH_3)_2</math> 3.3 IMO/IUM Designation: 3.2/1307 3.4 DOT ID No.: 1307 3.5 CAS Registry No.: 106-42-3</p>	<p><b>4. OBSERVABLE CHARACTERISTICS</b></p> <p>4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Like benzene, characteristic aromatic</p>
<p><b>5. HEALTH HAZARDS</b></p>	
<p>5.1 Personal Protective Equipment: Approved canister or air-supplied mask, goggles or face shield; plastic gloves and boots.</p> <p>5.2 Symptoms Following Exposure: Vapors cause headache and dizziness. Liquid irritates eyes and skin. If taken into lungs, causes severe coughing, distress, and rapidly developing pulmonary edema. If ingested, causes nausea, vomiting, cramps, headache, and coma. Can be fatal. Kidney and liver damage can occur.</p> <p>5.3 Treatment of Exposure: <b>INHALATION:</b> remove to fresh air; administer artificial respiration and oxygen if required; call a doctor. <b>INGESTION:</b> do NOT induce vomiting; call a doctor. <b>EYES:</b> flush with water for at least 15 min. <b>SKIN:</b> wipe off, wash with soap and water.</p> <p>5.4 Threshold Limit Value: 100 ppm</p> <p>5.5 Short Term Inhalation Limit: 300 ppm for 30 min.</p> <p>5.6 Toxicity by Ingestion: Grade 3; <math>LD_{50}</math> = 80 to 800 mg/kg</p> <p>5.7 Late Toxicity: Kidney and liver damage.</p> <p>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.</p> <p>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.</p> <p>5.10 Odor Threshold: 0.05 ppm</p> <p>5.11 IDLH Value: 10,000 ppm</p>	

<p><b>6. FIRE HAZARDS</b></p>
<p>6.1 Flash Point: 91°F C.C.</p> <p>6.2 Flammable Limits in Air: 1.1%-6.6%</p> <p>6.3 Fire Extinguishing Agents: Foam, dry chemical, or carbon dioxide</p> <p>6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective</p> <p>6.5 Special Hazards of Combustion Products: Not pertinent</p> <p>6.6 Behavior in Fire: Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back.</p> <p>6.7 Ignition Temperature: 870°F</p> <p>6.8 Electrical Hazard: Class I, Group D</p> <p>6.9 Burning Rate: 5.8 mm/min</p> <p>6.10 Adiabatic Flame Temperature: Data not available</p> <p>6.11 Stoichiometric Air to Fuel Ratio: Data not available</p> <p>6.12 Flame Temperature: Data not available</p>
<p><b>7. CHEMICAL REACTIVITY</b></p>
<p>7.1 Reactivity With Water: No reaction</p> <p>7.2 Reactivity with Common Materials: No reaction</p> <p>7.3 Stability During Transport: Stable</p> <p>7.4 Neutralizing Agents for Acids and Caustics: Not pertinent</p> <p>7.5 Polymerization: Not pertinent</p> <p>7.6 Inhibitor of Polymerization: Not pertinent</p> <p>7.7 Water Ratio (Reactant to Product): Data not available</p> <p>7.8 Reactivity Group: 32</p>

<p><b>8. WATER POLLUTION</b></p>
<p>8.1 Aquatic Toxicity: 22 ppm/96 hr/bluegill/TL<sub>50</sub>/fresh water</p> <p>8.2 Waterfowl Toxicity: Data not available</p> <p>8.3 Biological Oxygen Demand (BOD): 0 lb/lb in 5 days</p> <p>8.4 Feed Chain Concentration Potential: Data not available</p>

<p><b>9. SHIPPING INFORMATION</b></p>
<p>9.1 Grades of Purity: Research: 99.99%; Pure: 99.9%; Technical: 99.0%</p> <p>9.2 Storage Temperature: Ambient</p> <p>9.3 Inert Atmosphere: No requirement</p> <p>9.4 Venting: Open (flame arrester) or pressure-vacuum</p>

<p><b>10. HAZARD ASSESSMENT CODE</b> (See Hazard Assessment Handbook) <b>A-T-U</b></p>																																				
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<p>11.1 Code of Federal Regulations: Flammable liquid</p> <p>11.2 NAS Hazard Rating for Bulk Water Transportation:</p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Category</th> <th style="text-align: right;">Rating</th> </tr> </thead> <tbody> <tr> <td>Fire</td> <td style="text-align: right;">3</td> </tr> <tr> <td>Health</td> <td style="text-align: right;">0</td> </tr> <tr> <td>Vapor Irritant</td> <td style="text-align: right;">1</td> </tr> <tr> <td>Liquid or Solid Irritant</td> <td style="text-align: right;">1</td> </tr> <tr> <td>Poisons</td> <td style="text-align: right;">2</td> </tr> <tr> <td>Water Pollution</td> <td style="text-align: right;">0</td> </tr> <tr> <td>Human Toxicity</td> <td style="text-align: right;">1</td> </tr> <tr> <td>Aquatic Toxicity</td> <td style="text-align: right;">3</td> </tr> <tr> <td>Aesthetic Effect</td> <td style="text-align: right;">2</td> </tr> <tr> <td>Reactivity</td> <td style="text-align: right;">0</td> </tr> <tr> <td>Other Chemicals</td> <td style="text-align: right;">1</td> </tr> <tr> <td>Water</td> <td style="text-align: right;">0</td> </tr> <tr> <td>Self Reaction</td> <td style="text-align: right;">0</td> </tr> </tbody> </table> <p>11.3 NFPA Hazard Classification:</p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Category</th> <th style="text-align: right;">Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td> <td style="text-align: right;">2</td> </tr> <tr> <td>Flammability (Red)</td> <td style="text-align: right;">3</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td style="text-align: right;">0</td> </tr> </tbody> </table>	Category	Rating	Fire	3	Health	0	Vapor Irritant	1	Liquid or Solid Irritant	1	Poisons	2	Water Pollution	0	Human Toxicity	1	Aquatic Toxicity	3	Aesthetic Effect	2	Reactivity	0	Other Chemicals	1	Water	0	Self Reaction	0	Category	Classification	Health Hazard (Blue)	2	Flammability (Red)	3	Reactivity (Yellow)	0
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Other Chemicals	1																																			
Water	0																																			
Self Reaction	0																																			
Category	Classification																																			
Health Hazard (Blue)	2																																			
Flammability (Red)	3																																			
Reactivity (Yellow)	0																																			

<p><b>12. PHYSICAL AND CHEMICAL PROPERTIES</b></p>
<p>12.1 Physical State at 18°C and 1 atm: Liquid</p> <p>12.2 Molecular Weight: 106.16</p> <p>12.3 Boiling Point at 1 atm: 280.8°F = 128.3°C = 411.5°K</p> <p>12.4 Freezing Point: 66.8°F = 12.3°C = 289.5°K</p> <p>12.5 Critical Temperature: 649.4°F = 343.0°C = 616.2°K</p> <p>12.6 Critical Pressure: 506.4 atm = 34.65 psia = 3.510 MN/m<sup>2</sup></p> <p>12.7 Specific Gravity: 0.861 at 20°C (liquid)</p> <p>12.8 Liquid Surface Tension: 28.3 dynes/cm = 0.0283 N/m at 20°C</p> <p>12.9 Liquid Water Interfacial Tension: 37.8 dynes/cm = 0.0378 N/m at 20°C</p> <p>12.10 Vapor (Gas) Specific Gravity: Not pertinent</p> <p>12.11 Ratio of Specific Heats of Vapor (Gas): 1.071</p> <p>12.12 Latent Heat of Vaporization: 150 Btu/lb = 81 cal/g = <math>3.4 \times 10^4</math> J/kg</p> <p>12.13 Heat of Combustion: -17,558 Btu/lb = -8754.7 cal/g = <math>-408.41 \times 10^3</math> J/kg</p> <p>12.14 Heat of Decomposition: Not pertinent</p> <p>12.16 Heat of Solution: Not pertinent</p> <p>12.18 Heat of Polymerization: Not pertinent</p> <p>12.25 Heat of Fusion: 37.83 cal/g</p> <p>12.26 Limiting Viscosity: Data not available</p> <p>12.27 Reid Vapor Pressure: 0.34 psia</p>

NOTES

IMP 001 0169

# o-XYLENE

XLO

<p><b>Common Synonyms</b> 1, 2-Dimethylbenzene Xylol</p>	<p>Watery liquid      Colorless      Sweet odor</p> <p>Floats on water. Flammable, irritating vapor is produced.</p>
<p>Stop discharge if possible. Keep people away. Call fire department. Avoid contact with liquid and vapor. Isolate and remove discharged material. Notify local health and pollution control agencies.</p>	
<b>Fire</b>	<p><b>FLAMMABLE</b> Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear self-contained breathing apparatus. Extinguish with foam, dry chemical, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.</p>
<b>Exposure</b>	<p><b>CALL FOR MEDICAL AID</b></p> <p><b>VAPOR</b> 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.</p> <p><b>LIQUID</b> 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. <b>IF IN EYES,</b> hold eyelids open and flush with plenty of water. <b>IF SWALLOWED</b> and victim is <b>CONSCIOUS,</b> have victim drink water or milk. <b>DO NOT INDUCE VOMITING.</b></p>
<b>Water Pollution</b>	<p>Dangerous to aquatic life in high concentrations. Fouling to shrimps. May be dangerous if it enters water intakes.</p> <p>Notify local health and wildlife officials. Notify operators of nearby water intakes.</p>
<p><b>1. RESPONSE TO DISCHARGE</b> (See Response Methods Handbook) Issue warning-high flammability Evacuate area Should be removed Chemical and physical treatment</p>	<p><b>2. LABEL</b></p> <p>2.1 Category: Flammable liquid 2.2 Class: 3</p>
<p><b>3. CHEMICAL DESIGNATIONS</b></p> <p>3.1 CG Compatibility Class: Aromatic Hydrocarbon 3.2 Formula: <math>C_8H_{10}(CH_3)_2</math> 3.3 IMO/IUN Designation: 3.2/1307 3.4 DOT ID No.: 1307 3.5 CAS Registry No.: 95-47-6</p>	<p><b>4. OBSERVABLE CHARACTERISTICS</b></p> <p>4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Benzene-like; characteristic aromatic</p>
<p style="text-align: center;"><b>5. HEALTH HAZARDS</b></p> <p>5.1 Personal Protective Equipment: Approved canister or air-supplied mask; goggles or face shield; plastic gloves and boots.</p> <p>5.2 Symptoms Following Exposure: Vapors cause headache and dizziness. Liquid irritates eyes and skin. If taken into lungs, causes severe coughing, distress, and rapidly developing pulmonary edema. If ingested, causes nausea, vomiting, cramps, headache, and coma. Can be fatal. Kidney and liver damage can occur.</p> <p>5.3 Treatment of Exposure: <b>INHALATION:</b> remove to fresh air; administer artificial respiration and oxygen if required; call a doctor. <b>INGESTION:</b> do NOT induce vomiting; call a doctor. <b>EYES:</b> flush with water for at least 15 min. <b>SKIN:</b> wipe off, wash with soap and water.</p> <p>5.4 Threshold Limit Value: 100 ppm 5.5 Short Term Inhalation Limit: 300 ppm for 30 min. 5.6 Toxicity by Ingestion: Grade 3; LD<sub>50</sub> = 50 to 800 mg/kg 5.7 Late Toxicity: Kidney and liver damage. 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: 0.05 ppm 5.11 IDLH Value: 10,000 ppm</p>	

<p style="text-align: center;"><b>6. FIRE HAZARDS</b></p> <p>6.1 Flash Point: 60°F C.C.; 76°F O.C. 6.2 Flammable Limits in Air: 1.1%-7.0% 6.3 Fire Extinguishing Agents: Foam, dry chemical, 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: 860°F 6.8 Electrical Hazard: Class I, Group D 6.9 Burning Rate: 5.8 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</p>	<p style="text-align: center;"><b>10. HAZARD ASSESSMENT CODE</b> (See Hazard Assessment Handbook) A-T-U</p>																																				
<p style="text-align: center;"><b>7. CHEMICAL REACTIVITY</b></p> <p>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</p>	<p style="text-align: center;"><b>11. HAZARD CLASSIFICATIONS</b></p> <p>11.1 Code of Federal Regulations: Flammable liquid 11.2 NFPA Hazard Rating for Bulk Water Transportation:</p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Category</th> <th style="text-align: left;">Rating</th> </tr> </thead> <tbody> <tr> <td>Fire</td> <td>3</td> </tr> <tr> <td>Health</td> <td>1</td> </tr> <tr> <td>Vapor Irritant</td> <td>1</td> </tr> <tr> <td>Liquid or Solid Irritant</td> <td>1</td> </tr> <tr> <td>Poisons</td> <td>2</td> </tr> <tr> <td>Water Pollution</td> <td></td> </tr> <tr> <td>Human Toxicity</td> <td>1</td> </tr> <tr> <td>Aquatic Toxicity</td> <td>3</td> </tr> <tr> <td>Aesthetic Effect</td> <td>2</td> </tr> <tr> <td>Reactivity</td> <td></td> </tr> <tr> <td>Other Chemicals</td> <td>1</td> </tr> <tr> <td>Water</td> <td>0</td> </tr> <tr> <td>Self Reaction</td> <td>0</td> </tr> </tbody> </table> <p>11.3 NFPA Hazard Classification:</p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Category</th> <th style="text-align: left;">Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td> <td>2</td> </tr> <tr> <td>Flammability (Red)</td> <td>3</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td>0</td> </tr> </tbody> </table>	Category	Rating	Fire	3	Health	1	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	Category	Classification	Health Hazard (Blue)	2	Flammability (Red)	3	Reactivity (Yellow)	0
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<p style="text-align: center;"><b>8. WATER POLLUTION</b></p> <p>8.1 Aquatic Toxicity: &gt; 100 mg/l/96 hr/D, magna/TL<sub>100</sub>/fresh water 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): 0 lb/lb, 5 days, 2.5% (theor.), 8 days 8.4 Food Chain Concentration Potential: Data not available</p>	<p style="text-align: center;"><b>12. PHYSICAL AND CHEMICAL PROPERTIES</b></p> <p>12.1 Physical State at 15°C and 1 atm: Liquid 12.2 Molecular Weight: 106.16 12.3 Boiling Point at 1 atm: 291.6°F = 144.4°C = 417.6°K 12.4 Freezing Point: -13.3°F = -25.2°C = 248.0°K 12.5 Critical Temperature: 674.6°F = 357.1°C = 630.3°K 12.6 Critical Pressure: 541.5 atm = 36.84 meg = 3.732 MN/m<sup>2</sup> 12.7 Specific Gravity: 0.860 at 20°C (liquid) 12.8 Liquid Surface Tension: 30.53 dynes/cm = 0.03053 N/m at 15.5°C 12.9 Liquid Water Interfacial Tension: 36.06 dynes/cm = 0.03606 N/m at 20°C 12.10 Vapor (Gas) Specific Gravity: Not pertinent 12.11 Ratio of Specific Heats of Vapor (Gas): 1.088 12.12 Latent Heat of Vaporization: 148 Btu/lb = 62.9 cal/g = 3.47 X 10<sup>4</sup> J/kg 12.13 Heat of Combustion: -17,568 Btu/lb = -8754.7 cal/g = -408.41 X 10<sup>4</sup> J/kg 12.14 Heat of Decomposition: Not pertinent 12.15 Heat of Solution: Not pertinent 12.16 Heat of Polymerization: Not pertinent 12.18 Heat of Fusion: 30.84 cal/g 12.19 Limiting Value: Data not available 12.27 Reid Vapor Pressure: 0.28 psia</p>																																				
<p style="text-align: center;"><b>9. SHIPPING INFORMATION</b></p> <p>9.1 Grade of Purity: Research: 99.99%; Pure: 99.7%; Commercial: 95+ % 9.2 Storage Temperature: Ambient 9.3 Inert Atmosphere: No reaction 9.4 Venting: Open (Rime arrester) or pressure-vacuum</p>	<p style="text-align: center;"><b>NOTES</b></p>																																				

IMP 001 0170

# m-XYLENE

XLN

<p><b>Common Synonyms</b> 1,3-Dimethylbenzene Xylo</p>		<p>Watery liquid      Colorless      Sweet odor</p>
<p>Floats on water. Flammable, irritating vapor is produced.</p>		
<p>Stop discharge if possible. Keep people away. Call fire department. Avoid contact with liquid and vapor. Isolate and remove discharged material. Notify local health and pollution control agencies.</p>		
<p><b>Fire</b></p>	<p><b>FLAMMABLE</b> Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear self-contained breathing apparatus. Extinguish with foam, dry chemical, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.</p>	
<p><b>Exposure</b></p>	<p><b>CALL FOR MEDICAL AID.</b> <b>VAPOR</b> 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. <b>LIQUID</b> 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. <b>IF IN EYES</b>, hold eyelids open and flush with plenty of water. <b>IF SWALLOWED</b> and victim is <b>CONSCIOUS</b>, have victim drink water or milk. <b>DO NOT INDUCE VOMITING.</b></p>	
<p><b>Water Pollution</b></p>	<p><b>HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.</b> Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.</p>	
<p><b>1. RESPONSE TO DISCHARGE</b> (See Response Methods Handbook) Issue warning-high flammability Evacuate area Should be removed Chemical and physical treatment</p>	<p><b>2. LABEL</b> 2.1 Category: Flammable liquid 2.2 Class: 3</p>	
<p><b>3. CHEMICAL DESIGNATIONS</b> 3.1 CG Compatibility Class: Aromatic Hydrocarbon 3.2 Formula: m-C<sub>8</sub>H<sub>10</sub>(CH<sub>3</sub>)<sub>2</sub> 3.3 IMO/IUN Designation: 3.2/1307 3.4 DOT ID No.: 1307 3.5 CAS Registry No.: 106-36-3</p>	<p><b>4. OBSERVABLE CHARACTERISTICS</b> 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Like benzene, characteristic aromatic</p>	
<p><b>5. HEALTH HAZARDS</b></p> <p>6.1 Personal Protective Equipment: Approved canister or air-supplied mask, goggles or face shield, plastic gloves and boots. 6.2 Symptoms Following Exposure: Vapors cause headache and dizziness. Liquid irritates eyes and skin. If taken into lungs, causes severe coughing, distress, and rapidly developing pulmonary edema. If ingested, causes nausea, vomiting, cramps, headache, and coma; can be fatal. Kidney and liver damage can occur. 6.3 Treatment of Exposure: <b>INHALATION</b>: remove to fresh air, administer artificial respiration and oxygen if required; call a doctor. <b>INGESTION</b>: do NOT induce vomiting; call a doctor. <b>EYES</b>: flush with water for at least 15 min. <b>SKIN</b>: wipe off, wash with soap and water. 6.4 Threshold Limit Value: 100 ppm 6.5 Short Term Inhalation Limits: 300 ppm for 30 min. 6.6 Toxicity by Ingestion: Grade 3; LD<sub>50</sub> = 50 to 500 g/kg 6.7 Late Toxicity: Kidney and liver damage. 6.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary. 6.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin. 6.10 Odor Threshold: 0.05 ppm 6.11 IDLH Value: 10,000 ppm</p>		

<p><b>6. FIRE HAZARDS</b></p> <p>6.1 Flash Point: 94°F C.C. 6.2 Flammable Limits in Air: 1.1%-6.4% 6.3 Fire Extinguishing Agents: Foam, dry chemical, 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: 986°F 6.8 Electrical Hazard: Class I, Group D 6.9 Burning Rate: 5.8 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</p>	<p><b>10. HAZARD ASSESSMENT CODE</b> (See Hazard Assessment Handbook) <b>A-T-U</b></p>																																				
<p><b>7. CHEMICAL REACTIVITY</b></p> <p>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 Water Ratio (Reactant to Product): Data not available 7.8 Reactivity Group: 2</p>	<p><b>11. HAZARD CLASSIFICATIONS</b></p> <p>11.1 Code of Federal Regulations: Flammable liquid 11.2 NFPA Hazard Rating for Bulk Water Transportation:</p> <table border="1"> <thead> <tr> <th>Category</th> <th>Rating</th> </tr> </thead> <tbody> <tr> <td>Fire</td> <td>3</td> </tr> <tr> <td>Health</td> <td>2</td> </tr> <tr> <td>Vapor Irritant</td> <td>1</td> </tr> <tr> <td>Liquid or Solid Irritant</td> <td>1</td> </tr> <tr> <td>Poisons</td> <td>2</td> </tr> <tr> <td>Water Pollution</td> <td>1</td> </tr> <tr> <td>Human Toxicity</td> <td>1</td> </tr> <tr> <td>Aquatic Toxicity</td> <td>2</td> </tr> <tr> <td>Aesthetic Effect</td> <td>3</td> </tr> <tr> <td>Reactivity</td> <td>0</td> </tr> <tr> <td>Other Chemicals</td> <td>1</td> </tr> <tr> <td>Water</td> <td>0</td> </tr> <tr> <td>Self Reaction</td> <td>0</td> </tr> </tbody> </table> <p>11.3 NFPA Hazard Classification:</p> <table border="1"> <thead> <tr> <th>Category</th> <th>Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td> <td>2</td> </tr> <tr> <td>Flammability (Red)</td> <td>3</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td>0</td> </tr> </tbody> </table>	Category	Rating	Fire	3	Health	2	Vapor Irritant	1	Liquid or Solid Irritant	1	Poisons	2	Water Pollution	1	Human Toxicity	1	Aquatic Toxicity	2	Aesthetic Effect	3	Reactivity	0	Other Chemicals	1	Water	0	Self Reaction	0	Category	Classification	Health Hazard (Blue)	2	Flammability (Red)	3	Reactivity (Yellow)	0
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<p><b>8. WATER POLLUTION</b></p> <p>8.1 Aquatic Toxicity: 22 ppm/96 hr/basophilic/T<sub>100</sub>/fresh water 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): 0 lb/lb, 5 days; 0% (theor.), 8 days 8.4 Food Chain Concentration Potential: Data not available</p>	<p><b>12. PHYSICAL AND CHEMICAL PROPERTIES</b></p> <p>12.1 Physical State at 18°C and 1 atm: Liquid 12.2 Molecular Weight: 106.16 12.3 Boiling Point at 1 atm: 286.4°F = 131.9°C = 405.1°K 12.4 Freezing Point: -54.2°F = -47.9°C = 225.3°K 12.5 Critical Temperature: 650.8°F = 343.8°C = 617.0°K 12.6 Critical Pressure: 613.8 atm = 34.96 psi = 3.540 MN/m<sup>2</sup> 12.7 Specific Gravity: 0.864 at 20°C (liquid) 12.8 Liquid Surface Tension: 28.6 dynes/cm = 0.0286 N/m at 20°C 12.9 Liquid Water Interfacial Tension: 36.4 dynes/cm = 0.0364 N/m at 30°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: 147 Btu/lb = 81.8 cal/g = 3.43 X 10<sup>4</sup> J/kg 12.13 Heat of Combustion: -17,564 Btu/lb = -8752.4 cal/g = -408.31 X 10<sup>4</sup> 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: 26.01 cal/g 12.26 Limiting Value: Data not available 12.27 Reid Vapor Pressure: 0.34 psi</p>																																				
<p><b>9. SHIPPING INFORMATION</b></p> <p>9.1 Grades of Purity: Research: 99.99%; Pure: 99.9%; Technical: 99.2% 9.2 Storage Temperature: Ambient 9.3 Inert Atmosphere: No requirement 9.4 Venting: Open (flame arrester) or pressure-vacuum</p>	<p><b>NOTES</b></p>																																				

IMP 001 0171

# POLYCHLORINATED BIPHENYL

PCB

<p><b>Common Synonyms</b> PCB Chlorinated biphenyl Arochlor Halogenated waxes Polychloropolyphenyls</p>		<p>City liquid to solid powder Light yellow liquid, or white powder Weak odor</p>
<p>Slick discharge if possible. Keep people away. Avoid contact with liquid and solid. Call fire department. Isolate and remove discharged material. Notify local health and pollution control agencies.</p>		
<p><b>Fire</b></p>	<p>Comustible. Extinguish with water, foam, dry chemical, or carbon dioxide.</p>	
<p><b>Exposure</b></p>	<p>CALL FOR MEDICAL AID LIQUID OR SOLID Irritating to skin and eyes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water.</p>	
<p><b>Water Pollution</b></p>	<p>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.</p>	
<p><b>1. RESPONSE TO DISCHARGE</b> (See Response Methods Handbook) Issue warning-water contaminants Should be removed Chemical and physical treatment</p>	<p><b>2. LABEL</b> 2.1 Category: None 2.2 Class: Not pertinent</p>	
<p><b>3. CHEMICAL DESIGNATIONS</b> 3.1 CQ Compatibility Class: Not listed 3.2 Formula: <math>C_{12}H_{10}Cl_2</math> 3.3 IMO/IUN Designation: Not listed 3.4 DOT ID No.: 2315 3.5 CAS Registry No.: 1336-36-3</p>	<p><b>4. OBSERVABLE CHARACTERISTICS</b> 4.1 Physical State (as shipped): Liquid or solid 4.2 Color: Pale yellow (liquid); colorless (solid) 4.3 Odor: Practically odorless</p>	
<p><b>5. HEALTH HAZARDS</b> 5.1 Personal Protective Equipment: Gloves and protective garments. 5.2 Symptoms Following Exposure: Acne from skin contact. 5.3 Treatment of Exposure: SKIN: wash with soap and water. 5.4 Threshold Limit Value: 0.5 to 1.0 mg/m<sup>3</sup> 5.5 Short Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 2; oral rat LD<sub>50</sub> = 3880 mg/kg 5.7 Late Toxicity: Causes chromosomal abnormalities in rats, birth defects in birds 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause severe irritation of eyes and throat and cause eye and lung injury. They cannot be tolerated even at low concentrations. 5.9 Liquid or Solid Irritant Characteristics: Contact with skin may cause irritation. 5.10 Odor Threshold: Data not available 5.11 IDLH Value: 5 to 10 mg/m<sup>3</sup></p>		

**6. FIRE HAZARDS**

6.1 Flash Point: >296°F  
6.2 Flammable Limits in Air: Data not available  
6.3 Fire Extinguishing Agents: Water, foam, dry chemical, or carbon dioxide  
6.4 Fire Extinguishing Agents Not to be Used: Not pertinent  
6.5 Special Hazards of Combustion: Products: Irritating gases are generated in fire.  
6.6 Behavior in Fire: Not pertinent  
6.7 Ignition Temperature: Data not available  
6.8 Electrical Hazard: Not pertinent  
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: 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: Data not available

**8. WATER POLLUTION**

8.1 Aquatic Toxicity: 0.278 ppm/86 hr/bluegill/TL<sub>50</sub>/fresh water  
0.005 ppm/336-1080 hr/pinfish/TL<sub>50</sub>/salt water  
8.2 Waterfowl Toxicity: LD<sub>50</sub> 2000 ppm (mallard duck)  
8.3 Biological Oxygen Demand (BOD): Very low  
8.4 Food Chain Concentration Potential: High

**9. SHIPPING INFORMATION**

9.1 Grades of Purity: 11 grades (some liquid, some solids) which differ primarily in their chlorine content (20%-68% by weight)  
9.2 Storage Temperature: Ambient  
9.3 Inert Atmosphere: No requirement  
9.4 Venting: Open

**10. HAZARD ASSESSMENT CODE**  
(See Hazard Assessment Handbook)  
II

**11. HAZARD CLASSIFICATIONS**

11.1 Code of Federal Regulations: ORM-E  
11.2 RAS Hazard Rating for Bulk Water Transportation: Not listed  
11.3 NFPA Hazard Classification: Not listed

**12. PHYSICAL AND CHEMICAL PROPERTIES**

12.1 Physical State at 16°C and 1 atm: Solid  
12.2 Molecular Weight: Not pertinent  
12.3 Boiling Point at 1 atm: Very high  
12.4 Freezing Point: Not pertinent  
12.5 Critical Temperature: Not pertinent  
12.6 Critical Pressure: Not pertinent  
12.7 Specific Gravity: 1.3-1.8 at 20°C (liquid)  
12.8 Liquid Surface Tension: Not pertinent  
12.9 Liquid Water Interfacial Tension: Not pertinent  
12.10 Vapor (Gas) Specific Gravity: Not pertinent  
12.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
12.12 Latent Heat of Vaporization: Not pertinent  
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: Data not available

NOTES

IMP 001 0172

# TETRACHLOROETHYLENE

TTE

<p><b>Common Synonyms</b> Tetraco Percloro Perchloroethylene Park</p>		<p><b>Wetly liquid</b> Colorless Sweet odor</p>
<p>Striks in water. Irritating vapor is produced.</p>		
<p>Stop discharge if possible Avoid contact with liquid and vapor. Isolate and remove discharged material. Notify local health and pollution control agencies.</p>		
<p><b>Fire</b></p>	<p>Not flammable Poisonous gases are produced when heated.</p>	
<p><b>Exposure</b></p>	<p>CALL FOR MEDICAL AID.</p> <p><b>VAPOR</b> Irritating to eyes, nose and throat. If inhaled, will cause difficult breathing, or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.</p> <p><b>LIQUID</b> 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.</p>	
<p><b>Water Pollution</b></p>	<p>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.</p>	
<p><b>1. RESPONSE TO DISCHARGE</b> (See Response Methods Handbook) Should be removed Chemical and physical treatment</p>		<p><b>2. LABEL</b> 2.1 Category: None 2.2 Class: Not pertinent</p>
<p><b>3. CHEMICAL DESIGNATIONS</b> 3.1 O.S. Compatibility Class: Not listed 3.2 Formula: C<sub>2</sub>Cl<sub>4</sub> 3.3 B.O./U.N. Designation: 8.2/1887 3.4 DOT ID No.: 1887 3.5 CAS Registry No.: 127-18-4</p>		<p><b>4. OBSERVABLE CHARACTERISTICS</b> 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Etheral, like chloroform, mildly sweet</p>
<p><b>5. HEALTH HAZARDS</b></p> <p>5.1 Personal Protective Equipment: For high vapor concentrations use approved canister or air-supplied mask, chemical goggles or face shield, plastic gloves.</p> <p>5.2 Symptoms Following Exposure: Vapor can affect central nervous system and cause anesthesia. Liquid may irritate skin after prolonged contact. May irritate eyes but causes no injury.</p> <p>5.3 Treatment of Exposure: <b>INHALATION:</b> If illness occurs, remove patient to fresh air, keep him warm and quiet, and get medical attention. <b>INGESTION:</b> Induce vomiting only on physician's recommendation. <b>EYES AND SKIN:</b> Flush with plenty of water and get medical attention if irritation or injury occurs.</p> <p>5.4 Threshold Limit Value: 50 ppm</p> <p>5.5 Short Term Inhalation Limit: 100 ppm for 60 min.</p> <p>5.6 Toxicity by Ingestion: Grade 2; LD<sub>50</sub> = 0.8 to 5 g/kg</p> <p>5.7 Late Toxicity: None</p> <p>5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or throat if present in high concentrations. The effect is temporary.</p> <p>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.</p> <p>5.10 Odor Threshold: 5 ppm</p> <p>5.11 IDLH Value: 500 ppm</p>		

<p><b>6. FIRE HAZARDS</b></p> <p>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: Toxic, irritating gases may be generated in fire. 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: Not flammable 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not flammable 6.10 Autoclave Plasma Temperature: Data not available 6.11 Self-heating: Air to Fuel Ratio: Data not available 6.12 Plasma Temperature: Data not available</p>	<p><b>10. HAZARD ASSESSMENT CODE</b> (See Hazard Assessment Handbook) A-X</p>
<p><b>7. CHEMICAL REACTIVITY</b></p> <p>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: Data not available</p>	<p><b>11. HAZARD CLASSIFICATIONS</b></p> <p>11.1 Code of Federal Regulations: OSHA 11.2 NIOSH Hazard Rating for Bulk Water Transportation: Category Rating Fire 0 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 1</p> <p>11.3 MPPA Hazard Classification: Not listed</p>
<p><b>8. WATER POLLUTION</b></p> <p>8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): None 8.4 Feed Chain Concentration Potential: None</p>	<p><b>12. PHYSICAL AND CHEMICAL PROPERTIES</b></p> <p>12.1 Physical State at 18°C and 1 atm: Liquid 12.2 Molecular Weight: 186.83 12.3 Boiling Point at 1 atm: 250°F = 121°C = 394°K 12.4 Freezing Point: -4.3°F = -22.4°C = 250.8°K 12.5 Critical Temperature: 657°F = 347°C = 620°K 12.6 Critical Pressure: Not pertinent 12.7 Specific Gravity: 1.83 at 20°C (liquid) 12.8 Liquid Surface Tension: 31.3 dynes/cm = 0.0213 N/m at 20°C 12.9 Liquid Water Interfacial Tension: 44.4 dynes/cm = 0.0444 N/m at 25°C 12.10 Vapor (Gas) Specific Gravity: Not pertinent 12.11 Ratio of Specific Heats of Vapor (Gas): 1.116 12.12 Latent Heat of Vaporization: 90.2 Btu/lb = 80.1 cal/g = 2.10 x 10<sup>4</sup> 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 12.17 Heat of Fusion: Data not available 12.18 Limiting Value: Data not available 12.19 Reid Vapor Pressure: Data not available</p>
<p><b>9. SHIPPING INFORMATION</b></p> <p>9.1 Grades of Purity: Dry cleaning and industrial grades: 99+ % 9.2 Storage Temperature: Ambient 9.3 Inert Atmosphere: No requirement 9.4 Venting: Pressure-vacuum</p>	<p><b>NOTES</b></p>

IMP 001 0173

# PHENOL

PHN

<p><b>Common Synonyms</b> Hydroxybenzene Carbolic acid Phenic acid Phenyl hydroxide</p>	<p>Solid crystals; or waxy liquid</p> <p>White solid, or light pink liquid</p> <p>Sweet tarry odor</p> <p>May float or sink, and mixes slowly with water.</p>
<p><b>AVOID CONTACT WITH LIQUID AND SOLID</b> Keep people away Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves) Stop discharge if possible. Call fire department Evacuate area in case of large discharge Isolate and remove discharged material Notify local health and pollution control agencies</p>	
<p><b>Fire</b></p>	<p>Combustible <b>POISONOUS GASES ARE PRODUCED IN FIRE</b> Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves) Extinguish with water, carbon dioxide, dry chemical, or foam. Cool exposed containers with water.</p>
<p><b>Exposure</b></p>	<p>CALL FOR MEDICAL AID</p> <p><b>LIQUID OR SOLID POISONOUS IF SWALLOWED.</b> Will burn 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. <b>DO NOT INDUCE VOMITING.</b></p>
<p><b>Water Pollution</b></p>	<p><b>HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS</b> May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.</p>
<p><b>1. RESPONSE TO DISCHARGE</b> (See Response Methods Handbook) Issue warning-poison Restrict access Should be removed Chemical and physical treatment</p>	<p><b>2. LABEL</b> 2.1 Category: Poison 2.2 Class: 6</p>
<p><b>3. CHEMICAL DESIGNATIONS</b> 3.1 CG Compatibility Class: Phenol, cresol 3.2 Formula: C<sub>6</sub>H<sub>5</sub>OH 3.3 IMO/IUN Designation: 910/1671 3.4 DOT ID No.: 1671 3.5 CAS Registry No.: 108-95-2</p>	<p><b>4. OBSERVABLE CHARACTERISTICS</b> 4.1 Physical State (as shipped): Solid or molten liquid 4.2 Color: Colorless to light pink 4.3 Odor: Characteristically sweet, tarry, pungent, distinctive, distinct, aromatic, somewhat sickening sweet and acid</p>
<p><b>5. HEALTH HAZARDS</b></p> <p>5.1 Personal Protective Equipment: Fresh-air mask for confined areas; rubber gloves; protective clothing, full face shield. 5.2 Symptoms Following Exposure: Will burn eyes and skin. The analgesic action may cause loss of pain sensation. Readily absorbed through skin, causing increase in heart rate, convulsions, and death. 5.3 Treatment of Exposure: <b>INHALATION:</b> If victim shows any ill effects, move him to fresh air, keep him quiet and warm, and call a doctor immediately. If breathing stops, give artificial respiration. <b>INGESTION:</b> do NOT induce vomiting; give milk, egg whites, or large amounts of water and call doctor immediately, no known antidote; treat the symptoms. <b>EYES:</b> immediately flush with plenty of water for at least 15 min.; continue for another 15 min. if doctor has not taken over. <b>SKIN:</b> immediately remove all clothing while in a shower and wash affected area with abundant flowing water or soap and water for at least 15 min.; clean clothing thoroughly or discard. 5.4 Threshold Limit Value: 5 ppm (includes skin exposure). 5.5 Short Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 2; LD<sub>50</sub> = 0.5 to 5 g/kg (rat) 5.7 Lethal Toxicity: Carcinogenic in laboratory animals 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: Early severe skin irritant; may cause pain and second-degree burns after a few minutes' contact. 5.10 Odor Threshold: 0.05 ppm 5.11 IDLH Value: 100 ppm</p>	

<p><b>6. FIRE HAZARDS</b></p> <p>6.1 Flash Point: 185°F O.C.; 175°F C.C. 6.2 Flammable Limits in Air: 1.7%-8.6% 6.3 Fire Extinguishing Agents: Water fog, foam, carbon dioxide, or dry chemical 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Toxic and irritating vapors are generated when heated. 6.6 Behavior in Fire: Vapors flammable vapors when heated which will form explosive mixtures with air 6.7 Ignition Temperature: 1318°F 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: 3.5 mm/min 6.10 Adiabatic Flame Temperature: Data not available</p> <p>(Continued)</p>	<p><b>10. HAZARD ASSESSMENT CODE</b> ...(See Hazard Assessment Handbook) A-P-Q</p>
<p><b>7. CHEMICAL REACTIVITY</b></p> <p>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 Oxidation (Reactant to Product): Data not available 7.8 Reactivity Group: 21</p>	<p><b>11. HAZARD CLASSIFICATIONS</b></p> <p>11.1 Code of Federal Regulations: Poison, B 11.2 HAZ Hazard Rating for Bulk Water Transportation: Category Rating Fire ..... 1 Health ..... Vapor Irritant ..... 2 Liquid or Solid Irritant ..... 3 Poisons ..... 3 Water Pollution Human Toxicity ..... 2 Acute Toxicity ..... 3 Aesthetic Effect ..... 3 Reactivity Other Chemicals ..... 2 Water ..... 0 Self Reaction ..... 0 11.3 NFPA Hazard Classification: Category Classification Health Hazard (Red) ..... 3 Flammability (Blue) ..... 2 Reactivity (Yellow) ..... 0</p>
<p><b>8. WATER POLLUTION</b></p> <p>8.1 Aquatic Toxicity: 11.5-20.5 mg/L/96 hr/bluegill/TL<sub>50</sub>/fresh water 1.5 ppm/48 hr/rainbow trout/TL<sub>50</sub>/fresh water 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): 200%, 5 days 8.4 Feed Chain Concentration Potential: None</p>	<p><b>12. PHYSICAL AND CHEMICAL PROPERTIES</b></p> <p>12.1 Physical State at 15°C and 1 atm: Solid or liquid 12.2 Molecular Weight: 94.11 12.3 Boiling Point at 1 atm: 350.2°F = 181.8°C = 455.0°K 12.4 Freezing Point: 105.8°F = 40.9°C = 314.1°K 12.5 Critical Temperature: 790.0°F = 421.1°C = 694.3°K 12.6 Critical Pressure: 869 psia = 60.5 atm = 6.13 MN/m<sup>2</sup> 12.7 Critical Gravity: 1.056 at 41°C (liquid) 12.8 Liquid Surface Tension: 36.5 dynes/cm = 0.0065 N/m at 55°C 12.9 Liquid Water Interfacial Tension: (est.) 20 dynes/cm = 0.02 N/m at 42°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: 130 Btu/lb = 72 cal/g = 3.0 X 10<sup>4</sup> J/kg 12.13 Heat of Combustion: -13,400 Btu/lb = -7,445 cal/g = -311.7 X 10<sup>3</sup> 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: 0.3 psia</p>
<p><b>9. SHIPPING INFORMATION</b></p> <p>9.1 Grades of Purity: 90-99% (solid), 80-85% (liquid). Technical: 82-92% (contains cresols) 9.2 Storage Temperature: Ambient 9.3 Inert Atmosphere: No requirement 9.4 Venting: Pressure-vacuum</p>	<p><b>13. FIRE HAZARDS (Continued)</b></p> <p>6.11 Stoichiometric Air to Fuel Ratio: Data not available 6.12 Flame Temperature: Data not available</p>

IMP 001 0174



# BUTYL BENZYL PHTHALATE

BPH

<p><b>Common Synonyms</b> Benzyl n-butyl phthalate Phthalic acid, benzyl butyl ether</p>		<p>Liquid Colorless Slight odor</p>
<p>Stop discharge if possible Avoid contact with liquid Isolate and remove discharged material Notify local health and pollution control agencies</p>		
<p><b>Fire</b></p>	<p>Combustible Irritating gases may be produced when heated Extinguish with dry chemicals, alcohol foam, or carbon dioxide Water may be ineffective on fire Cool exposed containers with water</p>	
<p><b>Exposure</b></p>	<p>CALL FOR MEDICAL AID LIQUID Irritating to skin and eyes Remove contaminated clothing and shoes Flush affected areas with plenty of water.</p>	
<p><b>Water Pollution</b></p>	<p>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</p>	
<p><b>1. RESPONSE TO DISCHARGE</b> (See Response Methods Handbook) Should be removed Chemical and physical treatment</p>	<p><b>2. LABEL</b> 2.1 Category: None 2.2 Class: Not pertinent</p>	
<p><b>3. CHEMICAL DESIGNATIONS</b> 3.1 CG Compatibility Class: Ester 3.2 Formula: C<sub>18</sub>H<sub>20</sub>O<sub>4</sub> 3.3 IMO/UN Designation: Not listed 3.4 DOT ID No.: Data not available 3.5 CAS Registry No.: 85-68-7</p>	<p><b>4. OBSERVABLE CHARACTERISTICS</b> 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Slight characteristic</p>	
<p><b>5. HEALTH HAZARDS</b> 5.1 Personal Protective Equipment: Protective gloves and goggles 5.2 Symptoms Following Exposure: Prolonged contact with liquid causes some irritation of eyes and skin. 5.3 Treatment of Exposure: EYES: flush with water for 15 min. SKIN: wash well with soap and water. 5.4 Threshold Limit Value: Data not available 5.5 Short Term Inhalation Limit: Data not available 5.6 Toxicity by Ingestion: Grade 1; oral rat LD<sub>50</sub> = 13,800 mg/kg 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Vapors are nonirritating to eyes and throat. 5.9 Liquid or Solid Irritant Characteristics: No appreciable hazard, practically harmless to skin. 5.10 Odor Threshold: Data not available 5.11 IDLH Value: Data not available</p>		

<p><b>6. FIRE HAZARDS</b> 6.1 Flash Point: 290°F O.C. 6.2 Flammable Limits in Air: Data not available 6.3 Fire Extinguishing Agents: Dry chemical, carbon dioxide, foam 6.4 Fire Extinguishing Agents Not to be Used: Water or foam may cause frothing 6.5 Special Hazards of Combustion: Products: irritating vapors of unburned chemical may form in fire 6.6 Behavior in Fire: Data not available 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Data not available 6.9 Burning Rate: Data not available 6.10 Autobaric Flame Temperature: Data not available 6.11 Stoichiometric Air to Fuel Ratio: Data not available 6.12 Flame Temperature: Data not available</p>	<p><b>7. CHEMICAL REACTIVITY</b> 7.1 Reactivity With Water: No reaction 7.2 Reactivity with Common Materials: Data not available 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Bases: 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: Data not available</p>
<p><b>8. WATER POLLUTION</b> 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Feed Chain Concentration Potential: None</p>	<p><b>9. SHIPPING INFORMATION</b> 9.1 Grades of Purity: Commercial 9.2 Storage Temperature: Ambient 9.3 Inert Atmosphere: No requirement 9.4 Venting: Open</p>
<p><b>10. HAZARD ASSESSMENT CODE</b> (See Hazard Assessment Handbook) A-X</p>	
<p><b>11. HAZARD CLASSIFICATIONS</b> 11.1 Code of Federal Regulations: Not listed 11.2 MAS Hazard Rating for Bulk Water Transportation: Category Rating Fire ..... 1 Health Vapor Irritant ..... 0 Liquid or Solid Irritant ..... 0 Poisons ..... 0 Water Pollution Human Toxicity ..... 1 Aquatic Toxicity ..... 0 Aesthetic Effect ..... 1 Reactivity Other Chemicals ..... 3 Water ..... 1 Self Reaction ..... 0 11.3 NFPA Hazard Classification: Category Classification Health Hazard (Blue) ..... 1 Flammability (Red) ..... 1 Reactivity (Yellow) ..... 0</p>	
<p><b>12. PHYSICAL AND CHEMICAL PROPERTIES</b> 12.1 Physical State at 15°C and 1 atm: Liquid 12.2 Molecular Weight: 310 12.3 Boiling Point at 1 atm: 608°F = 380°C = 643°K 12.4 Freezing Point: Not pertinent 12.5 Critical Temperature: Not pertinent 12.6 Critical Pressure: Not pertinent 12.7 Specific Gravity: 1.12 at 20°C (liquid) 12.8 Liquid Surface Tension: Data not available 12.9 Liquid Water Interfacial Tension: Data not available 12.10 Vapor (Gas) Specific Gravity: Not pertinent 12.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 12.12 Latent Heat of Vaporization: Data not available 12.13 Heat of Combustion: -14,550 Btu/lb = -8,090 cal/g = -328 x 10<sup>3</sup> 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: Low</p>	
<p>NOTES</p>	

IMP 001 0175

# p-DICHLOROBENZENE

DBP

<p><b>Common Synonyms</b>                  Para-dichlorobenzene                  Dichlorobenzene                  Paradi                  Paradiol                  Paradiol                  Paradiol                  Paradiol</p>	<p><b>Solid crystals</b>      White to clear      Mothballs odor</p> <p>Sinks in water.</p>
<p>Avoid contact with solid                  Call fire department                  Isolate and remove discharged material                  Notify local health and pollution control agencies.</p>	
<b>Fire</b>	<p>Combustible  <b>POISONOUS GASES ARE PRODUCED IN FIRE.</b>                  Wear goggles and self-contained breathing apparatus.                  Extinguish with water, dry chemical, foam, or carbon dioxide.                  Cool exposed containers with water.</p>
<b>Exposure</b>	<p><b>CALL FOR MEDICAL AID</b></p> <p><b>SOLID</b>                  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.</p>
<b>Water Pollution</b>	<p><b>HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.</b>                  Fouling to shoreline                  May be dangerous if it enters water intakes.                  Notify local health and waste officials                  Notify operators of nearby water intakes</p>
<p><b>1. RESPONSE TO DISCHARGE</b>                  (See Response Methods Handbook)                  Issue warning-water contaminant                  Should be removed                  Chemical and physical treatment</p>	<p><b>2. LABEL</b>                  2.1 Category: None                  2.2 Class: Not pertinent</p>
<p><b>3. CHEMICAL DESIGNATIONS</b>                  3.1 CG Compatibility Class: Halogenated hydrocarbon                  3.2 Formula: p-C<sub>6</sub>H<sub>4</sub>Cl<sub>2</sub>                  3.3 IMO/IUN Designation: 6.0/1582                  3.4 DOT ID No.: 1582                  3.5 CAS Registry No.: 106-46-7</p>	<p><b>4. OBSERVABLE CHARACTERISTICS</b>                  4.1 Physical State (as shipped): Solid                  4.2 Color: White                  4.3 Odor: Aromatic</p>
<p><b>5. HEALTH HAZARDS</b></p> <p>5.1 Personal Protective Equipment: Full face mask fitted with organic vapor canister for concentrations over 75 ppm; clean protective clothing; eye protection.</p> <p>5.2 Symptoms Following Exposure: <b>INHALATION:</b> Irritation of upper respiratory tract; over-exposure may cause depression and injury to liver and kidney. <b>EYE CONTACT:</b> pain and mild irritation.</p> <p>5.3 Treatment of Exposure: <b>INHALATION:</b> If any ill effects develop, remove patient to fresh air and get medical attention. If breathing stops, give artificial respiration. <b>EYES:</b> flush with plenty of water and get medical attention if ill effects develop. <b>SKIN AND INGESTION:</b> no problem likely.</p> <p>5.4 Threshold Limit Value: 75 ppm</p> <p>5.5 Short Term Inhalation Limits: 50 ppm for 60 min.</p> <p>5.6 Toxicity by Ingestion: Grade 2; LD<sub>50</sub> = 0.5 to 5 g/kg</p> <p>5.7 Lethal Toxicity: Data not available</p> <p>5.8 Vapor (Gas) Irritant Characteristics: Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.</p> <p>5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smearing and reddening of the skin.</p> <p>5.10 Odor Threshold: 15-30 ppm</p> <p>5.11 IDLH Value: 1,000 ppm</p>	

<p><b>6. FIRE HAZARDS</b></p> <p>6.1 Flash Point: 165°F O.C.; 180°F C.C.</p> <p>6.2 Flammable Limits in Air:                  Data not available</p> <p>6.3 Fire Extinguishing Agents: Water, foam, carbon dioxide or dry chemical</p> <p>6.4 Fire Extinguishing Agents Not to be Used: Not pertinent</p> <p>6.5 Special Hazards of Combustion                  Products: Vapors are irritating. Toxic chlorine, hydrogen chloride, and phosgene gases may be generated in fires.</p> <p>6.6 Behavior in Fire: Not pertinent</p> <p>6.7 Ignition Temperature: Data not available</p> <p>6.8 Electrical Hazard: Not pertinent</p> <p>6.9 Burning Rate: 1.3 mm/min. (approx.)</p> <p>6.10 Adiabatic Flame Temperature:                  Data not available</p> <p style="text-align: right;">(Continued)</p>	<p><b>10. HAZARD ASSESSMENT CODE</b>                  (See Hazard Assessment Handbook)  <b>II</b></p>
<p><b>7. CHEMICAL REACTIVITY</b></p> <p>7.1 Reactivity With Water: No reaction</p> <p>7.2 Reactivity with Common Materials: No reaction</p> <p>7.3 Stability During Transport: Stable</p> <p>7.4 Neutralizing Agents for Acids and Caustics: Not pertinent</p> <p>7.5 Polymerization: Not pertinent</p> <p>7.6 Inhibitor of Polymerization:                  Not pertinent</p> <p>7.7 Molar Ratio (Reactant to Product): Data not available</p> <p>7.8 Reactivity Group: 36</p>	<p><b>11. HAZARD CLASSIFICATIONS</b></p> <p>11.1 Code of Federal Regulations: OPM-A</p> <p>11.2 HAS Hazard Rating for Bulk Water Transportation: Not listed</p> <p>11.3 NFPA Hazard Classification:                  Category      Classification                  Health Hazard (Blue) ..... 2                  Flammability (Red) ..... 2                  Reactivity (Yellow) ..... 0</p>
<p><b>8. WATER POLLUTION</b></p> <p>8.1 Aquatic Toxicity:                  50 ppm/148 hr/fresh water                  880 mg/148 hr/rainbow trout/L<sub>50</sub>/fresh water                  *No time interval specified</p> <p>8.2 Waterway Toxicity: Data not available</p> <p>8.3 Biological Oxygen Demand (BOD):                  Data not available</p> <p>8.4 Food Chain Concentration Potential:                  Data not available</p>	<p><b>12. PHYSICAL AND CHEMICAL PROPERTIES</b></p> <p>12.1 Physical State at 15°C and 1 atm:                  Solid</p> <p>12.2 Molecular Weight: 147.01</p> <p>12.3 Boiling Point at 1 atm:                  345.6°F = 174.2°C = 447.4°K</p> <p>12.4 Freezing Point:                  130°F = 53°C = 226°K</p> <p>12.5 Critical Temperature: Not pertinent</p> <p>12.6 Critical Pressure: Not pertinent</p> <p>12.7 Specific Gravity:                  1.458 at 20°C (solid)</p> <p>12.8 Liquid Surface Tension: Not pertinent</p> <p>12.9 Liquid Water Interfacial Tension:                  Not pertinent</p> <p>12.10 Vapor (Gas) Specific Gravity:                  Not pertinent</p> <p>12.11 Ratio of Specific Heats of Vapor (Gas):                  Not pertinent</p> <p>12.12 Latent Heat of Vaporization:                  Not pertinent</p> <p>12.13 Heat of Combustion: Not pertinent</p> <p>12.14 Heat of Decomposition: Not pertinent</p> <p>12.15 Heat of Solution: Not pertinent</p> <p>12.16 Heat of Polymerization: Not pertinent</p> <p>12.18 Heat of Fusion: 29.07 cal/g</p> <p>12.26 Limiting Value: Data not available</p> <p>12.27 Reid Vapor Pressure: Data not available</p>
<p><b>9. SHIPPING INFORMATION</b></p> <p>9.1 Grades of Purity: Solid: 5 grades, chemical purity close to 100% Liquid: 1-2% orthodichlorobenzene.</p> <p>9.2 Storage Temperature: Data not available</p> <p>9.3 Inert Atmosphere: Data not available</p> <p>9.4 Venting: Data not available</p>	<p><b>6. FIRE HAZARDS (Continued)</b></p> <p>6.11 Stoichiometric Air to Fuel Ratio: Data not available</p> <p>6.12 Flame Temperature: Data not available</p>

IMP 001 0176

# NITROBENZENE

NTB

<p><b>Common Synonyms</b> Nitrobenzol Essence of Mirbane Oil of Mirbane</p>	<p><b>Oil liquid</b>      Light yellow to brown      Almond or shoe polish odor</p> <p>Sinks in water. Freezing point is 41°F.</p>
<p><b>AVOID CONTACT WITH LIQUID</b> Keep people away. Wear chemical protective suit with self-contained breathing apparatus. Stop discharge if possible. Call fire department. Isolate and remove discharged material. Notify local health and pollution control agencies.</p>	
<p style="text-align: center;"><b>Fire</b></p>	<p>Combustible. <b>POISONOUS VAPOR IS PRODUCED WHEN HEATED.</b> Wear chemical protective suit with self-contained breathing apparatus. Extinguish with water, dry chemical, foam, or carbon dioxide. Cool spaced containers in water.</p>
<p style="text-align: center;"><b>Exposure</b></p>	<p>CALL FOR MEDICAL AID</p> <p><b>LIQUID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED.</b> Will burn 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.</p>
<p style="text-align: center;"><b>Water Pollution</b></p>	<p><b>HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.</b> May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.</p>
<p style="text-align: center;"><b>1. RESPONSE TO DISCHARGE</b> (See Response Methods Handbook)</p> <p>Issue warning-poison Restrict access Should be removed Chemical and physical treatment</p>	<p style="text-align: center;"><b>2. LABEL</b></p> <p>2.1 Category: Poison 2.2 Class: 6</p>
<p style="text-align: center;"><b>3. CHEMICAL DESIGNATIONS</b></p> <p>3.1 CG Compatibility Class: Nitrocompounds 3.2 Formula: C<sub>6</sub>H<sub>5</sub>NO<sub>2</sub> 3.3 IMO/UN Designators: 6.1/1982 3.4 DOT ID No.: 1982 3.5 CAS Registry No.: 98-95-3</p>	<p style="text-align: center;"><b>4. OBSERVABLE CHARACTERISTICS</b></p> <p>4.1 Physical State (as shipped): Liquid 4.2 Color: Light greenish-yellow 4.3 Odor: Like shoe polish</p>
<p style="text-align: center;"><b>5. HEALTH HAZARDS</b></p>	
<p>5.1 Personal Protective Equipment: Respirator approved by U.S. Bureau of Mines for organic vapors, rubber gloves, splashproof goggles, eyewash fountain, safety shower and medical oxygen supply.</p> <p>5.2 Symptoms Following Exposure: Highly toxic when absorbed through the skin, inhaled as vapor, or swallowed. First symptoms are a blue discoloration of the lips, nails, and skin. Acute poisoning produces headache, dizziness, weakness, nausea, vomiting, and coma.</p> <p>5.3 Treatment of Exposure: Remove to fresh air and call a physician at once. In case of contact, immediately flush skin or eyes with plenty of water for at least 15 min. If cyanotic (blue discoloration) is present, shower with soap and warm water, with special attention to scalp and fingernails. Administer oxygen until physician arrives.</p> <p>5.4 Threshold Limit Value: 1 ppm</p> <p>5.5 Short Term Inhalation Limit: 10 ppm for 30 min.</p> <p>5.6 Toxicity by Ingestion: Grade 3; LD<sub>50</sub> = 90-100 mg/kg (dog)</p> <p>5.7 Lethal Toxicity: Data not available</p> <p>5.8 Vapor (Gas) Irritant Characteristics: Vapor is moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations.</p> <p>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.</p> <p>5.10 Odor Threshold: 5.94 ppm</p> <p>5.11 IDLH Value: 200 ppm</p>	

**6. FIRE HAZARDS**

6.1 Flash Point: 171°F C.C.; 190°F C.C.  
6.2 Flammable Limits in Air: 1.8% LEL (UEL not available)  
6.3 Fire Extinguishing Agents: Water, foam, carbon dioxide, or dry chemical  
6.4 Fire Extinguishing Agents Not to be Used: Not pertinent  
6.5 Special Hazards of Combustion Products: Not pertinent  
6.6 Behavior in Fire: Not pertinent  
6.7 Ignition Temperature: 824°F  
6.8 Electrical Hazard: Not pertinent  
6.9 Burning Rate: 2.5 mm/min.  
6.10 Adiabatic Flame Temperature: Data not available  
6.11 Steam/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 Water Ratio (Resistant to Product): Data not available  
7.8 Reactivity Group: 4.2

**8. WATER POLLUTION**

8.1 Aquatic Toxicity: 20 ppm/8 hr/freshwater/fresh water  
8.2 Waterway Toxicity: Data not available  
8.3 Biological Oxygen Demand (BOD): 0%, 5 days  
8.4 Food Chain Concentration Potential: None

**9. SHIPPING INFORMATION**

9.1 Grades of Purity: Technical: 98.5-100%  
9.2 Storage Temperature: Ambient  
9.3 Inert Atmosphere: No requirement  
9.4 Venting: Open (flame arrester)

**10. HAZARD ASSESSMENT CODE**  
(See Hazard Assessment Handbook)  
A-X-Y

**11. HAZARD CLASSIFICATIONS**

11.1 Code of Federal Regulations: Poison, B  
11.2 HAS Hazard Rating for Bulk Water Transportation:  
Category      Rating  
Fire ..... 1  
Health ..... 3  
Vapor Irritant ..... 3  
Liquid or Solid Irritant ..... 2  
Poisons ..... 4  
Water Pollution  
Human Toxicity ..... 3  
Aquatic Toxicity ..... 3  
Acute Effect ..... 3  
Reactivity  
Other Chemicals ..... 2  
Water ..... 0  
Self Reaction ..... 1  
11.3 NFPA Hazard Classification:  
Category      Classification  
Health Hazard (Blue) ..... 3  
Flammability (Red) ..... 2  
Reactivity (Yellow) ..... 0

**12. PHYSICAL AND CHEMICAL PROPERTIES**

12.1 Physical State at 15°C and 1 atm: Liquid  
12.2 Molecular Weight: 123.11  
12.3 Boiling Point at 1 atm: 411.6°F = 210.9°C = 484.1°K  
12.4 Freezing Point: 41.2°F = 5.1°C = 278.3°K  
12.5 Critical Temperature: 836°F = 447°C = 720°K  
12.6 Critical Pressure: 700 psia = 47.82 atm = 4.824 MN/m<sup>2</sup>  
12.7 Specific Gravity: 1.204 at 20°C (liquid)  
12.8 Liquid Surface Tension: 43.9 dynes/cm = 0.0439 N/m at 20°C  
12.9 Liquid Water Interfacial Tension: 25.66 dynes/cm = 0.02566 N/m at 20°C  
12.10 Vapor (Gas) Specific Gravity: Not pertinent  
12.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
12.12 Latent Heat of Vaporization: 150 Btu/lb = 85 cal/g = 3.6 x 10<sup>4</sup> J/kg  
12.13 Heat of Combustion: -10,420 Btu/lb = -5,791 cal/g = -242.5 x 10<sup>4</sup> J/kg  
12.14 Heat of Decomposition: Not pertinent  
12.15 Heat of Solution: Not pertinent  
12.16 Heat of Polymerization: Not pertinent  
12.17 Heat of Fusion: 22.50 cal/g  
12.18 Limiting Value: Data not available  
12.19 Reid Vapor Pressure: 0.01 psia

NOTES

IMP 001 0177

# o-DICHLOROBENZENE

DBO

<p><b>Common Synonyms</b> 1, 2-Dichlorobenzene Orthodichlorobenzene Dowtherm E</p>	<p><b>Liquid</b></p> <p><b>Colorless</b></p> <p><b>Pleasant odor</b></p> <p>Blinks in water.</p>
<p>Avoid contact with liquid. Wear goggles and self-contained breathing apparatus. Stop discharge if possible. Call fire department. Isolate and remove discharged material. Notify local health and pollution control agencies.</p>	
<b>Fire</b>	<p>Combustible <b>POISONOUS GASES ARE PRODUCED IN FIRE.</b> Wear goggles and self-contained breathing apparatus. Extinguish with water, dry chemical, foam, or carbon dioxide. Cool exposed containers with water.</p>
<b>Exposure</b>	<p>CALL FOR MEDICAL AID</p> <p><b>LIQUID</b> Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. <b>IF IN EYES,</b> hold eyelids open and flush with plenty of water. <b>IF SWALLOWED</b> and victim is <b>CONSCIOUS,</b> have victim drink water or milk and have victim induce vomiting. <b>IF SWALLOWED</b> and victim is <b>UNCONSCIOUS OR HAVING CONVULSIONS,</b> do nothing except keep victim warm.</p>
<b>Water Pollution</b>	<p>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.</p>
<p><b>1. RESPONSE TO DISCHARGE</b> (See Response Methods Handbook) Issue warning-water contaminant Should be removed Chemical and physical treatment</p>	<p><b>2. LABEL</b></p> <p>2.1 Category: None 2.2 Class: Not pertinent</p>
<p><b>3. CHEMICAL DESIGNATIONS</b></p> <p>3.1 CG Compatibility Class: Halogenated hydrocarbon 3.2 Formula: o-C<sub>6</sub>H<sub>4</sub>Cl<sub>2</sub> 3.3 IMDG Designation: 6.1/1891 3.4 DOT ID No.: 1591 3.5 CAB Registry No.: 95-50-1</p>	<p><b>4. OBSERVABLE CHARACTERISTICS</b></p> <p>4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Aromatic; characteristic</p>
<p style="text-align: center;"><b>5. HEALTH HAZARDS</b></p> <p>5.1 Personal Protective Equipment: Organic vapor-acid gas respirator; neoprene or vinyl gloves; chemical safety spectacles; face shield; rubber footwear; apron; protective clothing. 5.2 Symptoms Following Exposure: Chronic inhalation of mist or vapors may result in damage to lungs, liver, and kidneys. Acute vapor exposure can cause symptoms ranging from coughing to central nervous system depression and transient anesthesia. Irritating to skin, eyes, and mucous membranes. May cause dermatitis. 5.3 Treatment of Exposure: <b>INHALATION:</b> remove victim to fresh air, keep him quiet and warm, and call a physician promptly. <b>INGESTION:</b> no known antidote; treat symptomatically; induce vomiting and get medical attention promptly. <b>EYES AND SKIN:</b> flush with plenty of water; get medical attention for eyes; remove contaminated clothing and wash before reuse. 5.4 Threshold Limit Value: 50 ppm 5.5 Short Term Inhalation Limit: 50 ppm for 15 min. 5.6 Toxicity by Ingestion: Grade 2; LD<sub>50</sub> = 0.5 to 0.9 g/kg 5.7 Late Toxicity: Causes kidney and liver damage in rats. Effects unknown in humans. 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: 4.0 ppm; 50 ppm 5.11 IDLH Value: 1,700 ppm</p>	

<p style="text-align: center;"><b>6. FIRE HAZARDS</b></p> <p>6.1 Flash Point: 105°F O.C.; 165°F C.C. 6.2 Flammable Limits in Air: 2.2%-8.2% 6.3 Fire Extinguishing Agents: Water, foam, dry chemical, or carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Irritating vapors including hydrogen chloride gas, chloroacarbon, chlorine 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: 1198°F 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: 1.3 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</p>	<p style="text-align: center;"><b>10. HAZARD ASSESSMENT CODE</b> (See Hazard Assessment Handbook) <b>A-X-Y</b></p>																																				
<p style="text-align: center;"><b>7. CHEMICAL REACTIVITY</b></p> <p>7.1 Reactivity With Water: No reaction 7.2 Reactivity with Common Inorganic: 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 Molecular Ratio (Reactant to Product): Data not available 7.8 Reactivity Group: 35</p>	<p style="text-align: center;"><b>11. HAZARD CLASSIFICATIONS</b></p> <p>11.1 Code of Federal Regulations: OPM-A 11.2 HAS Hazard Rating for Bulk Water Transporters:</p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Category</th> <th style="text-align: left;">Rating</th> </tr> </thead> <tbody> <tr> <td>Fire</td> <td>1</td> </tr> <tr> <td>Health</td> <td></td> </tr> <tr> <td>Vapor Irritant</td> <td>2</td> </tr> <tr> <td>Liquid or Solid Irritant</td> <td>1</td> </tr> <tr> <td>Poisons</td> <td>1</td> </tr> <tr> <td>Water Pollution</td> <td></td> </tr> <tr> <td>Human Toxicity</td> <td>3</td> </tr> <tr> <td>Aquatic Toxicity</td> <td>1</td> </tr> <tr> <td>Aesthetic Effect</td> <td>3</td> </tr> <tr> <td>Reactivity</td> <td></td> </tr> <tr> <td>Other Chemicals</td> <td>2</td> </tr> <tr> <td>Water</td> <td>1</td> </tr> <tr> <td>Self Reaction</td> <td>0</td> </tr> </tbody> </table> <p>11.3 NFPA Hazard Classification:</p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Category</th> <th style="text-align: left;">Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td> <td>2</td> </tr> <tr> <td>Flammability (Red)</td> <td>2</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td>0</td> </tr> </tbody> </table>	Category	Rating	Fire	1	Health		Vapor Irritant	2	Liquid or Solid Irritant	1	Poisons	1	Water Pollution		Human Toxicity	3	Aquatic Toxicity	1	Aesthetic Effect	3	Reactivity		Other Chemicals	2	Water	1	Self Reaction	0	Category	Classification	Health Hazard (Blue)	2	Flammability (Red)	2	Reactivity (Yellow)	0
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<p style="text-align: center;"><b>8. WATER POLLUTION</b></p> <p>8.1 Aquatic Toxicity: 13 ppm*/marine plankton/no growth/soft water *Time period not specified. 8.2 Waterflow Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): &lt;0.1% (theor.), 1/8 day 8.4 Feed Chain Concentration Potential: Data not available</p>	<p style="text-align: center;"><b>12. PHYSICAL AND CHEMICAL PROPERTIES</b></p> <p>12.1 Physical State at 16°C and 1 atm: Liquid 12.2 Molecular Weight: 147.01 12.3 Boiling Point at 1 atm: 356.9°F = 180.5°C = 453.7°K 12.4 Freezing Point: 0.3°F = 17.6°C = 255.6°K 12.5 Critical Temperature: Not pertinent 12.6 Critical Pressure: Not pertinent 12.7 Specific Gravity: 1.305 at 20°C (liquid) 12.8 Liquid Surface Tension: 37 dynes/cm = 0.037 N/m at 20°C 12.9 Liquid Water Interfacial Tension: (est.) 40 dynes/cm = 0.04 N/m at 20°C 12.10 Vapor (Gas) Specific Gravity: Not pertinent 12.11 Ratio of Specific Heats of Vapor (Gas): 1.080 12.12 Latent Heat of Vaporization: 115 Btu/lb = 63.9 cal/g = 2.66 X 10<sup>6</sup> J/kg 12.13 Heat of Combustion: -7986 Btu/lb = -4427 cal/g = -186.4 X 10<sup>6</sup> J/kg 12.14 Heat of Decomposition: Not pertinent 12.15 Heat of Solution: Not pertinent 12.16 Heat of Polymerization: Not pertinent 12.17 Heat of Fusion: 21.02 cal/g 12.18 Melting Value: Data not available 12.19 Reid Vapor Pressure: 0.05 psia</p>																																				
<p style="text-align: center;"><b>9. SHIPPING INFORMATION</b></p> <p>9.1 Grades of Purity: Technical: 99.5% min. dichlorobenzene (ortho-ortho + para/meta: 80 min.) Technical: 85% orthodichlorobenzene, 14.0% para-dichlorobenzene Technical: 80% ortho, 17% para, 2% meta Pure: not less than 99.5% ortho, not more than 0.5% para 9.2 Storage Temperature: Data not available 9.3 Inert Atmosphere: Data not available 9.4 Venting: Data not available</p>	<p style="text-align: center;"><b>NOTES</b></p>																																				

IMP 001 0178



# ISOPHORONE

IPH

<b>Common Synonyms</b> 3,3,5-Trimethyl-2-cyclohexane-1-one	<b>Liquid</b>  Colorless  Camphor-like odor  Floats and mixes slowly with water.		
Stop discharge if possible. Keep people away. Call fire department. Isolate and remove discharged material. Notify local health and pollution control agencies.			
<b>Fire</b>	Combustible. Extinguish with dry chemicals, foam or carbon dioxide. Water may be ineffective on fire.		
<b>Exposure</b>	CALL FOR MEDICAL AID  <b>LIQUID</b> 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. DO NOT INDUCE VOMITING.		
<b>Water Pollutor.</b>	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		
<b>1. RESPONSE TO DISCHARGE</b> (See Response Methods Handbook) Issue warning-water contaminant Restrict access Mechanical containment Should be removed Chemical and physical treatment		<b>2. LABEL</b> 2.1 Category: None 2.2 Class: Not pertinent	
<b>3. CHEMICAL DESIGNATIONS</b> 3.1 CG Compatibility Class: Ketone 3.2 Formula: $\text{C}_{10}\text{H}_{18}\text{O}$ 3.3 IMO/UN Designation: Not listed 3.4 DOT ID No.: Data not available 3.5 CAS Registry No.: 78-59-1		<b>4. OBSERVABLE CHARACTERISTICS</b> 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Like camphor	
<b>5. HEALTH HAZARDS</b> 5.1 Personal Protective Equipment: Self-contained breathing apparatus with full face mask; rubber gloves 5.2 Symptoms Following Exposure: Inhalation irritates eye, nose and throat; causes central depression and has some anesthetic effect. Contact of liquid with eyes causes severe irritation and possible tissue damage. Skin is irritated by liquid and may crack on prolonged contact. Ingestion causes irritation of mouth and stomach. 5.3 Treatment of Exposure: <b>INHALATION:</b> remove victim promptly from contaminated atmosphere; if breathing has stopped, give artificial respiration and oxygen. <b>EYES:</b> flood with water for at least 15 min.; consult an eye specialist as soon as possible. <b>SKIN:</b> flood with water. <b>INGESTION:</b> do NOT induce vomiting; call a doctor. 5.4 Threshold Limit Value: 5 ppm 5.5 Short Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 2, oral $\text{LD}_{50}$ = 2,330 mg/kg (rat) 5.7 Lethal 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 second-degree burns on long exposure. 5.10 Odor Threshold: Data not available 5.11 IDLH Value: 800 ppm			

<b>6. FIRE HAZARDS</b> 6.1 Flash Point: 205°F O.C., 184°F C.C. 6.2 Flammable Limits in Air: 0.84%-3.8% 6.3 Fire Extinguishing Agents: Dry chemical, foam, 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: Not pertinent 6.7 Ignition Temperature: 864°F 6.8 Electrical Hazard: Data not available 6.9 Burning Rate: 4.0 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	<b>10. HAZARD ASSESSMENT CODE</b> (See Hazard Assessment Handbook) <b>A-P-Q-T-U</b>																																				
<b>7. CHEMICAL REACTIVITY</b> 7.1 Reactivity With Water: No reaction 7.2 Reactivity with Common Inorganic: 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: 10	<b>11. HAZARD CLASSIFICATIONS</b> 11.1 Code of Federal Regulations: Not listed 11.2 NIOSH Hazard Rating for Bulk Water Transportation: <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Category</th> <th style="text-align: left;">Rating</th> </tr> </thead> <tbody> <tr> <td>Fire</td> <td>1</td> </tr> <tr> <td>Health</td> <td></td> </tr> <tr> <td>Vapor Irritant</td> <td>2</td> </tr> <tr> <td>Liquid or Solid Irritant</td> <td>2</td> </tr> <tr> <td>Poisons</td> <td>2</td> </tr> <tr> <td>Water Pollution</td> <td></td> </tr> <tr> <td>Human Toxicity</td> <td>1</td> </tr> <tr> <td>Aquatic Toxicity</td> <td>3</td> </tr> <tr> <td>Aesthetic Effect</td> <td>2</td> </tr> <tr> <td>Reactivity</td> <td></td> </tr> <tr> <td>Other Chemicals</td> <td>2</td> </tr> <tr> <td>Water</td> <td>0</td> </tr> <tr> <td>Self Reaction</td> <td>0</td> </tr> </tbody> </table> 11.3 NFPA Hazard Classification: <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Category</th> <th style="text-align: left;">Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td> <td>2</td> </tr> <tr> <td>Flammability (Red)</td> <td>1</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td>0</td> </tr> </tbody> </table>	Category	Rating	Fire	1	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	2	Water	0	Self Reaction	0	Category	Classification	Health Hazard (Blue)	2	Flammability (Red)	1	Reactivity (Yellow)	0
Category	Rating																																				
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<b>8. WATER POLLUTION</b> 8.1 Aquatic Toxicity: 430 ppm/24 hr/bone shrimp/TL <sub>50</sub> 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Feed Chain Concentration Potential: None	<b>12. PHYSICAL AND CHEMICAL PROPERTIES</b> 12.1 Physical State at 15°C and 1 atm: Liquid 12.2 Molecular Weight: 138.2 12.3 Boiling Point at 1 atm: 419.5°F = 215.3°C = 488.5°K 12.4 Freezing Point: 17.4°F = -8.1°C = 265.1°K 12.5 Critical Temperature: Not pertinent 12.6 Critical Pressure: Not pertinent 12.7 Specific Gravity: 0.821 at 25°C (liquid) 12.8 Liquid Surface Tension: 32.3 dynes/cm = 0.0323 N/m at 20°C 12.9 Liquid Water Intercal Tension: Not pertinent 12.10 Vapor (Gas) Specific Gravity: 4.75 12.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 12.12 Latent Heat of Vaporization: 135 Btu/lb = 75 cal/g = $3.14 \times 10^4$ J/kg 12.13 Heat of Combustion: -16,170 Btu/lb = -8,980 cal/g = $-376 \times 10^4$ 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: Low																																				
<b>9. SHIPPING INFORMATION</b> 9.1 Grades of Purity: 99+ % 9.2 Storage Temperature: Ambient 9.3 Inert Atmosphere: No requirement 9.4 Venting: Open (flame arrester)	<b>NOTES</b>																																				

IMP 001 0180

# DIOCTYL PHTHALATE

DOP

<p><b>Common Synonyms</b></p> <p>Phthalic acid, bis (2-octylhexyl ester) DOP Bis (2-octylhexyl) phthalate D (2-octylhexyl) phthalate Octol</p>	<p>Oil liquid</p> <p>Colorless</p> <p>Slight odor</p>	<p>Floats on water.</p>
<p>Size discharge if possible Call fire department Isolate discharge if possible Notify local health and pollution control agencies</p>		
<b>Fire</b>	<p>Combustible Extinguish with dry chemical, foam, or carbon dioxide</p>	
<b>Exposure</b>	<p>Not harmful</p>	
<b>Water Pollution</b>	<p>Effect of low concentrations on aquatic life is unknown. Fouling to shorelines May be dangerous if it enters water intakes. Notify local health and wildlife officials Notify operators of nearby water intakes</p>	
<p><b>1. RESPONSE TO DISCHARGE</b> (See Response Methods Handbook) Mechanical containment Chemical and physical treatment</p>		<p><b>2. LABEL</b></p> <p>2.1 Category: None 2.2 Class: Not pertinent</p>
<p><b>3. CHEMICAL DESIGNATIONS</b></p> <p>3.1 CG Compatibility Class: Ester 3.2 Formula: <math>C_{26}H_{44}(COOCH_2CH_2C_8H_{17})_2</math> 3.3 BPO/UN Designation: Not listed 3.4 DOT ID No.: Data not available 3.5 CAS Registry No.: 117-84-0</p>		<p><b>4. OBSERVABLE CHARACTERISTICS</b></p> <p>4.1 Physical State (as shipped): Solid 4.2 Color: Colorless 4.3 Odor: Very slight</p>
<p style="text-align: center;"><b>5. HEALTH HAZARDS</b></p> <p>5.1 Personal Protective Equipment: Not required 5.2 Symptoms Following Exposure: Produces no ill effects at normal temperatures but may give off irritating vapor at high temperature 5.3 Treatment of Exposure: Leave contaminated area; wash skin with soap and water; flush eyes with water 5.4 Threshold Limit Value: Not pertinent 5.5 Short Term Inhalation Limit: Not pertinent 5.6 Toxicity by Ingestion: Grade 0; LD<sub>50</sub> above 18 g/kg (rat) 5.7 Lethal Toxicity: Not established 5.8 Vapor (Gas) Irritant Characteristics: Nonirritating to the eyes and throat. 5.9 Liquid or Solid Irritant Characteristics: No appreciable hazard. Practically harmless to the skin. 5.10 Odor Threshold: Not pertinent 5.11 IDLH Value: Data not available</p>		

**6. FIRE HAZARDS**

6.1 Flash Point: 425°F O.C.  
6.2 Flammable Limits in Air: Not pertinent  
6.3 Fire Extinguishing Agents: Dry powder, carbon dioxide, foam  
6.4 Fire Extinguishing Agents Not to be Used: Water or foam may cause boiling  
6.5 Special Hazards of Combustion  
Products: None  
6.6 Behavior in Fire: Not pertinent  
6.7 Ignition Temperature: Data not available  
6.8 Electrical Hazard: Not pertinent  
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: 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 Water Ratio (Reactant to Product): Data not available  
7.8 Reactivity Group: 34

**8. WATER POLLUTION**

8.1 Aquatic Toxicity: Data not available  
8.2 Waterway 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: Data not available  
9.2 Storage Temperature: Ambient  
9.3 Inert Atmosphere: No requirement  
9.4 Venting: Open (flame arrester)

**10. HAZARD ASSESSMENT CODE**  
(See Hazard Assessment Handbook)  
A-T-U-X-Y

**11. HAZARD CLASSIFICATIONS**

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

Category	Classification
Health Hazard (Blue)	0
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: 390.6  
12.3 Boiling Point at 1 atm: 727°F = 386°C = 656°K  
12.4 Freezing Point: Not pertinent  
12.5 Critical Temperature: Not pertinent  
12.6 Critical Pressure: Not pertinent  
12.7 Specific Gravity: 0.980 at 25°C (liquid)  
12.8 Liquid Surface Tension (est.): 15 dynes/cm = 0.015 N/m at 20°C  
12.9 Liquid Water Interfacial Tension (est.): 30 dynes/cm = 0.03 N/m at 20°C  
12.10 Vapor (Gas) Specific Gravity: Not pertinent  
12.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent  
12.12 Latent Heat of Vaporization: Not pertinent  
12.13 Heat of Combustion: -15,130 Btu/lb = -8410 cal/g = -352 x 10<sup>3</sup> 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: Low

NOTES

IMP 001 0181

CHEMICAL TOXICITY AND OTHER INFORMATION

COMPOUND,	TLV (mg/m <sup>3</sup> )	ACC OR STEL (mg/m <sup>3</sup> )	PHYSICAL STATE	REMARKS
Arsenic Compounds*	0.2	---	Yellow, orange, red or white crystals or powder. Appearances of individual compounds vary.	<p>Acute and chronic arsenic poisoning results in disturbances of the digestive tract, liver, blood, kidneys, and nervous system. Arsenic is a recognized carcinogen of the skins, lungs, and liver. When heated to decomposition or contacted with acids, emits highly toxic fumes.</p> <p><u>SYMPTOMS:</u> Acute exposure to arsenic by ingestion causes nausea, vomiting and diarrhea and in severe cases coma and death. Chronic exposure often manifests itself as loss of appetite, cramps, nausea, and constipation or diarrhea. Chronic exposure results in a variety of skin abnormalities.</p> <p><u>FIRST AID:</u> Ingestion: Vomiting followed by medical attention Direct Contact: Wash with soap immediately</p> <p><u>INCOMPATIBILITIES:</u> Compound specific</p>
Barium Compounds	0.5	---	Yellow, white or colorless crystals or powder. Appearances of individual compounds vary.	<p>Exposure to barium poisoning results effects to the skin, eyes and throat, Flammable at room temperature when in powder form.</p> <p><u>SYMPTOMS:</u> Direct Contact: Causes irritation of eyes, nose, throat and skin Ingestion: Symptoms vary depending upon compound.</p> <p><u>First Aid:</u> Direct contact with skin and eyes: Flush immediately Ingestion: medical attention immediately</p>
Cadmium* Salts, dusts, and fumes	0.5	0.2 0.1	Silver/White/Blue tinged metal compounds have different	<p>Continuous exposure to cadmium may cause irreversible lung injury, abnormal lung function and kidney disease. Increased incidence of prostatic cancer, kidney and respiratory cancer in cadmium workers has been observed. Dust or powder is flammable, toxic gases may be released in a fire.</p> <p><u>SYMPTOMS:</u> Inhalation: irritation of nose and throat, 0.5 to 2.5 mg/w<sup>3</sup> exposure can cause non-fatal lung inflammation. 4 to 10 hours exposure - severe chest pain, persistent cough, and difficulty in breathing. Eye: irritation Ingestion: A dose of 15-30 mg of metal or soluble salt may cause increased salivation, choking, vomiting, abdominal pain, etc.</p> <p><u>FIRST AID:</u> Ingestion: Conscious person--give large amounts of water immediately and seek medical advice.</p> <p><u>INCOMPATIBILITIES:</u> Strong oxidizers, elemental sulfur, selenium, zinc, hydrobenzoic acid, ammonium nitrate.</p>

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CHEMICAL TOXICITY AND OTHER INFORMATION  
(continued)

COMPOUND	TLV (mg/m <sup>3</sup> )	ACC OR STEL (mg/m <sup>3</sup> )	PHYSICAL STATE	REMARKS
Chlorides	---	---	Dependent upon compound	Toxicity varies greatly among the individual compounds. When heated to decomposition or on contact with acids, emit toxic chloride fumes.
Chromium (II & III) Hexavalent (VI)* oxide	0.5 0.05	--- ---	Steel gray metal or silver metal powder	The toxicity of chromium varies with different chromium compounds. Chronic acids and chromates appear to be more toxic than chromium metal dust, insoluble chromium salts, and soluble chromic and chromous salts. Exposure to certain incidence in humans. <u>SYMPTOMS:</u> Inhalation: Dust may cause irritation of nose, throat, respiratory passages, and lungs. Repeated or prolonged exposure to chromic acid or dust may cause ulceration and perforation of the nasal septum. Skin: Dermatitis, repeated exposure may cause an allergic skin rash. <u>INCOMPATIBILITIES:</u> Alkalies, dil H <sub>2</sub> SO <sub>4</sub> & HCl.
Copper Fume Dust & mist as copper	0.2 1.0	--- 2.0	Reddish, lustrous metal No odor	<u>SYMPTOMS:</u> Inhalation: Copper and Copper oxide fumes may cause metal fume fever--chills, fever, aching muscles, dry mouth and throat, headache, nausea, vomiting, diarrhea and stomach pains. Skin: May cause irritation - metal solutions can cause swelling and itching. Ingestion: May cause stomach pain, nausea, vomiting and diarrhea from ingestion of 10 mg of copper by an adult and 8.5 mg by a child. Long Term: No long term effects from inhalation or ingestion reported. Copper fragment in cornea may cause cataracts. <u>FIRST AID:</u> Ingestion: Seek medical attention. (Pennillamine or triethylenetetramine dihydrochloride may be beneficial in reducing body burden.) <u>INCOMPATIBILITIES:</u> Acetylene gas, magnesium metal, oxidizing agent
Lead Lead Chloride* Lead Nitrate*	0.15	0.45	Bluish white or silvery gray Solid	Lead is a cumulative poison. Increasing amount builds up in the body and eventually a point is reached where symptoms and disability may occur. Lead dust carried home may cause symptoms in other family members. <u>SYMPTOMS:</u> Long term exposure: Decreased physical fitness, fatigue, sleep disturbances, headache, aching bones, constipation, decreased appetite, and abdominal pain. Inhalation of large amounts of lead may lead to seizures, coma and death. <u>FIRST AID:</u> Get medical attention. Ingestion: If victim is conscious, give water. <u>INCOMPATIBILITIES:</u> Reacts violently with potassium.

810 001 0183 IMP

CHEMICAL TOXICITY AND OTHER INFORMATION  
(continued)

COMPOUND	TLV (mg/m <sup>3</sup> )	ACC OR STEL (mg/m <sup>3</sup> )	PHYSICAL STATE	REMARKS
Mercury*				
Alkyl compounds	0.01	0.03	Silvery mobile odorless	Highly toxic by skin absorption and inhalation of fume or vapor and ingestion. Spillage requires caution due to droplet proliferation. <u>SYMPTOMS:</u> After absorption mercury causes dermatitis, stomatitis, tremors and psychic disturbances. Irritation of mucous membranes are also noted. Exposure to mercury first causes excessive salivation, pain in chewing and gingivitis. <u>FIRST AID:</u> Eyes: Irrigate immediately Skin: Wash immediately with soap Breath: Artificial respirator Ingestion: Immediate medical attention <u>INCOMPATIBILITIES:</u> Acetylenes, ammonia gas, and strong oxidizers (i.e. chlorine gas).
All forms except Alkyl vapor	0.05	---	liquid	
Nickel	1.0	---	Silvery white malleable metal	Nickel is an insoluble metal, but most common salts are soluble. <u>SYMPTOMS:</u> (from nickel dust and salts) <u>Inhalation:</u> Dust and mists can cause lung irritation, shortness of breath, coughing and wheezing. <u>Skin:</u> Itching, burning and sores referred to as "nickel rash" <u>Eyes:</u> Irritation and damage to cornea. <u>Ingestion:</u> Giddiness and nausea  Long term exposure, in addition to symptoms listed above, impairment of sense of smell, chest pain, destruction of nasal tissues and asthmatic lung disease. Dust inhalation has been associated with an increased risk of lung and nasal cancer. <u>FIRST AID:</u> <u>Ingestion:</u> Consume large amounts of water. Seek medical attention. <u>INCOMPATIBILITIES:</u> Nickel dust is flammable. Reacts violently with fluorine, strong mineral acids; liberates H <sub>2</sub> , ammonium nitrate, etc.
Soluble nickel Compounds	0.1	0.3	White or colored crystal or powder	

IMP 001 0184

CHEMICAL TOXICITY AND OTHER INFORMATION

COMPOUND	TLV (mg/m <sup>3</sup> )	ACC OR STEL (mg/m <sup>3</sup> )	PHYSICAL STATE	REMARKS
Selenium*	0.2	---	White, red or orange powder depending on specific compound	Selenium dusts or fumes are severe irritants of the respiratory tracts. Elemental Selenium has low toxicity, however, some compound have high toxicity. <u>SYMPTOMS:</u> Chronic exposure to inorganic compound causes dermatitis, pallor, nervousness, depression and digestive disturbances. <u>FIRST AID:</u> Eyes: Irrigate immediately Skin: Soap wash immediately Breath: Artificial respiration Ingestion: Immediate medical attention <u>INCOMPATIBILITIES:</u> Acids and strong oxidizing agents
Zinc	---	---	Blue powder	Zinc is considered an essential trace element, necessary for normal growth and development. Most zinc compounds have a relatively low order of toxicity however, occupational exposure to zinc chloride and zinc oxide has been associated with adverse health effects. Spontaneous combustion may occur if zinc dust is stored in damp place. Zinc dust forms an explosive mixture with air.
Zinc Chloride*				<u>SYMPTOMS:</u> Inhalation: Inhalation of mists of fumes may cause respiratory or gastrointestinal irritation, shortness of breath, a feeling of constriction in the chest and coughing with phlegm and bloody sputum. It may also produce a cyanosis, resulting in a blue color of the skin and lip. Exposure to freshly formed zinc oxide fumes can cause a flu-like illness called metal fume fever, with symptoms similar to those encountered with viral influenza. Skin: Skin contact with zinc chloride may produce dermatitis. Ingestion: 12 grams of zinc metal over two days has caused sluggishness, light headedness; a staggering gait and difficulty in writing. <u>INCOMPATIBILITIES:</u> Acids, strong alkalies, amines, chlorides, chlorates, nitrates, oxides, fluorine, S, CB <sub>2</sub> .

\*See page 42, "References."

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