

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

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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.

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#### 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

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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.

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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.

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#### 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 semivolatile 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 Sludge	<u></u>	Solid Semi-Solid		Gas Other	
<u>Characteristics</u>					
Corrosive Volatile	<u> </u>	Flammable Radioactive		Explosive Other	
Containment					
Pit Lake Tank		Pond Process Vessel Piping	 √* 	Lagoon Drum Lab Pack	
Tank Car		Other	√*		

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

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Compound •	Hazard	Location	Concentration Range Range (ppm)	Threshold Limit Value TLV (ppm)
Volatile Organics Benzene Benzol	Readily absorbed via inhalation & ingestion: absorbed through skin.	Groundwater Soil	ND-0.204 ND-0.01	10 .
[C <sub>6</sub> H <sub>6</sub> ]	carcinogenic. Harmful if swallowed.	,		
1,1-Dichloroethane	Absorbed in GI tract and respiratory tract: Respiratory tract and skin irritant.	Groundwater	ND-1.48	200
$[C_2H_4C\ell_2]$	Irritating to eyes.			
1,2-Dichloroethane Ethylene Dichloride	Vapor irritating to eyes, nose, throat liquid burns skin and eyes. Harmful if swallowed.	Groundwater	ND-0.899	10
[C1CH2CH2C2]				
Trans-1,2-Dichloroethylene DCE	Absorbed through GI tract and inhalation. Harmful if swallowed.	Groundwater	ND-0.257	200
[C1CH=CHC1]				
1,2-Dichloropropane Propylene dichloride [CH <sub>3</sub> CHClCH <sub>2</sub> Cl]	Vapor irritiating to eyes, nose and throat, Liquid irritating to skin and eyes.	Groundwater Soil	ND-0.013 ND-0.059	75
Ethylbenzene EB	Vapor irritating to eyes, nose, throat, Liquid irritating to skin and eyes. Harmful if swallowed.	Groundwater Soil	ND-0.098 ND-0.059	100
[C <sub>6</sub> H <sub>5</sub> CH <sub>2</sub> CH <sub>3</sub> ]	Absorbed through respiratory tract.			
1,1,2,2-Tetrachloroethane Tetrachloroethane	Vapor irritating to eyes, nose, throat, Harmful if inhaled. Liquid irritating to skin and eyes.	Groundwater	ND-0.107 ND	1.0
[C1 <sub>2</sub> CHCHC1 <sub>2</sub> ]	Poisonous if swallowed or if skin exposed.			
l,l,l-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 CHC&=CC& <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	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
С <sub>6</sub> Н <sub>5</sub> СН <sub>3</sub>				
Total Xylenes (p-,o-m-)	Absorbed via inhalation. Vapor irritating to eves, nose and throat	Groundwater	ND-0.211	100
C <sub>6</sub> H <sub>4</sub> (CH <sub>3</sub> ) <sub>2</sub>	Liquid irritating to skin and eyes.			

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(continued)	

Compound	Hazard	Location	Concentration Range Range (ppm)	Threshold Limit Value TLV (ppm)
Polychlorinated Biphenyls PCB	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>
$(C_{12}H_{10_{x}})Cl_{2}$				
Tetrachloroethylene Perchloroethylene	Inhalation irritates eyes, nose, throat, Contact irritating to skin and eyes. Carcinopen	Soil	ND-0.115	50
Cℓ <sub>2</sub> C≈CCl <sub>2</sub>	Carcinogen.			
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	
Semi-Volatile Organics				
PHENOLS Phenol 2,4-Dichlorophenol 2,4-Dimethylpenol 4-Nitrophenol Pentachlorophenol 2,4,6-Trichlorophenol 2,4-Dinitrophenol 2-Methyl 1,4, 6-Dinitrophenol 2-Nitrophenol	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
с <sub>б</sub> н <sub>5</sub> он				
Butyl Benzyl Phthalate BB	Irritating to skin and eyes.	Groundwater	ND-0.172	N/A
C4H900CCH4C00C7H7; C9H2104				
Hexachlorobutadiene	Absorbed via ingestion and inhalation.	Groundwater	ND-0.108	
Cl <sub>2</sub> C:CC1CC1:CC1 <sub>2</sub>	Suspected carcinogen.			
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	

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Compound	Hazard	Location	Concentration Range Range (ppm)	Threshold Limit Value TLV (ppm)
1,4-Dichlorobenzene p-Dichlorobenzene PDCB C <sub>6</sub> H <sub>4</sub> Cl <sub>2</sub>	Irritates eye, nose and throat. Skin irritant. Poisonous gas from fire.	Groundwater	ND-0.085	75
Nitrobenzene C <sub>6</sub> H <sub>5</sub> NO <sub>2</sub>	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 <sub>12</sub> H <sub>12</sub> N <sub>2</sub>	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 <sub>6</sub> H <sub>4</sub> Cl <sub>2</sub>	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 <sub>2</sub> ) <sub>2</sub> C <sub>6</sub> H <sub>3</sub> CH <sub>3</sub>	Absorbed via skin, inhalation. Irritant to skin mucous membranes. Carcinogen.	Groundwater	ND-1.03	3 1.5mg/m <sup>3</sup>
Isophorone C <sub>9</sub> H <sub>14</sub> O; COCH=C(CH <sub>3</sub> )CH <sub>2</sub> C(CH <sub>3</sub> ) <sub>2</sub> CH <sub>2</sub>	Irritates eyes, nose, throat. Harmful if swallowed.	Groundwater	ND-0.167	5
N-Nitrosodiphenylsmine NDPA C <sub>12</sub> H <sub>10</sub> N <sub>2</sub> O	No data available.	Soil	ND-8.69	
Bis(2-ethylhexyl)phthalate Dioctyl Phthalate Phthalic Acid; DOP Di(2-ethylhexyl) phtlalate o-C <sub>6</sub> H <sub>4</sub> [COOCH <sub>2</sub> CH(C <sub>2</sub> H <sub>5</sub> )(CH <sub>2</sub> ) <sub>3</sub> CH <sub>3</sub> ]	Poorly absorbed through skin. Not harmful.	Sediment Surface Water	ND-11.7 ND-0.067	5 mg/m <sup>3</sup>

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Compound	Hazard	Location	Concentration Range Range (ppm)	Threshold Limit Value TLV (ppm)
		C		·····
Polyaromatic Hydrocarbons (PAHs)	Absorbed via ingestion and innalation.	Groundwater	ND-0.407	
Polynuclear Hydrocarbons	Irritates eyes, nose and throat.	5011	ND-1.37	
PAHs include:	Skin irritant. Carcinogenic.	Sediment		
Fluorene		Surface water	ND-0.6	
Napthalene	а — — — — — — — — — — — — — — — — — — —			
Acenaphthene	·			
Acenaphthylene				
Anthracene				
Phenanthrene				
Fluoranthene	·			
Pyrene			,	
Elements				
Arsenic	Highly toxic by inhalation.	Surface Soil	1.7-852	$0.2 \text{mg/m}^3$
	ingestion, and direct contact.	Sediments	0.027-200	5.
	Can cause skin abnormalities.	Groundwater	0.012-2.4	
	Recognized carcinogen.	Surface Water	ND-0.534	
				3
Barium	Toxic by inhalation, ingestion and	Surface Soil	ND-1260	0.5mg/m
	direct contact. Some barium compounds	Sediments	1.2-160	0.
	cause irritation of the eves, nose, throat,	Groundwater	ND-0.241	
	and skin	Surface Water	ND-23	
Cadmium	Cadmium is not readily absorbed by the skin	Surface Soil	ND-1 37	3 0.05me/m
C80m10m	When inhaled both cadmium dust and fumes are	Sediments	ND-0.69	0.00,00,0
•	shearhed	Groundwater	0 002-0 007	
	Cadmium dust and fumes are highly toxic and	Surface Water	ND-0 008	
	carcinogenic when inhaled.	buildet woter	110 0.000	
Chlorides	Toxicity varies widely with specific compound.	Sediments	86	
		Groundwater	2-55.5	
Chromium	Commonly found in trivelent and beyavalent	Surface Soil	ND-160	3 0.5mg/m_a
	states Hevavalent compounds have an irritating	Sediments	ND-52	0.05mg/m
	and corrective effect on skin Chromium dust	Groundwater	ND-0 057	(as dust)
	and fumer are carcinogenic by inhelation	Surface Water	ND-0.031	
	and tumes are carcinogenic by initiation.	Surface water	ND-0.031	
•			(2.1500	, , , , , , , , , , , , , , , , , , ,
Copper	copper dust toxic by inhalation;	Segiment	47-1500	U. 2mg/m (fume)
	irrilates mucous membranes and eyes	Surface Water	ND-0.036	l mg/m3 (dust)

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Compound •	Hazard	Location	Concentration Range Range (ppm)	Threshold Limit Value TLV (ppm)
Lead	Toxic by ingestion and inhalation	Surface Soil	ND-7600	0.15mg/m (dus
	of dusts and fumes.	Sediments	ND-1200	and fumes)
	Some evidence of carcinogenicity	Groundwater	ND-0.128	
	in animals.	Surface Water	ND-0.190	
Mercury	Highly toxic by skin absorption and inhalation of fume and vapor.	Sediments Surface Water	ND-1.01 ND-0.002	3 O.O5mg/m (skin-all forms except alkyl vapor)
Nickel	Toxic when inhaled as a dust. Carcinogenic when inhaled.	Sediments	16.0-21.0	s 1 mg/m <sub>3</sub> 0.1 mg/m (soluble compou
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 Sediments Groundwater Surface Water	0.63-1500 98.0-220 0.64-0.732 ND-0.320	Compound dependent

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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:

- <u>Existing Well Sampling</u> -- 4 existing onsite monitoring wells and 6 offsite residential wells will be sampled to confirm earlier findings and to direct subsequent field activities.
- <u>Air Monitoring</u> -- volatile organic emissions will be detected through the use of portable photoionization meters.
- <u>Soil Sampling</u> -- 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.
- <u>Groundwater Investigation</u> -- 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

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

- 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.
- 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.

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#### 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 <u>heat stress</u> that can arise from wearing Level A protection should also enter into the subtask leaders decision. (Comfort is <u>not</u> 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.

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	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	Х	Х	Х	Х
o Safety glasses				
or equivalent	Х	x	X	
o Hard hat	Х	Х	Х	
o Gloves, inner				
and outer	Х	Х	Х	Х
o Booties		Х	Х	Х
o Coveralls	X	Х	Х	
o Chemical protective				
coveralls		Х	X	
o Totally encapsulated				
suit				X

#### TABLE 5-1 Protective Gear

- <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 photoionzation meter's relative response varies with each compound. Action levels should be reviewed (when constituents are known) to determine appropriate modifications.

11.86.71T 0011.0.0 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.

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#### 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 polyaromatic 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.

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#### 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.

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#### 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. Burger, R. Dionne, D. Goodwin, C. Healey, L.

Ikalainen, B. Lewis, R. Longley, T. McMullen, J. Poor, D. Secovich, S. Urquhart, J. Wibby, S. Field Coordinator, Geologist Groundwater Sampling Groundwater Sampling Health and Safety Officer, Geologist Project Manager Technical Director Drilling Monitor, Geologist Groundwater Sampling Field Support Groundwater Sampling Drilling Monitor, Geologist 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 1MP 001 0072

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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;
- review of site safety plan (site safety plans are updated as new information becomes available)
- review of decontamination procedures;
- o proper use and care of personal protective equipment;
- o proper calibration and use of monitoring equipment;
- 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.

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#### 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 progam 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 symptons 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.

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#### TABLE 8-1

#### BASELINE HEALTH MONITORING PROGRAM

#### 1. PHYSICAL EXAMINATION

Medical history а. Medical examination Ъ. Vision: c. o near/distant o color Audiometry (optional, assignment dependent) d. Radiology: PA/LAT е. f. Spirometry Electrocardiogram (optional, age and history dependent) g٠ LABORATORY ANALYSIS 2. Hematology а. -complete blood count red blood cell count white blood cell count hemoglobin hematocrit platelets indices: MCV, MCH, MCHC sedimentation rate b. Blood Chemistry --Multi-22 calcium inorganic phosphate glucose blood urea nitrogen uric acid cholesterol total protein albumin bilirubin alkaline phosphatase sodium SGPT potassium chloride creatine CO globulin CO/globulin ratio triglycerides BUN/creating ratio gamma GT serum iron iron binding capacity acetyl cholinesterase T3 uptake plasma Total T4 red blood cell Immunoprofile III free erythrocyte porphyrin

c. Urine Analysis

pH, specific gravity, appearance, sugar, etc.

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11.86.71T 0010.0.0 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-handing. 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

11.86.71 0031.0.0 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 mimick 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.

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- 2. Assume that the site is contaminated and conduct a site safety reconnaissance.
  - 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.

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#### 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;
- 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).

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#### 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:

- 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.
- 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.

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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.

<u>11.2.1</u> 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.

<u>11.2.2</u> 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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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.

<u>11.2.4 Respirators</u>. 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).

<u>11.2.5</u> 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.

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#### 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.

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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

11.86.71 0041.0.0 also be briefed on the availability of personnel health data and technical support through Envirologic 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.
- 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.

<u>12.3.1</u> 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

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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)
History: (Worker or non-worker injury; complaints from public; previous
agency action): During RAMP investigation, contaminants in
site media were noted
C. HAZARD EVALUATION
tile and semivolatile organics, PCBs and heavy metals have been detected
he site. Some of these compounds are toxic or carcinogenic when ingested,
led or absorbed by the skin; several are flammable or may produce toxic

fumes when heated. Both dermal and respiratory protection may be needed.

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## D. SITE SAFETY PROCEDURES

Map/Sketch	n Attached? <u>Yes</u>		Site S	Secured?	Parti	ally		
Perimeter	Identified? Yes	S Zone	(s) of	Contami	nation	Ident	ified?	Partially
Perimeter	Establishment:	Specific	zones w	vill be	marked	with_	flagging	<u> </u>

Some off-site areas of suspected contamination are not secured.

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

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

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Modifications: \_

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SITE MONITORING INSTRUMENTATION: Photoionization Meter, Combustible Gas

Indicator, Oxygen Meter, Radiation Survey Meter.

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TABLE A-1							
PERSONNEL	SAFETY	EQUIPMENT	CHECK	LIST			

Estimated		
Quantity	Protective and	Model or
Required	Safety Equipment	Material
2	SCBA	MSA 401
	Spare Cylinders	
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	*Eve Wash Station	Portable
- 2	*Fire Extinguisher	CO.
-	Safety Harness	2
	Emergency Tools	
	Other	
10	Duct Tape (rolls)	
**	(10110)	

\* - Mandatory

11.86.71T 0002.0.0 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	Туре	Remarks
10	wash tubs	
	high pressure water sprayer cold hot	
1	steam sprayer	
10	scrub brushes	
2 4	containers contaminated liquíds contaminated disposables	55 gallon drums
10 lbs.	detergent	non-phosphate
10 gallons	acetone	
25 gallons	deionized water/distilled	
10 boxes	disposable wipes	
l roll	plastic wrap	
10 boxes	Ziploc bags	

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11.86.71T 0001.0.0 TEAM ORGANIZATION:

Team Member

Responsibility

	Peter Baker	Field Coordinator
	Ian Broadwater	Drilling Monitor
	Robert Burger	Groundwater Sampler
	David Dionne	Groundwater Sampler
	Charles Goodwin	Groundwater Sampler
	Linda Healey	Drilling Monitor/HSO
	Barbara Ikalainen	Project Manager
	Ronald Lewis	Technical Director
	Tom Longley	Drilling Monitor
	Jay McMullen	Groundwater Sampler
	Denley Poor	Drilling Monitor
	Sharon Secovich	Groundwater Sampler
	Scott Wibby	Drilling Monitor
WORK	LIMITATIONS (Time of day, etc.): <u>Dayl</u>	ight hours and as weather permits.
PERS	ONNEL PROTECTIVE GEAR, DECONTAMINATION	AND OTHER MATERIAL DISPOSAL:
	Disposables placed in plastic garbage	bags which in turn are placed in
	55 gallon drums. Decontamination flui	ids emptied into 55-gallon drums and
	closed. Drums will be marked for iden	ntification.

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## 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 <u>N/A</u>

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
2.	Bruce Campbell, RPh
3.	Maine Poison Control Center
4.	E.C. Jordan (Maine)
5.	E.C. Jordan (Florida)
6.	E.C. Jordan (Detroit)
7.	Envirologic Data
8.	Bob Soboleski, Site Manager (NJDEP)
9.	USEPA Emergency Response
10.	CMA Chemical Referral Center
11.	L. Healey (HSO)
12.	Lester Jargowsky, Health Officer
13.	Saul Hornick, Mayor (Municipal Offices)
14.	24-Hour Hotline
15.	NJDEP Emergency Response
16.	Imperial Oil Contact (George Kulick)

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<u>F. EMERGENCY ROUTES</u> (Give road or other directions; attach map)

HOSPITAL: PRIMARY ROUTE:

From off-site go left on Greenwood Rd. to Tennet 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:

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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 diretions.

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## APPENDIX B

# PERSONAL FORMS AND LOGS

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11.86.71 0061.0.0 DAILY SAFETY LOG

	DAIL:
PROJECT NUMBER:	DAY NO:
.C. JORDAN WORK PARTY:	
SUBCONTRACTOR ( ):	
/ISITORS.	
NORK SITE LOCATION:	
	· · · · · · · · · · · · · · · · · · ·
SUMMARY OF CONDITIONS ENCOUNTERED:	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	l	 	 	
Date		 	 	

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AME:		
TE:	DATE:	
UMBER OF HOURS ON SITE:		
NDITION OF SITE		
MELENT ALE SOL AWATER INDICATORS.	· · · · · · · · · · · · · · · · · · ·	
MBIENT AIR/ SULLY WATER INDICATORS:		
LABORATORY: G.C.	CN-SITE: G.C	<u></u>
21. METER	P.I. METER	
OTHER	OTHER	
(PE CF EXPOSURE (i.e. inhalation, soil/water contact):		
PERATION PERFORMED (i.e. test pit inspection, sampling, dri	lling):	
EMICALS BURIED OR KNOWN PRESENT.		
L	······	
OTECTIVE EQUIPMENT WORK	· · · · · · · · · · · · · · · · · · ·	
SAFETY SHOES (STEEL TOE & SHANK)	INNER LAR GLOVES	
CHEMICAL RESISTANT BOOTS, TYPE	OUTER CHEMICAL RESISTANT GLOVES	
HALF-FACE RESPIRATOR		
TYPE OF CARTRIDGE:	COVERALLS	
FULL-FACE RESPIRATOR	TYPE:	
TYPE OF CARTRIDGE:	0	
ECONTAMINATION MEASURES TAKEN:		
CHANGE OF CLOTHES	0	
SHOWER	<b>—</b> ———————————————————————————————————	
CHANGE OF PROTECTIVE EQUIPMENT	Ū	
ERSCNAL PROTECTIVE DECONTAMINATION PROCEDURES:		
·	•	
NUSUAL SITE CONDITIONS/OCCURANCES:		
		_
SERVED HEALTH EFFECTS		IMF
		100
JIC3:	· · · · · · · · · · · · · · · · · · ·	- ·
· · · · · · · · · · · · · · · · · · ·		
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# APPENDIX C

## MISCELLANEOUS REPORTS

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## SITE SAFETY FOLLOW-UP REPORT

**REASON FOR CHANGES:** 

APPROVED	BY	SITE	MANAGE	<:	DATE :
		SITE	SAFETY	OFFICER:	DATE :

EVALUATION OF SITE SAFETY PLAN

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

WHAT CHANGES WOULD YOU RECOMMEND?

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Report No.:

PROJECT NO.: SITE: LOCATION: DATE OF REPORT: PREPARERS NAME: NAME AND ADDRESS OF INJURED: SSN: AGE : SEX: YEARS OF SERVICES: TIME ON PRESENT JOB: TITLE/CLASSIFICATION: DATE OF ACCIDENT: TIME: DIVISION/DEPARTMENT: \_\_\_\_ Motor Vehicle \_\_\_\_ Property Damage \_\_\_\_ Chemical Exposure \_\_\_\_ Near Miss ACCIDENT CATEGORY: Fire \_\_ Other \_\_\_\_Non-disabling \_\_\_\_\_Disabling \_\_\_Medical Treatment \_\_\_\_\_Fatality SEVERITY OF INJURY OR ILLNESS: AMOUNT OF DAMAGE: \$ PROPERTY DAMAGED: ESTIMATED NUMBER OF DAYS AWAY FROM JOB: NATURE OF INJURY OR ILLNESS: CLASSIFICATION OF INJURY \_\_\_\_ Cold Exposure Fractures \_\_\_\_ Heat Burns \_\_\_\_ Chemical Burns \_\_\_\_ Frostbite Dislocations \_\_\_\_ Heat Stroke \_\_\_\_ Radiation Burns \_\_\_\_\_Sprains \_\_\_\_Abrasions \_\_\_\_\_Bruises \_\_\_\_Blisters \_\_\_\_Toxic Respiratory Exposure \_\_\_\_Toxic Ingestion \_\_\_\_\_ Heat Exhaustion Concussion Faint/Dizziness \_\_\_\_ Lacerations Punctures \_\_\_\_\_Bites \_\_\_\_ Toxic Respiratory
\_\_\_ Dermal Allergy \_\_\_ Respiratory Allergy

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

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EMERGENCY SERVICE:

## ACCIDENT LOCATION

\_\_\_ Other (explain) \_\_\_\_

ACCIDENT REPORT

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

WAS WEATHER A FACTOR?

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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):

<u>DETAILED NARRATIVE DESCRIPTION</u> (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) <u>Symptoms</u>: 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) <u>First Aid</u>: Immediately remove the victim to the Decomtamination 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 vicitm to a medical facility.

### 2. Heat Stroke

- <u>Symptoms</u>: 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) <u>First Aid</u>: 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.

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## B. PREVENTION OF HEAT STRESS

- 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.

	Maximum lime	
Ambient Temperatures	<u>Between Cooldown Breaks</u>	
Above 90°F	1 hr.	
85°-90°F	$\frac{1}{2}$ hr.	
80°-85°F	1 hr	
70°-80°F	$1\frac{1}{2}$ 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.

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- 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.

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## 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. <u>Chilblains</u> 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. <u>Frostbite</u> 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 subzero weather, especially where there are strong winds.

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There are three stages of frostbite. Classification depends upon the amount of tissue damage. (frostnip), which affects involves the skin and the bite, a much more serious and even bone.

#### a. Symptoms

Symptoms for each of the three stages of frostbite include:

<u>Frostnip</u> 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

<u>Frostnip</u> 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.

<u>Superficial Frostbite</u> 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.

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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.

<u>Deep Frostbite</u>. 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.

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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  $may'_{l}$  have become numb.

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

3. <u>Immersion foot</u> (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 wriggling your toes and moving your ankles. Never wear tight boots.

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#### 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

APPROX. CORE TEMPS.

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

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 <u>very mild cases</u> of hypothermia, dry clothing and shel that is needed.	lter may be all
Move victim to shelter and warmth as rapidly as pos	ssible.
Gently remove all wet clothing (so victim does not warming and drying wet clothing) and replace it wit	expend energy th 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 <u>remote outdoor location</u> 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.

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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 <u>without</u> 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.

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# 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?

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#### B. Scheduling

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Try to schedule work in the least severe weather.

Plan to rotate crew members to keep cold exposures short.

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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 <u>dependable</u> 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.

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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 counterproductive. 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.

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# 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.

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# 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.

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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.

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# 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.

# Standard Respiratory Protection Procedure No.

Topic

Respiratory Protection Principles

Selection of Respirators

Fit Testing

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. 001 0127

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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:

- 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.
- 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.
- 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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# Respirator Fit Test Worksheet

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# RESPIRATOR FIT TEST WORKSHEET

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Applicant Name		
Organization		
Date of Test		
Employee Number		
Equipment Type		
Manufacturer		
Model/Size		
Test Conducted by		
TEST RES	ULTS	
(1) Negative Pressure Test	Pass ( )	Fail ( )
(2) Positive Pressure Test	Pass ( )	Fail ( )
(3) Isoamyl Acetate Vapor Test		
Initial Odor Recognition	Yes ()	No ()
Odor Detected W/ Respirator On	ies ()	NO ()
(4) Irritant Smoke Test Irritant Detected	Yes ( )	No ( )
Employee briefed on fundamental principal	s of respiratory	y protection, use,
inspection, cleaning, maintenance and sto	rage of equipmen Yes ( )	No ( )
ADDITIONAL IN	FORMATION	,
Last Employee Physical Exam Conducted on Stress Test Included Yes ( ) No (	)	
At Medical Facility		
Corrective Lenses Required for Normal Wor	k Tasks Yes (	) No ( )
Facial Characteristics: Clean Shaven ( )	Beard ( )	Other ( )
-		Specity
Follow-up Phýsical Due		
I hereby certify the subject employee has dures specified in RESPIRATORY PROTECTION	been fit teste PROCEDURE NO.	d according to proce 3.
Tester	Name	Date
Tester		
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Exhibit 2

# Respirator Use & Maintenance Record

RESPIRATOR USE AND MAINTENANCE RECORD

ID Number				
Respirator Typ	e			
Manufacturer				
Model Number			Date Place In Service	
	Assigned 1	o Whom	Inspection/Maintenance	
Date	or Location_of	Storage	and Charging (SCBAs) Information	Serviced
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STANDARD RESPIRATORY PROTECTION PROCEDURE NO. 1 RESPIRATORY PROTECTION PRINCIPLES

#### INTRODUCTION 1.1

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.

#### ROUTES OF EXPOSURE 1.2

The volume of air inhaled during "normal" activities is approximately 6  $\ell/\min$ . The volume of air inhaled during brisk activity or during periods of stress can go up to 75 £/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.

Gas	Volume (%)	Partial Pressure (mm Hg at sea level)	
Nitrogen	78.9	594	7 M T
Oxygen	20.95	159	-
Argon	0.93	7	0
Carbon dioxide	0.04	0.03	10

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#### Table 1. Atmospheric Composition

It is not the percentage of  $O_2$  in the air, but rather its partial pressure  $(pO_2)$ , that is important in respiration. As one increases in altitude, the

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percentage of  $0_2$  stays constant, but  $p0_2$  drops. Additionally, as the percentage of  $0_2$  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  $pO_2$  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  $pO_2$  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  $O_2$  at sea level, then an atmosphere-supplying device must be used.

Note that as altitude increases, the percentage of  $O_2$  stays constant, but the  $pO_2$  drops. There is currently no standard that accounts for the drop in  $pO_2$  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:

Pharynx - 10-30 μm
Trachea - 10 μm
Bronchus - 5-10 μm
Alveoli - 0.1-1 μm

Particulates less than 0.5 µm 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. mg/m<sup>3</sup> 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).

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c. mg/m<sup>3</sup> - milligrams of gas per cubic meter.

d. Conversion of units. The following equation converts  $mg/m^3$  to ppm, at 24°C and 760 mm Hg.

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

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. <u>Threshold Limit Value</u>. 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. <u>Immediately Dangerous to Life and Health</u>. 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:

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- 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. <u>Lower Flammable Limit</u>. 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

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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 288.2, "American National Standards Practices for Respiratory Protection". Standard 288.2 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 288.2 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.

- Step 1 Assemble Information on Substance. Assemble necessary toxicological, safety, and research information for the particular contaminant. The following are required:
  - 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.

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- 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.
- 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. <u>Step 3 Assemble a Table of Permissible Respiratory Protection for</u> <u>Substance</u>. 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

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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  $LD_{50}$  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.

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#### 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.

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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.

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#### 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-

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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.)

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# 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.

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# 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 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 workng 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.

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- 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.

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- 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.

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#### 4.4 INSPECTION PROCEDURES

Respirator inspection shall include checking of:

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

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- 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 value 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.

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- 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
  - 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.

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- 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.
    - 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.

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

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- 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 value 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 "0" 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>&</sup>lt;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.
- 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.

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#### 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".

11.86.71 0116.0.0 IMP 001 0155

#### APPENDIX H

# TABLE OF CHEMICAL TOXICITY AND OTHER INFORMATION

11.86.71 0117.0.0

- ·.

IMP 001 0156

#### 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  $H_2S$  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  $H_2S$  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)  $H_2S$  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

### BENZENE

Comment Autom		Contractions Generation after		
Benzol	All	Colores Gelore-eu ador	6. FIRE MAZAROS	18. HAZARD ASSESSMENT CODE
Benzole	Posts on water Fi goint is 42	enmeble, messing vapor is produced. Pressing IFF.	<ul> <li>Barmatie Linds in Air: 1:3%-7:3%</li> <li>Barmatie Linds in Air: 1:3%-7:3%</li> <li>Bre Estinguishing Agentic Dry channesi, toem, or carbon docude</li> <li>Bre Frithermithing Accests Motion in the</li> </ul>	A-T-U-V-W
Avoid contact Wear gogges Shut oft grin Stop discharg Blay upwind i teolate and re Nosty local h	t with lique and vacor. Keep per s and set-contained breathing at on sources and call fire depents per possible anay to "knock ( minure discribiged meternal setth and poliuson control agen	ope sway, operatus ann kown <sup>11</sup> vepor, Des.	Lueak Water may be methodow 6.5 Special Hazanda of Combustion Products: Noi partnersi 6.6 Sehavior in Pini: Vapor is hasive then ar and may tavel considerable detance to a source of igneon and flesh back	11. NAZARD CLASSIFICATIONS 11.1 Code of Federal Regulations: Fishmable Road 11.2 NAS Hazard Roting for Bulk Weler Transportations:
Fire	FLAMMABLE Flashback along vapor trail m Vapor may explode it graned Water googless and self-conta Estinguish with dry charmocal Water may be instructive on 1 Cool explosed containers with	ey occur nan enclosed erea. Ned Dreastung apperatud loam, or Carbon dioxide. Ye water	8.7 Ignition Temperature: 10975     8.8 Exectrical Hassing Class I, Group D     8.9 Burning Rate: 0 Puni/ren.     8.10 Adlabatic Flame Temperature:     Data not available     8.11 Stolchometric Air to Fuel Ratio:     Data not available     8.12 Flame Temperature: Data not available	Casegory     Rusing       Free     3       Health     1       Vapor Imfant     1       Liquid or Solid Imfant     1       Posions     3       Water Position     3       Human Toxicity     3       Aquatic Toxicity     1       Assthetic Effect     3
Exposure	CALL FOR MEDICAL AID VAPOR Imaging to eyes, nose and th If massed, will cause heacach Move to here ar If breatming as stopped, give if breatming a difficult, give or LIGUED Imaging to skin and eyes. Hermitul if assignment Futo attected areas with give If the ETTER's hard eyested open IF SWALLOWED and victors is or mail.	rost. • difficult prestring, or loss of consciousness. • anshoel respression rg and shoes th of water is CONSCIOUS, have worm drynt water	<ol> <li>CHEMICAL REACTIVITY</li> <li>Reactivity With Weiter: No reaction</li> <li>Reactivity with Common Materials: No reaction</li> <li>Blability During Transport Stable</li> <li>Moultraitizing Agents for Acids and Cassion: Not pertnent</li> <li>Perymetratifier: Not pertnent</li> <li>Inhibitor of Polymerization: Not pertnent</li> <li>Molar Ratio (Reactant to Product): Data not available</li> <li>Reactivity Group: 32</li> </ol>	ReaCtivity Other Chemicals
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CHEMIN     CG Competibilit     Hydrocarbon     Hydrocarbon     S3 IMO/UH Design     24 DOT ID No.: 11     35 CAS Registry I	CAL DESIGNATIONS by Class: Aromatic hetion: 3.2/1114 14 te: 71-43-2	OBSERVABLE CHARACTERISTICS     4.1 Physical State (as shipped): Liquid     4.2 Color: Colories     4.3 Odor: Annexic: rather pleasant annexic     odor: charactenesic color	8.4 Food Chain Concentration Potentiat None	12.9 Liquid Water Interfacial Tension: 25.0 oynes/cm = 0.035 k/m et 2010 12.10 Vapor (Cas) Severitic Gravity: 2.7 12.11 Resto of Specific Hearts of Vapor (Cas) 10.61 12.12 Latent Heart of Vaportation: 199 Bu/b = 94.1 Ce/g = 3.94 x 10° J/kg 12.13 Heart of Combustion: = 17.460 Bb/b
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ol eyes o'n E-B Liquid or Sob reman, may E-19 Oeler Threate E-11 IDLH Valuer 2	espresory system The effect a d initiant Cherectentetics. Movi cause smarting and reddening bit: 4.68 ppm .000 ppm	temporally. num hazard. If apilled on clothing and allowed to of the skin.		<u> </u>

IMP 100 0159

# 1,1-DICHLOROETHANE

DCH

Cammon Synor Ethyldane chloride Ethyldane dichloride Chlorinated hydrochlo sther	Cessenan Bynonyme Cay squid Coloriess Chiproform Bue Islame chipride Islame donkonte ceshaned Brits and messe with water.		<ol> <li>FIRE INJARDS</li> <li>Fash Paine 57F D.C. = 22°F C.C.</li> <li>Planmaste Lanta in Arr. 5.8% to 11.4%</li> <li>Pro Extinguishing Agente: Alcohol Isam, weier, Isam, COs, dy chamical, carbon interchords</li> </ol>		6. FIRE MAZARDS Pash Paint: 57°F C.C. Parnnetic Lawle in Air: 5.0% to 11.4% Pro Extinguishing Agents: Alcohol Ioam, water, team, COs, dry chemical, certon	18. MAZARD ASSESSMENT CODE (Bee Hazard Assessment Handbook) A-P-O-R-8	
Wear goggies, self-contented breathing apparatus, and nubber overclothing (including gloves). Boo decharge if possible, Keep people away Shut off gration sources and call fire department. Avoid contact with flaud. Notes and nemove decharged material. Notes local needs and polution control agencies.				и и и	senschloride Pire Extinguishing Agente Net to be Used: Water may be natificative Special Hazards of Canduation Products: When hested to decomposition entits inprity toxic funces to phospens. Behavior in Pire: Explosion hezard	11. IAZARD CLASSIFICATIONS     11.1 Code of Federal Regulations:     Not least     11.2 IAS Hazard Rasing for Bulk Water     Transportation: Not least     11.3 IMAS Hazard Residue	
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5.6 Vapor (Cas) is system if pro 6.9 Liquid or Soli remain, may 5.16 Odor Thrusho	rritant Characteristics: Vapor seent in high concentrations. 1 d Influent Characteristics: Mil - cause emering and reddenin htt: Deta not evaluate	a cause a slight emering of the eyes or respiratory he effect is temporary. imum hazard. If spilled on clothing and allowed to g of akin.				0160	

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#### **ETHYLENE DICHLORIDE**

EDC

1. 2-Dichloroethane Ethylene chloride EDC		Coloriene Simoni ador		6. FIRE HAZARDS Flash Petric 60°F O.C.; 55°F C.C. Flammable Lants in Air: 6.2%-15.8%	18. HAZARD ASSESSMENT CODE (Bee Hazard Assessment Handbook)	
Broade Dutch liquid Glycol dichionde	Seria n veitr. P	envielde, intesing vepor le produced.	<b>– – –</b>	Pre Extingularing Agents: Form, carbon doxide, dry chemical Pre Extingularing Agents Not to be		
Avoid cont Wear good In Blue det of Stop dech Stop upon lacete and Notify local	act with load and vispor Keep I les, self-contained breathing ap- cluding gloves), sicon sources and call fire depair uppe is possible call fire do the d and use water sorray to "brood remove declaraged metamal hears and polycon control ap- tic sources."	people sway, barshill, and nubber overclothing timent. A down" vapor. ances		Used: Water may be instructive. Bpochel Hazarde of Canducation Products: Tools and instang gases Bydrogen chlonds, phosping are generated Behavior in Pine: Vapor is hasiver than air and may thivel considerable distance to .	11. HAZARD CLASSIFICATIONS 11.1 Code of Feetural Regulations: Flammable liquid 11.2 NAS Hazard Racing for Bulk Water Transportation; Collegory Radio	~
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Water Pollution	Denomous to squartic life in May be dangerous if it enter Nooty local hashin and wild Nooty operation of neerby MISE TO DISCHARGE	high concentrations. In water maked. He officiels were maked. 2. LABEL		8. WATER POLLUTION	12. PHYSICAL AND CHEMICAL PROPER 12.1 Physical Basis at 19°C and 1 above Ugaid 12.2 Melacular Weight 50.06 13.3 Beiling Patrix at 1 abro: 182.37°F = 0.5°C = 356.7°K 12.4 Pressing Patrix -32.37°F = -35.7°C = 237.5°K 12.6 Critical Temperature:	nes
(Bee Respone leave wome Depense an 3. Chifbil	e Methode Handbook) ng-hgh flammabildy id flush	2.1 Category: Fignmet/e liquid     2.2 Class: 3	11 11 14	Aquetic Testolty: 150 ppm/*/pm perch/TL_/selt water *Tere period not specified Waterford Testolty: Data not evaluable Biological Daygen Demand (BOD): 0.002 fb/b, 5 days Peod Chain Concentration Petentiet: None	550"F = 288"C = 561"K           12.6         Critical Pressure: 735 Data = 50 atm = 5.1 MN/m <sup>3</sup> 12.7         Bascin: Growby: 1.253 at 20"C (lepud)           12.8         Liquid Burtson Tension: 32.2 dynas/cm = 0.0022 N/m gl .           13.8         Liquid Water Interfacial Tension:	20°C .
2.1 CG Compatibil hydrocarbor 3.2 Formula: CiCH 3.3 INC/UN Desig 3.4 DOT ID No.: 11 3.5 CAS Registry	Ny Clean Helogensied 3- 50HcCi netion: 32/1164 164 No: 107-06-2	4.1 Physical State (as shipped): Liquid 4.2 Gast: Colorisa 4.3 Oder: Etherest: chlorolym-like; after-like			(est.) 30 cynes/cm = 0.03 N/m si 12.10 Yapor (Gas) Specific Gravity: 3.4 12.11 Ratio of Specific Heats of Vapor (G 1.118 12.12 Latent Heat of Vaportautor: 138 Bh//b = 78.4 cal/g = 3.2 X 10 <sup>6</sup> J/hg 12.13 Heat of Combustion: (est.) 3400 Bhu	1 25°C
<ul> <li>8.1 Personal Prot sheta. Res mask and c</li> <li>8.2 Symptome Fe Contact of I burn.</li> <li>8.3 Truetment of</li> </ul>	5. REAl bective Equipment Clean, body persony protectors: up to 50 pps anister: greater than 2%, self-co flowing Exposure: inhistenin d louid with eyes may produce co Exposure: INHALATION: I vict	TH NAZARDS -covering clothing and asfety gleases with side m, nore; 50 ppm to 2%, 1/2 hr or less, s.d lece intarved breathing apparatus. I reports causes nauses, durkervises, depression. meet injury. Protonged contact with skin may cause a im is overcome, remove him to them air, beep hen	11 12 13 14	<ol> <li>SHIPPING INFORMATION Grades of Parity: Commercial Storage Temperature: Antisent Inert Almosphere: No requirement Venting: Pressure-sector</li> </ol>	12.15 Neet of Bolution: Not partment 12.16 Neet of Polymertzition: Not partment 12.25 Neet of Polymertzition: Not partment 12.25 Limiting Yalau: Otta Not Available 12.27 Reid Vapor Pressure: 2.7 pee	r.
guiet and w respiration. immediately and wash sl 8.4 Threehold Lim 8.5 Shert Term in 8.6 Textotty by In	erm, and get medical stanson i INGESTION: Induce vomtang, ci with copious amounts of Bown un, thoroughly with soap and we wit Value: 10 ppm whatetion Livelita: 200 ppm for 5 genetion: Grade 2: Libus = 0.5	mmadassy: if breating stops, give anticial al a physician; breat the symptome, EVES: that greater for at least 15 min. SKR: remove abthing ter, wash contaminated clothing batter reuse. min, during any 3-hour period. Io 5 g/hg fmQ				IMP
5.7 Late Toxicity: 5.8 Yaper (Gas) 3 And high col 5.8 Liquid or Soli short expos 5.10 (new Yourse	Data not available inflant Characteristics: Vapora ncentrations unpleasant. The eff d inflant Characteristics: Cau unt: may cause accordany buffs with 100 norm	cause moderuse inflation such that personnel will sect is temporary ses smaring of the skin and first-degree burns on s on long seposure.	L 11 L 12	6. FIRE HAZ Biolohiometric Air to Puel Retie: Data Hol Reme Temperature: Data Hol Avuluate	ARDS (Continued) Anabatro	001
E.11 IDLH Value: 1		·				016

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0161

# 1,2-DICHLOROETHYLENE

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Fire	FLAMMABLE. POISONCUS GAS Containers may as Fisshback along v yapor may applo Extroguish with or Extroguish with or Water may be ne Cool exposed con	SES MAY BE sport in the de if grand me by characters of characters effective on for manners with t	PRODUCED IN FIRE. y occur i en enclosed area. hoem or carbon dicade re. wetar			end may tave a considerable distance a source of grition and Bash back. Ignition Temperature: 80°F Decisical Hazant: Data not available Burning Rate: 2.6 mm/mm. 10 Addeabit Plans Temperature: Data not evalable (Continued	to     Thereadors above not asked       11.3     HFPA Heccovic Classeffication:       Category     Classeffication:       Health Heccard (Bus)     2       Plannabiny (Red)     3       Reactivity (Yallow)     2
Exposure	CALL FOR MEDX YAPOR If inhased will cause difficult beaution if breathing has a if breathing as diffi- LIQUID if SWALLOWED or mak	NCAL AID. Med disconses, i during reach ar. stooped, give houst, give day wead. a and victors a	nausse, vomiting, or artifical respiration. rgen. CONSCIOUS, have vict	rh gink weter	- 7. 72 72 72 72 72 72 72	7. CREMICAL REACTIVITY     Reactivity With Water: No reaction     Reactivity With Common Materials: No     reaction     Muthating Agents for Aslats and     Countering Transport: Stable     Neutrating Agents for Aslats and     Countering Transport: Stable     Reading: Condense of stagment. The     reaction is not vegotoxe.     Substration Rescant to     Product; Date not evaluate     Reactivity Greag: Date not available	
Water Pollution	Effect of low conc May be dangerout Nosty local health Nosty operators o	constructions on us if it enters u th and wildle i of nearby wait	n equetic life is unknown water intakes. Officialis of intakes				12. PHYSICAL ARD CHEMICAL PROPERTIES 12.1 Physical Bate at 16°C and 1 atm: Lipad 12.2 Molecular Weight: 97.0 13.3 Balling Point at 1 atm: di: 140°F = 60°C = 333°K true: 116°F = 48°C = 321°K 13.4 Broates Bate
I. RESPORT     Give Response I     leave werning-     Restrict acres     Evecusies area     Should be rein     Chemical and	SE TO DISCHARGE Methods Handbook high Bannabaky as noved   physical busisment AL DESIGNATIONS	E ok) t	2. LABEL 2.1 Catagory: Flanv 2.3 Class: 3	E CHARACTERISTICS		WATER POLLITION     Aquesto Testishiy: Data not available     Waterfowt Tostishiy: Data not available     Biological Oxygen Dewand (BOD):     Data not available     Pood Chain Concentration Polential:     None	Conserve Lance
2.1 CG Competibility 3.2 Permute: CCH = 3.3 MO/UN Design 3.4 DOT ID No.: 1150 3.5 CAS Registry Mo	y Class: Not lated - CHCl stor: 1.2/1150 0 0.: 540-59-0		4.1 Physical State ( 4.2 Caler: Colorises 4.3 Oder: Ethered, i chlorotorm-B	as shipped; Liquid Aighty sofit; pleasani. e			30 dynes/on = 0.000 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 Laterri Heat of Vaporization: 130 Bh//b = 72 cal/g = 2.0 X 10 <sup>4</sup> J/kg 12.13 Heat of Cembustion:4,847.2 Bh//b =
E.1 Personal Profile contained bree E.2 Symptoms Follo change, caritri prolonged com E.3 Trestment of El coryon: Pivich coryon: If wich SKR: seeh W	ctive Equipment: R affing appendix. owing Exposure: In al nervous depression fact) skin. Ingestion zposure: IP44AA7 prestring is resume all with scop and with home the scop and with	5. HEALTH Pubber gloves, Inhalation caus ion. Contact w in causes sligh TON: remove 1 , give artificial ed; call a phys wster. INGEST	I RAZARDS ; selvely gogglies; all sup ses nauses, vorwling, un with liquid causes infesto it dispression to deep no from further appoarts; if respiration, preferably it scars, EVES: Such with IOR: give gastric levege	by mesk or self- not over and (on roots. breathing is difficult, give isulth-brouch; give meter for at least 15 min. and cathertics.		E. SHIPPING UNCORNATION Grades of Parity: Commercial Storage Tempershere: Antient I have Alenosphere: No requerement Venting: Pressure-iscourn	12.14 Heat of Decomposition: Not perform 12.15 Heat of Solution: Not perform 12.15 Heat of Solution: Not perform 12.25 Heat of Polymerization: Not perform 12.25 Limiting Value: Data not available 12.27 Reid Vapor Pressure: Data not available
LA Treation Link LS Short Term Inhi LS Textolty by Inge L7 Late Textolty: Pi L8 Vapor (Gae) Irfl L8 Liquid or Sold I L16 Odor Threshold	topania and particular electors Grade 2; ora roduces liver and bi lavet Characteristic instant Characteristic instant Characteristic to bela not available	la not available rai LDee = 77 kidney injury in ca: Data not a latica: Data no latica: Data no	a 10 mg/kg (rat) 1 experimental animata Institutio 11 available				
6.11 IDLH Yake 4.01	00 ppm				&1 0.1	6. FRE HA 1 Biolohiometric Air te Puel Rathe: Data no 2 Plane Temperature: Data not avalable	ZAROS (Continued) of available
			·				JUNE 198

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## 1,2-DICHLOROPROPANE

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DPP

Common Bynen Propylene dichloride	yme Wesey Road	Colorises Burest odor	6. FIRE MAZARDS	TA. HAZARD ASSESSMENT CODE	
Dicrecropropere	Binka in weker, l	Pervinable, Intelling vapor is produced.	Barmatin Lanta in Air: 3 4%-14.5%     Barmatin Lanta in Air: 3 4%-14.5%     S.3 Fire Estinguishing Agente: Fean, carbon     double, dry dremical.     A.4 Pite Fritmundelse Accents Med to be	A-X-Y	
Stop desche Shut off spri Blay upwind Avoid conta Isolate and Nosty local	rge if possible. Keep people a tion sources and call fire dep and use water spray to "tho i with liquid and vegor remove decharged material, health and pollution control a	wey rinwst. Sk down" vepor. wrties.	Ling Linguisting Agencia hold to be Uesait Not performi E.S. Byrocial Hazarda of Combustion Producto: Touc and Intelling gases may be generated. E.S. Bahavior In Proc. Not perform E.7. Ignition Temperature: 1035°F	11. HAZARD CLASSIFICATIONS 11.1 Code of Pederal Regulations: Planmable load 11.3 NAS Hazard Reting for Bulk Water Transportation:	
Fire	FLAMMABLE POISONOUS GASES ARE Plashback along vapor that Vaco mey approach if grint Vaca gogost and service Entropush with toam, dry Cool exposed containers of	PRODUCED IN FIRE. may occur. d in an enclosed area. Anned Dreatmag apportune Annecal. or carbon decide effi-water.	6.3 Electrical Neurori: Not perform 6.9 Burning Rate: (ac), 3.2 mm/mer. 6.19 Adhabatic Plane Temperature: Data not evalable 6.11 Bisionannetic Air to Puel Rate: Data not evalable 6.12 Plane Temperature: Data not evalable	Fire     3       Health     3       Vacor Intant     1       Uquid or Solid Intant     1       Possona     3       Wester Polytion     3       Human Tozochy     3       Aquatic Tozochy     1	
Exposure	CALL FOR MEDICAL AUD VAPOR Intering to stress and if breathing a stocoad, if the stress and stocoad, if the stress and stocad stocad intering to stoc and syste. Harmonic containmented do Fush affected snear with if hit PTS, hold synthet of swall.LOWED and vote or mat.	Broat. In anygen. Tring and shoes being of water per and funder with planity of water on and funder with planity of water in a CONSCIOUS, have victim divis water	<ol> <li>CHEMICAL BEACTIVITY</li> <li>Reactivity With Water: No reaction reaction</li> <li>Reactivity with Columnon Materializ. No reaction</li> <li>Bablitty During Transport: Stabin 2.8 Bablitty During Transport: Stabin Columbiation for partnerst</li> <li>Beingentastiker: Not partnerst</li> <li>Britishitor of Polymarkaster: Not partnerst</li> <li>Britishitor fasto (Reactart) to Product): Data not evaluate 7.8 Reactivity Group: 33</li> </ol>	Asethese Effect	
Water Pollution	Effect of low concentration May be dangarous if it emit Notify local health and with Notify operators of hearby	5 On Equatic Me is unbrown. In wear intellas. Bre officels. wear intellas		12. PHYSICAL AND CHEMICAL PROPERTIES 12.1 Physical Blans at 15°C and 1 alar: Liquid 12.2 Molecular Wagne: 102.9 12.3 Boiling Point at 1 alm: 206°F = 95.4°C = 309.5°K	
1. RESPOI (Bee Response Issue vernin Evecuss an	ESPONSE TO DISCHARCE     2 LABEL (Bee Response Methods Handbook)     Bee evening-high Barrinability     Evecuste area		WATER POLLITION     Aquatic Testainy:     >100 ppm/crustons/TL_/ast water     &2 Weterbust Testainty: Data not evaluate     &3 Biological Oxygen Demand (BOD):     Data not available     &4 Pood Chein Cencentration Potentiat     None		
3. CHENK 3.1 CB Compacibilit hydrocarbon 3.2 Permula: CHoC 3.3 BMO/UN Denign 3.4 DOT ID No.: 127 3.5 CAS Registry H	CAL DESIGNATIONS by Class: Helogeneed HCICH=CI enter: 3.2/1279 79 Na: 79-87-6	4. OBSERVABLE CHARACTERISTICS 4.1 Physical Blate (an ehipped): Liquid 4.2 Celor: Colorines 4.3 Gdar: Sweet	× .	12.10 Vapor (Gas) Bpachic Gravity: 3.5 12.11 Ratio of Specific Gravity: 3.5 1.064 12.12 Latent Heat of Vaporization: 12.2 Burb = 67.7 ratig = 2.83 X 10 <sup>4</sup> Jrkg 12.13 Heat of Combustion: (sc), 7200 Bur/p =4100 cat/g = 170 X 10 <sup>4</sup> Jrkg 12.14 Heat of Cocomposition: Not partneril	
6.1 Personal Prote protective co 6.2 Symptoms Pol 4.3 Treatment of 1 wash sturt for 6.4 Threahold Lim 6.4 Short Term Ini 6.4 Short Term Ini	5. IEZ inclive Equipment: Ar supply versits and rubber toolwar. lowing Exposure: Contact wi Exposure: IN-HLATION: nem orougity with loop and veter. It Value: 75 ppm halation Limits: Date not eve method: Public 2: Due = 0.0	LTN NAZAROS In confined area, nabber ploves, chemical goggles, In stath or eyes may cause inteston. In stath or eyes may cause inteston. Frush eyes with water for 15 min. Call a dector. Intois In 5 n/cm (rodnes nint)	SHIPPING INFORMATION     S.1 Grades of Purity: Refined     S.2 Blorage Temperature: Antions     S.3 Inert Amogenere: No requirement     S.4 Venting: Pressure-regularit	12.16 Heat of Bolution: Not perment 12.16 Heat of Polymerization: Not perment 12.25 Heat of Fusion: 13.53 cal/g 12.36 Limiting Value: Data not available 12.37 Reid Vapor Pressure: 1.8 pea	
6.7 Late Toxicity: 5.8 Vapor (Gas) in system if pre 6.9 Liquid or Solid remain, may	Dets not available Hant Chursclaristics: Vapon eeril in high concentrations. T I writant Churacteristics: Min cause emarting and reddening	i cause a slight amarting of the eyes or respiratory he effect is temporary. mum hazard. It apilled on clothing and allowed to of the slat.			
6.11 IDLH Value: 2.0	et Data not available 000 ppm	· · · · · · · · · · · · · · · · · · ·		μ C C μητει μη	
				0163	
			I <b>L</b>		

### ETHYLBENZENE

Common Byner	lyme Liquid	Colonses	Sweet, gascine-lae ador	
Eð	Ficada on angle	. Flemmable, inflating vapo	r is produced	
Avoid contail Wear goopi Shut off grov Bloo deche Blay upand Isolate and Noth scoal	rt with liqued and vapor. Keep re, self-contained breathing ap auding gloves) con sources and cell are depe ge if possible and use realer spray to "Minor remove discharged material watch and polivion control ag	people gway perska, and naber overd ymant, pi down" vegor, ences,	offung	
Fire	FLAMMABLE. Fisanbact along vepor that Vapor mey explode it grin Wese gopples self-contain (including gioves) Exanguals with dy chemic Waier may be ineffective o Cool exposed containers in	i may occur is in an enclosed area ad breathing apparatus. Br al toern, or carbon dowde in fire with water	d rubber overcipiting	
Exposure	CALL FOR MEDICAL AID. VAPOR Instant to eyes, nose and throat If instant, will cause dozones or difficult breathing. More to insen air If breating has isopped, give anticell respiration. If breating a difficult give anticell respiration. IDONO Will burn takin and eyes. Harmful if availationed coolining and shoes. Public difficult areas with painty of water of mile DO NOT INDUCE VOMITING.			
Water Pollution	WARMIFUL TO ADUATIC I Fouring to shorthine. May be dangerous # it emit Notify local health and wild Notify local health and wild	JFE IN VERY LOW CONC ars water intakes. Inte officiels. water intakes	ENTRATIONS.	
ESPONSE TO DISCHARGE     See Response Methods Handbook)     Mechanical containment     Snould be removed     Chemical and physical restment				
E CNEMICAL DESIGNATIONS     Conspectibility Class: Aromatic     hydrocarbon     Action Colorises     Ali Physical Blante (an ahlpped): Liquid     hydrocarbon     Action Colorises     Ali Delay: Coloride     Ali Delay: Colorises     Ali Delay: Colorises     Ali Delay				
<ol> <li>HEALTH HAZARDS</li> <li>Forsonal Protective Exagement: Self-contained breating apparatus; antel goggtes.</li> <li>Symptome Pollowing Exposure: Inhibition may class initiation of noise, dispirate, depression. Moderne mation of eye with cornel inpury possible, initiases stin and may classe blaters.</li> <li>Treasment of Exposure: PhilaATDN # II effects occur, remove vicim to treat ar, heap tim wom and quer, and get medical heap promptly. If breathing stops, give anticle respiration. BidESTICH: induce vonling only upon physicistr's approval; meaned in the area channel may classe channel and quer, and get medical heap promptly. If breathing stops, give anticle respiration. BidESTICH: induce vonling only upon physicistr's approval; meaned in high may chanse channel and medical efferitors, remove and urean contaminated clothing before reuse.</li> <li>Threathorid Linet Yeake: 100 ppm</li> <li>Breart Terms Inhaletton Linets: 200 ppm for 20 min.</li> <li>Teachtry by Ingestion; Grade 2: LDx = 0.5 to 5 g/tg (mi).</li> <li>Last Teachty: Data not available</li> <li>Veguer (Das) Initiant Characteristics: Vapors cause moderate inflation such that personnel will find high concentrations unpleasant. The effect is temporary.</li> <li>Light treachter. 140 ppm</li> <li>Light treachter. 140 ppm</li> <li>But value: 2,000 ppm</li> </ol>				

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6. FIRE INAZARDS	M. NAZARD ASSESSMENT CODE	1
6.1 Plant Palet 80°F O.C.; SP'F C.C.	(Bee Hutard Assessment Hundbeak)	Į.
6.2 Planmable Limits in Air: 1.0%-6.7%	A-T-U	I.
6.3 Pere Estinguishing Agents: Foam prost		Ł
dry chartical.		
6.4 Per Extinguishing Agents Not to be	11. NAZARD CLASSIFICATIONS	L
Used: Not persivent	11.1. Casta of Festeral Benderhause	
6.5 Special Patteries of Conduction	Flammable liquid	Ł
when heated.	11.2 HAS Hazard Rating for Sulk Water	L
6.5 Behavior In Pire: Vepor is heavier than er	Transportation:	L
and may travel considerable detence to	Cologory Rolling	L
the source of gration and fash back.	Health	Ł
6.0 Electrical Hazand: Not perment	Vapor Imteri	L
6.8 Burning Rate: 5.8 mm/mm.	Liquid or Solid Initiant 2	Ł
6.10 Adubatic Plane Temperature:	Postors 2	
	Human Tomony	Ł
(Continued)	Aquistic Toxicity	L
T CHEMICAL DEACTINGTY	Assthetic Effect	Ł
A GREAT AND A CONTRACT OF A CO	Pleacevity Other Charterine 4	L
7.1 Reactivity With Water: No reaction	Water 0	
reaction	Self Reaction	L
7.3 Stability During Transport; Stable	11.3 HEPA Hazard Classification:	1
7.4 Neurofizing Agents for Aside and	Collegery Classification	L
Canaditas: Not partment	Fierwrabilly (Red)	ł
7.8 Inhibitor of Pelvmentanters	Reactivity (Yellow)	L
Nol pertinent		l
7.7 Motor Rollo (Reactant to	1	ł
Product: Data Not Available	1	
ra militaring group: 12	(	I
		1
		1
	TE THISTER MAY CHEMICAL PROPERTIES	F
	TTTT Provide State at 15°C and 1 alon:	١
	12.2 Bolecular Weight: 106.17	I
	12.3 Bolling Point at 1 sen:	L
	277.2"F = 136.2"C = 409.4"K	L
	1 12.4 Pressing Paint:	
8. WATER POLLUTION	-137745°C = 178°K 12.5 Critical Temperature:	I
8.1 Aqualic Taxiolty:	651.0"F = 343.9"C = 617.1"K	L
29 ppm/86 hr/bluegill/11_/heen weter	12.6 Critical Preseure:	I
E.2 Waterlowi Toxicity: Data not available	523 pea = 35.6 ptm = 3.61 MH/m <sup>4</sup>	
2.8% (theor.), 5 days	0.867 st 20°C denarth	L
8.4 Food Chain Concentration Petentisk	12.6 Liquid Burface Tension:	Ł
None	29.2 dynas/cm = 0.0292 N/m at 20°C	L
	12.5 Liquid Water Intertacted Tanaters	Ł
	35.48 dynes/cm = 0.03548 N/m at	L
	12.10 Value (Gen) Scotting Granter	Ł
	Not pertinent	I
	12.11 Ratio of Specific Heats of Vaper (Ges):	1
	1.071	1
	144 Bbu/b a 80 1 cm/a -	L
	3.35 X 10 <sup>4</sup> J/kg	L
1. SHIPPING INFORMATION	12.13 Heat of Combustiers	Ł
A1 deadas of Barber Bernands made	=	L
00.00%, pure grade: 00.5%; technical	12.16 Hast of Encomposition's Not pertment	L
grade: 68.0%	12.14 Heat of Polymerization: Not particular	L
8.2 Storage Temperature: Ambient	12.25 Heat of Fusion: Data Not Available	1
B.J. Event Atmosphere: No requirement	12.38 Lamiting Value: Data Not Available	ŧ
	TE.27 Hold Vapor Pressure: 0.4 pain	I
(		1
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	L	c
6. FIRE NAZA	JDS (Continued)	è
6.11 Statchiometric Air in Funt Ratio Date Inte		Ē
6.12 Plane Temperature: Data Not Available		
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JUNE 1985

### TETRACHLOROETHANE

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Common Bynanym 1, 1, 2, 2-Terrichlonostik Acelylere tetrachlonostik AVOID CON17 Stop decharge locate and me Notify total he Fire	Ven Bymanyme erachtorostrare srachtorostrare srachtorostrare srachtorostrare srachtorost Brits in weser. UVOD CONTACT WITH LIQUID AND VAPOR. KEEP PEOPLE AWAY. Noo decharge i posable bothe and remove decharged meanel. bothe and remove decharged meanel. both local health and poliulon control agences Nor Remmable Posonous gases may be produced when heated. Fe		6. FIRE NAZAROS     6.1 Planth Paint: Not Reministe     6.2 Planthinade Lands in Adr: Not Reministe     6.3 Pro Estinguishing Agentis: Not sertiment     6.4 Pro Estinguishing Agentis: Not sertiment     6.5 Special Hazards of Combusten     Productis: Instainty hydrogen chloride     vapor may form in Bre.     6.5 Behavior In Pre: Date not evaluate     6.7 Significat Hazards not performent     6.8 Behavior In Pre: Date not evaluate     6.7 Significat Hazards not performent     6.8 Behavior In Pre: Date not evaluate     6.7 Significat Hazards not performent     6.8 Behavior In Pre: Date not evaluate     6.9 Significat Hazards not performent     6.1 Behavior In Pre: Date not evaluate     6.11 Belachisematric: An to Free Ratio:     Date not evaluate     6.12 Plante Temperature: Date not evaluate	18. HAZARD ASSESSMENT CODE (Bee Heard Assessment Handbeek) A-X 11. HAZARD CLASSIFICATIONS 11.1 Code of Poderal Regulations: ORMA. 11.2 MAS Heard Reting for Bulk Water Transportation: Not lased 11.9 MPA Heard Classification: Not lased
Exposure	CALL FOR MEDICAL AID. VAPOR Internal II shaked Mermal II shaked II in eyes, nose and II In eyes, nose and II II insetting has stopped, give II breating is difficult give PolsOnOUS IF SWALLOW Internal II eyestower and Remove constraintsid clobe Fuel Affected areas with pil IF SWALLOWED and vector and here vector induces for SWALLOWED and vector for SWALLOWED and vector for Notice States and vector for Notice States and vector for nothing except lasep	Vost. and flush with planty of water. a principal regordson. argon. ED OR IF SKIN IS EXPOSED. See and vorsing of and shoes and hush with planty of water. a CONSCIOUS. New vicin dans water or milk sommong. Is UNCONSCIOUS OR HAVING CONVULSIONS. victor warm.	7. CHENICAL BEACTIVITY     7.1 Reactivity With Water: No reaction     7.2 Reactivity With Common Materials: May     artisck come forms of plastics     7.3 Bitability During Transpert: Stable     7.4 Meutimizing Agents for Acids and     Caustitics: Not partnerst     7.5 Polymertzation: Not partnerst     7.4 Inhabitor of Polymertzation:     Not partnerst     7.3 Mater Resto (Reactizet to     Product): Data not evaluable     7.3 Reactivity Group: 35	12. PHYSICAL AND CHEMICAL PROPERTIES
Water Pollution I. RESPONS (Bee Response In Issue owning- containing Respired access Should be rem Chemical and	Effect of low concentrations May be dangerous if it entern Notify local health and watch Notify operators of naerby w SE TO DISCHARGE Methods Handbook) poison, air ant a noved physical treatment	on aquetic Ne is unknown: i weter makes. is officials. is officials. 2. (ABEL 2.1 Casegory: None 2.2 Class: Not partment	8. WATER POLLITION     8.1 Aquatic Testolity: Data not evaluable     8.2 Waterfowl Testolity: Data not evaluable     8.3 Biological Oxygen Demand (BCO):     Data not evaluable     8.4 Peed Chain Concentration Peterstat.     Date not evaluable	12.1 Physical State at 15°C and 1 abox. Ligad 12.3 Bolesolar Weight: 157.85 12.3 Bolesolar Weight: 157.85 12.3 Bolesolar Weight: 157.85 12.3 Bolesolar Weight: 157.85 12.4 Preating Paint - 43.8°C = 418.5°K 12.6 Ortical Tempersture: Data not available 12.6 Ortical Pressure: Data not available 12.6 Ortical Surface Tension: 37.85 dynas/on = 0.03785 N/m at 80°C
CHEMICA     Compatibility     hydrocarbon     A: Fermula: CirCHO     A: MO/UH Designel     MO/UH Designel     A: DOT ID No.: 1702     A: CAS Registry Ne.	NL DESIGNATIONS Classe: Halogenated HCL: Hor: Not lased 2 C 1299-80-7	<ol> <li>COSERVABLE CHARACTERISTICS</li> <li>Physical Barle (as shipped): Liquid</li> <li>Celar: Colorses yaboutsh green</li> <li>Odor: Chicroform-like, phesenit; like carbon sateschords; mild, sweetsh, similar to several other chiomasia hydrocarbons.</li> </ol>		Data not available 12.10 Vapor (Dea) Specific (Investig: 5.75 12.11 Ratio of Specific Heats of Vapor (Dats): 1.000 at 25°C 12.12 Latent Heat of Vapor Isator: 89.2 Bu/Ib = 56.1 cat/g = 2.50 X 10 <sup>4</sup> J/kg 12.13 Heat of Cambustion: Not partment 13.14 Heat of Decomposition: Not partment
<ul> <li>L1 Parsonal Protect supplied matic</li> <li>Symptoms Folds cause charges inhelation can cyanose, unco- lacitymistion.</li> <li>L3 Treatment et Ex- breathing has tor 15 mm. Skil.</li> <li>Threather Linkt</li> </ul>	<ol> <li>NEAL Stve Equipment: Chemical as a seriety hat with form; achien- wing Exposure: Compound is a in blood composition and ne bisituil. Ingestion causes vor practicusness, loss of reflexes. Can be absorbed through the posure: IPAULATION: remove cessed. INGESTION: Induce v UN: remove clothing: weah skit Value: 1 ppm</li> </ol>	TH MAZARDS TH MAZARDS hery poggles: plastic tace inhistic at- or oxygen- proof apror: synthetic hober gloves a powerful narcosic and liver posers; may also urological daturbances. Repeated supceure by herg, darrhes, severe mucceal rijury, her recreate, and death. Contact with eyes causes inflation and altin and may produce severe alon lealons. I e utchn from exposure, begin artificial respiration II omiting; call a physician. EVES: Intgate with water in throughly with warm water and sciep.	SHIPPING INFORMATION     S.1 Grades of Purity: Technical, DP's     S.2 Storage Temperature: Anthen     S.3 Short Asmosphere: No requirement     G.4 Ventiling: Open	12.15 Heat of Solution: Not perform 12.16 Heat of Polymerization: Not perform 12.25 Heat of Pusion: Data not evaluate 12.35 Landbrg Value: Data not evaluate 12.37 Reld Vaper Pressure: 0.5 pas
6.5 Short Term Inhe 6.6 Testolly by Inge 6.7 Late Testolly 1	alation Limite: 10 ppm, 30 mil sellon: Grade 3; oral LDue —	t. 200 mg/tg (mit) ⊨n		- · · · · · · · · · · · · · · · · · · ·
E.B. Vapor (Class) tritt usually toirate E.B. Liquid or Solid k remain, may ca 5.19 Oder Threatold: 5.11 EDLH Value: 150	tant Characteristics: Vapor la a moderate or high vapor conc initiant Characteristics: Minin ause amarting and reddening ( 1.0.5 ppm 1.ppm	moderately initiating such that personnel will not pertrations. turn hazard. If apilied on clothing and allowed to at the skin.	•	INTES C
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Common Bynam 1,1,1-Trichloroisthane Methylchloroiorm Aerothane Chlorothane	ymaa Wattery Inguid Binka in water, in	Colorises Buset ador	6. FIRE INJARDS 6.1 Plant Paint: Data not available 6.2 Planmable Liketia in Air: 7%-19% 6.3 Pire Estimputering Agentic: Dry chamical, latem, or cerbon dioxide	M. MAZARD ASSESSMENT CODE (Bee Husser Assessment Handbook) A-X-Y
Biop decher Avoid conten Cali fre dep Isolete und Notify local (	pa il possible. Keep people an simo di vego. ennext. ennos discherged material matri and politico control ago Combustible POSCHOUS GASES ARE I	ny. Proint	6.4 Pire Estimptioning Agents Not to be Lead: Not perform 6.8 Specific Instrument 9-reducts: Traic and integrageses are generated in free. 6.8 Bediever in Pre: Not performent 6.7 Specific Name: Not performent 6.8 Electrical Hearth Not performent 6.8 Bediever hot performent 6.9 Be	11. NAZARD CLASSIFICATIONS     11.1 Code of Product Regulations:     0765-A     11.2 NAS Hazard Reting for Bulk Water     Transportation:     Collegery Ruting     Fro
Fire	Weer googles and self-cont Exercises with dry chemics	arved bruething apperatus 4. cartuon dooxda, or loem.	6.10 Adabtetic Rene Temperature: Data not available     6.11 Statchlemetric Air to Feel Ratto: Data not available     6.12 Plane Temperature: Data not evaluable	Vapor Imark
- Exposure	CALL FOR MEDICAL AD. VAPOR Va		7. CHEMICAL BEACTIVITY     7.1 Readinity With Water: Reads about, releasing corrower hydrochlonic acid.     7.2 Readwithy with Caneses Industrials: Corrodes duranum, but readilor is not hezerdows.     7.3 BlackWy During Transpert: Stable     7.4 Neutralizing Agents for Acids and Caustion: Not partment     7.5 Pelymentization; Not partment     7.6 Industries: Not partment     7.6 Industries: Not partment     7.7 Black Ry During the sealed is a sealed in the search of partment     7.8 Pelymentization; Not partment     7.9 Pelymentization; Not partment     7.9 Research to Product to a sealed is     7.4 Rescriptions of a sealed is     7.4 Rescription: 38	Asstive: Effect
Water Pollution	Effect of low concentrations May be dangarous if it enter Notify local health and wild Notify operators of nearby v	i on aquetto. Die is untrinown. I webr Intelia. My official. Webr Intelias.		12. PHYSICAL AND CHEMICAL PROPERTIES 12.1 Physical State at 15°C and 1 alm: Liquid 12.2 Molecular Weight: 123.41 12.3 Boling Point at 1 alm: 185°F = 7°C = 347°K
1. RESPO (Bee Response Should be n Chemical an	INSE TO DISCHARGE Notreda Mendbook) inoved d physical Insement	2. LABEL 2.1 Category: None 2.2 Class: Not personnt	B. WATER POLLUTION     B.1 Aquatic Testalty:     75-150 ppm/*/pinleh/71_/ask water     Three penod not specified.     B.3 Biological Corpor Demand (BCO):     Date not evaluable     B.4 Read Chain Concentration Potentiat:	12.4     Preasing Point:       <
2. CHEMH     3.1 CG Competition hydrocarbon     3.2 Permute CHaCl     3.3 \$407UN Design     4. DOT ID No.: 25     3.5 CAB Registry in	AL DESIGNATIONS by Classe: Halogenuted Cla genere: Not Reted 11 No: 71-86-8	4. OBSERVABLE CHARACTERISTICS 4.1 Physical Base (so shipped): Liquid 4.3 Color: Coloriesa 4.3 Oder: Chicrotom-Ba; sweeten	Norma (	12.10 Vaper (Gas) Specific Gravity: 4.8     12.11 Relie of Specific Heats of Vaper (Gas):     1.104     12.12 Latent Heat of Vaperbalance     100 Bis/b = 36 cal/g =     2.4 × 10 <sup>4</sup> J/kg     12.13 Heat of Combustion: (set.) 4700 Bis/b     = 2800 cal/g = 110 × 10 <sup>4</sup> J/kg     12.14 Heat of Decomposition: Not persent
1 Personal Prote apparetus to and less shu nacorane or la Symptome Pel incoordinatio asphysistion	<ol> <li>NEAL solve Equipment: Organic veg- enarguriset: neoprene or po- alt: neoprene askey shoes (or polytwy abontol auf, or spron- leaving Exposure: NHALATIO to base of consciousness, Ng portpined with base of conecous- tions of the spine base of any spine of the polytopic of the spine base of the spine of the polytopic of the spine base of the spine of the polytopic of the spine base of the spine of the polytopic of the spine base of the spine of the polytopic of the spine base of the spine base of the polytopic of the spine base of the spine base of the polytopic of the spine base of the spine base of the polytopic of the spine base of the spine base of the polytopic of the spine base of the spine base of the polytopic of the spine base of the spine base of the polytopic of the spine base of the spine base of the polytopic of the spine base of the spine base of the polytopic of the spine base of the spine base of the polytopic of the spine base of the spine base of the polytopic of the spine base of the spine base of the polytopic of the spine base of the spine base of the spine base of the polytopic of the spine base of the spine base of the polytopic of the spine base of the spine base of the spine base of the polytopic of the spine base of the spine base of the polytopic of the spine base of the spine base of the spine base of the polytopic of the spine base of the spine base of the spine base of the polytopic of the spine base of the spine base of the spine base of the polytopic of the spine base of the polytopic of the spine base of the spine</li></ol>	LTN IMZARDS bor-acid gas constant, self-contented breathing hypoty-stochol-type gloves; chamical selety goggles lesthar safety shoes pius neoprane tootwear; for speech protector( R symptoms range from loss of equilibrium and in concentration can be least due to simple unness, INGESTICRE produces and tests simple unness, INGESTICRE produces and tests simple	SHIPPING INFORMATION     S.1 Grades of Purity: University: Ambient Absorptors: No requirement     S.4 Vending: Pressure-vectors	12.15 Heat of Bolytion: Not permant 12.16 Heat of Polymerizatien: Not permant 12.25 Heat of Fusion: Data not evaluate 12.37 Reid Vapor Pressure: 4.0 pole
BKIN: delab BKIN: delab seposuras. D persalation genalation storoughly w with scop an	o may cause semantia ng action may cause demastia groosura: Get medical attentio to NOT administer administri or i; remove victim to finein ar; il i rygen, INGESTION: have victim gh water, BKR: remove contan gi water.	in for all eye esposures and any other serious ever- spinaphrins; otherwise, breatment is symptometic. necessary, spity artificial respiration and/or 1 dirik water and induce voniting. EYES: Such ninesed clothing and week exposed area thoroughly		
<ul> <li>B.4 Threshold Lim</li> <li>B.8 Shert Tarm bit</li> <li>B.4 Tastality by ing</li> <li>S.4 tast Tarts bit</li> <li>S.4 tast Tastality:</li> <li>B.8 Vapor (Gao) in system if pro</li> <li>B.8 Lipud: or Solid aromati.may</li> <li>8.10 Oder Threshol</li> <li>8.11 IDLH Value: 1/</li> </ul>	It Yalus: 350 ppm waterion (Jintis: 1.000 ppm for yeation: (Jintis: 1.10us = 8 to Data not available thank Characteristics: Vapors sant in high concentrations. Th initiane Characteristics: Data initiane Characteristics: Data initiane Characteristics passes smalling and reddening d: 100 ppm	80 min. In man 15 g/hg (mi, mouse, rabbit, guines pig) cause a slight amarting of the eyes or respiratory a effect is temporary. mum hazard. If apilled on clothing and allowed to of the skin.		dTES

JUNE 1985

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### TRICHLOROETHYLENE

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Селинал Зулалу Тлобио-селукана Тлобите, Адука Околува Салидуата Тлебукана Тлебукана Тлебукана Тлебукана	rma Wutary kyu Sinka in wa	d Colorieus Sweet ador Ier. Witsing vepor is produced.	L L1 Plant Pai conten L2 Plannad L3 Pin Estin L4 Pin Estin	FIRE MAZARDS web 80°F C.C.; practically maked to Latella In Air; 8.0%-10.5% regulating Agoreta: Water log regulating Agoreta: Mat in Inn	18. HAZARD ASSESSMENT CODE (Bee Hezzre Assessment Handbook) A-X-Y	
Biop dectery Avoid contac Call fire depa fectese and it Notify local it	ge if possible. Keep peop s web lagued and vepor. Priment enrove discharged mater reachs and poliulion contr seath and poliulion contr	ke swey. Ipi ol agencies.	Used: 1 6.5 Speedor H Product product 6.8 Dehevior 6.7 Spritten 1	Not partment tezzróla of Combustilion Nel: Todic and smallforg gases are ad in the situations. In Fine: Not partment Temperature: 770°F	II. NAZARD CLASSIFICATIONS     II.1 Code of Pederal Regulations: ORM-A     II.2 NAS Hazard Reting for Bulk Weber Transportation: Comments     Comments     Comments     Comments     Comments     Comments	
Fire	Combustible. POISONOUS GASES Wear gopples and set Estinguish with dry ch	ARE PRODUCED IN PIRE. -contained breathing apparetus. Imical, carbon dioxide, or learn	6.3 participal 6.3 participal 6.10 Adhabasic Data no 6.11 Platicipal Data no 6.12 Plane Te	i Heater: Not performit Refe: Not performent c: Plane Temperature: ci available metric Air to Fuel Ratto: ci available amperature: Data not available	Pre	
Exposure	CALL FOR MEDICAL AID. VAPOR Initiating to eyes, nose and throat. If inhabed, will cause naives, vonteing, difficult breathing, or bas of consecutioness. Move to freeh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give artificial respiration. If breathing is difficult, give artificial respiration. If breathing is difficult, give artificial respiration. If preathing is difficult, give artificial respiration. If preathing is difficult for any stopped difficult breathing, or take of consectuationess. Remove conservices discharge and shoes. Fuen affected areas with pering in weiter. If IN EVES, hold eyesks open and fuely with pering of weiter. If IN EVES, hold eyesks open and fuely with pering of weiter. If IN EVES, hold eyesks open and fuely with pering of weiter. If IN EVES, hold eyesks open and fuely with pering of weiter. If IN EVES, hold eyesks open and fuely with pering of weiter. If IN EVES, hold eyesks open and fuely with pering of weiter. If IN EVES, hold eyesks open and fuely with pering of weiter. If IN EVES, hold eyesks open and fuely with pering of weiter. If IN EVES, hold eyesks open and fuely with pering of weiter. If IN EVES, hold eyesks open and fuely with pering of weiter.		7. Cr 7.1 Reactivity 7.2 Reactivity Reactor 7.3 Stability D 7.4 Notification 7.5 Stability O 7.4 Notification 7.5 Polymerication 7.7 Motific Reactivity 7.8 Reactivity	HEMISCAL REACTIVITY With Water, No reaction with Common Melerials: No in During Transport Stable ong Agents for Aede and Osc Not partment atters: Not partment of Polymerization: rimert to (Reactant to C: Dats not available ( Groups: 35	Assorbet: Effect	
Water Pollution	Effect of low concerns May be dangerous if a Notify local health and Notify local health and Notify operators of ne	stors on squatic life is unknown. entre water interies. I widdle officials afby weter intektes.			12. PHYSICAL AND CHEMICAL PROPER 12.1 Physical State at 15°C and 1 atm: Louid 12.2 Molecular Weight, 131.30 12.3 Belling Point at 1 atm: 180°F = 8°°C = 380°K	TIES
1. BESPON (Bee Response Should be rei Chemical and	ESPONSE TO DISCHARGE     See Response Methods Handbook)     Should be removed     Chemical and physical unatment		E. II 6.1 Aquatic 7: 600 mg water 6.2 Waterhood Balagdad Data m 6.4 Feed Chail	NATER POLLUTION executy: g/V40 tr/dephvie/kill/treah 1 Testofty: Data not available Ozygen Data (diOD); o available an Cancentration Polentias;	<ul> <li>12.5 Pressing number</li> <li>-123.57 E86.4°C = 186.8°K</li> <li>12.5 Critical Temperature: Not persent</li> <li>12.6 Critical Temperature: Not persent</li> <li>12.7 Specific Gravity;</li> <li>1.46 at 20°C (splid)</li> <li>12.8 Liquid Surface Temater:</li> <li>29.3 dynas/cm = 0.0230 N/m at</li> <li>12.9 Liquid Water Interfacial Temator:</li> <li>34.5 dynas/cm = 0.0245 N/m at</li> </ul>	20°C 24°C
3. CHEMIC 9.1 CG Competibilit hydroceton 3.2 Permula: CHCI= 3.3 MIO/UH Design 3.4 DOT ID No.: 171 3.5 CAS Registry IN	AL DESIGNATIONS y Class: Helogenated (CCs edior: 9.0/1710 0 a: 79-01-6	4. OBSEIN/ "LE CHARACTERISTICS 4.1 Physical Busic (on shipped): Liquid 4.2 Cater: Colorina 4.3 Odier: Chioroforni-Bis; etheroid			12.11 Relia of Specific Heats of Vapor (G 1.116 12.12 Latent Heat of Vaporization: 100 Bu/b = 57.2 cm/g = 2.4 X 10 <sup>4</sup> J/kg 12.13 Heat of Combustien: Not partment 12.14 Heat of Decomposition: Not partment 12.15 Heat of Bolution: Not partment 12.16 Heat of Bolution: Not partment	<b>100</b> ): M
L1 Personal Prote apparate to neoprove ad Substance Pol Broat to new Nervous syst NGESTICH:	5. ctive Equipment: Organ emergencies; neoprene ety shoes; neoprene suit lowing Exponent: PHW ses, an attbude of invep emergens antifer to inte somptome antifer to inte	NEALTH NAZARDS is vepor-ecid gas consister; self-contained breathing ' or vinyl gloves; chamical safety goggles; hace-shield; or epron for solesh protection. ATON: symptomis range strom initiation of the rices and unability, blurted vision, and finally desurbance of central lars. Cironic exposure may cause organic injury. selon. SIGN: electrism action can cause dimensioned PEES.	<ol> <li>SH</li> <li>Grutes of degree</li> <li>Sharape 71</li> <li>Sharape 71</li> <li>Sharape 71</li> <li>Sharape 71</li> </ol>	IPPING INFORMATION Party: Technical; dry cleaning; ang: adhection angestention: Ambient cephene: No requirement reason-monum	12.35 Heat of Fusion Data not evaluate 12.36 Heat of Fusion Data not evaluate 12.37 Reid Vapor Pressure: 2.5 pais	
storby trigging 5.3 Treatment of E Gases of over reportion an reposit tree t water. SICH: 5.4 Threshold Limit 5.5 Shert Term infe	g sensition and lachym Exposure: Do NOT admin resposure: ImHALATION: d/or administer oxygen. Imies; then give 1 lables week thoroughly with soil it Value: So pom valation (Liwite: 200 ppm	ustion. Hister schmalen er opinsphriver, get medical attantion for all remove vicim to heath air; if nocessery, apply artificial NGESTICH: have vicim drink water and historoughly with po and warm water. Ter 30 min.				IMP 00]
<ul> <li>E.6 Testelity by beg</li> <li>E.7 Late Testelity: C</li> <li>E.8 Veger (Ras) by</li> <li>E.9 Liquid er Setel</li> <li>remain, may (</li> <li>E.10 Oder Threates</li> <li>E.11 (SULI) Value: 1.0</li> </ul>	secter: Gradi 3: Libos - Data not available Want Characteristics: Vi sent in high concentration laritant Characteristics course enanting and redd at 80 ppm 200 ppm	: au to SUO Myrte) spors cause a slight emarting of the eyes or respiratory st. The effect is temporary. Minimum huzard. If spilled on dothing and allowed to ming of the elein.		80	123	0167

JUNE 1985

# TOLUENE

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Common Synony Toluci Methybergene	yma Watery Itput	Colorieen Pleasant odor		6. FRE HAZARDS 6.1 Pash Paint: 40°F C.C.; 55°F O.C. 6.7 Pashmente Limits in At 1 77575	"18. HAZARD ASSESSMENT CODE (Bee Heard Assessment Handbook)
MethyDargol	Floats on water. F	Termable, initialing vapor is produced.	] [	<ul> <li>L2 Pre-Extinguishing Agents: Carbon dicitide or dry cremical for avail fires, ordinary loans for area fires.</li> </ul>	U-T-A
Blop decherg Bhut off sprit Blay upwrid Avoid contac Isolate and r Hosty local f	ge a possible. Keep people awa son sources and cat fire depart and use were spray to "Intock ct with louid and viscor. remove decharged meternal heatin and poliuson control age	yy mart down" vepor. nose.		Long of the second	11. NAZARD CLASSIFICATIONS 11.1 Code of Poderal Regulations: Planmable liquid 11.2 NAS Heaved Rolling for Bulk Water Transportation: Cottagory Rusing
Fire	FLAMMABLE Fissificats along vapor that if Vapor may explode if igneed Wear goggles and seri-cont Estinguish with dry chemical Water may be reiffective on Cool exposed containers with	vey occur. In an enclosed evel. Inder, or carbon diclode. New, or carbon diclode. In weiter.		E.7 Ignition Temperature: 097F     E.8 Electrical Hazard: Case I, Group D     E.9 Eurong Refer: 57 mm/mm.     E.10 Adiabatic Plane Temperature:     Data not evaluable     Continuent	Fire
Exposure	CALL FOR MEDICAL AD VAPOR Intering to eyes, nose and 1 if intering the cause name difficult breathing, or too Move to heart are it breathing has iscoped, giv if breathing discust, give any breathing to akin and eyes. However, will cause new Remove contermasted dotte Fuer interical arress with pu if NLEYES, head systems on prime. DO NOT INDUCE VOMTING	Intrati vonting, hasdache, dizzinase. a of, consciouenees e artificial respiration. gen. see. vonting or loss of consciouenees. ng and shose. my of water on and flush with planty of water. is CONSCIOUS, have wichn dmh.water 3.		7. CHEMICAL REACTIVITY     7.1 Reactivity With Water: No reaction     7.2 Reactivity with Common Materials: No     reaction     7.3 Stability Curring Transport: Stable     7.4 Neutralization: Not partnernt     7.5 Pelymerization: Not partnernt     7.6 Pelymerization: Not partnernt     7.6 Note Ratio Reactant to     Product: Data not available     7.8 Reactivity Group: 32	Assthuse Effect
Water Pollution	Dergerous to equatic life in Fouring to shorehe. May be dergerous if it enter Nothy local health and width Nothy coarsions of nearby in	high concernessons. 5 webs: instage. 10 offices: and instage.			12. PHYSICAL AND CHEMICAL PROPERTIES 12.1 Physical State at 15°C and 1 am: Liquid 12.2 Minicidaer Weight 82.14 12.3 Bolling Point at 1 atm; 201.11°F = 110.8°C = 363.8°K 13.4 Freacher Parks;
1. RESPO (Bee Response lead vernin Evecute an	NSE TO DISCHARGE 9 Methods Hundhook) ng-ngin Remmability es	2. LABEL 2.1 Category: Flammable Iquid 2.2 Class: 3		B. WATER POLLUTION     Aquatic Testolity:     1180 mg///95 hr/aunteh/TL_/heah     were     Waterfour Toxicity: Data not evenable     Bological Citygen Demand (BCD):     O'%, 5 days: 38% (theo), 8 days	
1. CHEMIK 3.1 CG Competibilit Hydrocarbon 3.2 Fermula: CoHoC 3.3 MBO/UH Design 3.4 BOT ID No.: 12 3.5 CAS Registry N	CAL DESIGNATIONS my Class: Aromatic CHs chatter: 3.2/1294 94 No.: 108-88-3	4. OBSERVABLE CHARACTERISTICS 4.1 Physical Bisto (as shipped): Liquid 4.2 Cater: Colories 4.3 Odor: Pungent; sromstic, bentane-Bis; definit, pleasant		None .	29.0 dynes/cm = 0.0290 N/m at 20°C 12.9 Liquid Water Interioxial Tension: 26.1 dynes/cm = 0.0061 N/m at 25°C 12.19 Year (Sas) Specific Gravity: Not perman 12.11 Ratio of Specific Heats of Yaper (Bas): 1.089 12.12 Latent Heat of Yaporization: 155 Bau/b = 86.1 cat/g = 3.61 X 104 J/m
<ul> <li>E.1 Personal Prote</li> <li>Symptoms Following Following</li> <li>Ingested cau</li> <li>Ingested cau</li> <li>Treatment of 1</li> <li>reactic, cal</li> <li>uster for at 1</li> <li>E.3 Threshold Lim</li> <li>E.5 Tacticity by ing</li> <li>E.7 Late Testicity:</li> <li>S Tacticity by ing</li> <li>E.7 Late Testicity:</li> <li>S Tacticity and form of the system if provided in a system if provided in a system if provided in the solution of the solution</li></ul>	L HEAL active Equipment: Ar-acpired sowing Exposure: Vapors inter- neatheak. Represory arrest, Lic mass coording, griping, darnes, Exposure: NH-ALATION: remo- a doctor. NGESTION: do NOT least 15 min. SKIN: who off, we at Value: 100 ppm heatton Livelike: 800 ppm for 3 gester: Grade 2; Libes = 0.5 1 Kohrey and leve demage may 5 ritant Characteristics: Vapors each in high concentrations. The 5 system Characteristics: Main and the concentrations. In-	TH IA2ARDS math: poggles or face sheet; plastic gloves. Is even and upper respiratory tract; cause diszinase, jud inflates even and causes drying of skin. If as, and reply developing pulmonary edems. If depressed respiration approximation and cargen if induce vormang: call a doctor. EYES: Ruch with soft with acep and water. D men. D men. D Service a sight smarting of the even or respiratory a effect a temporary. num hazerst. If spilled on clothing and allowed to other too.		SHIPPING INFDEMATION     SIMPPING INFDEMATION     If and the output of the second	12.13 Heat of Convexation:17.430 Bu/lb 8065 cat/g =-405.5 X 10° J/kg 12.14 Nest of Decomposition: Not partnerst 12.16 Heat of Solution: Not partnerst 12.16 Heat of Polymertzation: Not partnerst 12.28 Heat of Polymertzation: Not partnerst 12.29 Heat of Puelen: 17.17 cat/g 12.39 Limiting Value: Data not evaluate 12.37 Reid Vapor Pressure: 1.1 psis
remain, may 6.10 Oder Throshol 6.11 IDLH Valve: 2/	cause emaring and reddening Ad: 0.17 ppm ,000 ppm	(F THE GL7).		6. FIRE NAZA 8.11 Stoichionwirld Air le Puel Rette: Data not / 6.12 Plante Temperature: Data not available	RDS (Continued) C Involutive H
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Common Bynon 1, 4-Camethylconzone Xylol	ryme Watery lead Floate on water Freezo	Wassry lead Colories Buset odor Floels on water. Flammable, imitaling vepor is produced Freezong pomi is 85°F.		6. FIRE HAZARDS 6.1 Planth Paint: 81% C.C. 6.2 Planmathe Lindis in Air: 1.1%-8.6% 6.3 Priv Estinguishing Agentic Foan, dry chemical, or catton domite	38. HAZARD ASSESSMENT CODE (Boo Hazard Assessment Handbook) A-T-U
Sico decharge if poseble Keep people away. Caf tre department Avoid contact with load and vepor lease and remove decharged meternal Notify local heath and polysion control agencies.			<ul> <li>8.4 Pire Extinguishing Agents Not to be Uase: Water may be suffective.</li> <li>8.5 Bysolal Hezards of Combinistion Presents: Not pertnent</li> <li>8.8 Behavior in Pire: Vapor is heavier than ar and may invest considerable distance to a source of greaten and Resh back.</li> </ul>	11. RAZARD CLASSIFICATIONS 11.1 Code of Foderal Regulations: Flammable liquid 11.2 HAS Heaturd Rating for Bulk Wyter Transportation;	
Fire	FLAMMABLE Financial along report that Vepor may explose it grint Waar par-contained breat Estropart with loam, dh c Waar may be netlective Cool exposed containers t	i may occur. I in an enclosed area. Ing spoarstus Internical or carbon depade In fire Inn reater.		S.7 Ignition Temperature: \$70°F     S.8 Excitned Heasing Class I, Group D     S.9 Entring Rate: 35 mm/ms.     S.19 Adhabatic Plane Temperature:     Date not evelable     S.11 Blocknewstric, Air to Fuel Retlo:     Date not available     S.12 Plane Temperature: Date not available	Category Rating Pro
Exposure	CALL FOR MEDICAL AD VAPOR Instancy to syns, nose and If instancy to syns, nose and If one of correctourness Nove to here ar. If bestming has incoded, and UDURD instancy to skin and eves. If bestming is difficult, pro- LIQUID instance constraintised cto Fluid affected areas with If MEDIC and vice If Single D and Vice VINITI	Proof. sea, difficult breathing, or pre-artificult integration. (anygen. turgs and shoes. point private point point water turgs and shoes. point point water turgs and shoes. point point water turgs and shoes. Any of water turgs and turgs		7. CHEMICAL REACTIVITY     7.1 Reactivity With Water: No reaction     7.2 Reactivity with Common Meteriais: No     reaction     7.3 Stability During Transport: Stable     7.4 Headministry Agents for Anide and     Constitution: Not partnerst     7.5 Polymerization: Not partnerst     7.6 Anide Ratio (Reaction to         Preduct): Data not available     7.8 Reactivity Group: 32	Asstivence Effect
Water Pollution	HARMFUL TO AQUATIC L Fouling to shorekine. May be despective. If it and Notify local health and with Notify local health and with Notify colorators of nearby	IFE IN VERY LOW CONCENTRATIONS. Ins under Indukes. See official			12 PHYSICAL AND CHEMICAL PROPERTIES 12.1 Physical Base at 16°C and 1 alm: Usual 12.2 Metocolar Weight 106.16 12.3 Belling Point at 1 alm: 280.0°F = 138.3°C = 411.5°K 12.4 Proving Point:
1. RESPO (Bee Response lays servin Evecuste en Stoutd be re Chemical en	NSE TO DISCHARCE i Biothode Hendbook) g-tigh Remmability as proved d physical treatment	2 LABEL 2.1 Category: Flammable liquid 2.3 Classe: 3		WATER POLLISTION     Aquestic Testolity: 22 ppm/18 in/(bacgl/TL_/thenh weter &2 weterieuri Testolity: Data not available distribution (BCO); 0 b/b n 5 days     &4 Food Chain Concentration Potential: Date not available	55.9"F = 13.3"C = 298.5"K 12.6 Critical Temperature: 846.4"F = 343.0"C = 816.2"K 12.8 Critical Pressure: 800.4 atm = 34.65 pms = 3.510 MV/m <sup>2</sup> 12.7 Specific Gravity: 0.651 at 20"C (bould) 12.8 Liquid Surface Tempion:
1 CHEMH 8.1 CO Competitive Hydrocerton 9.2 Fermula: p-CaH 9.3 BIO/UH Design 9.4 DOT ID No.: 19 9.5 CAB Registry II	CAL DESIGNATIONS ky Class: Avonatic h h h(CHs)s willion: 3.2/1307 07 te:: 105-42-3	4. OBSERVABLE CHARACTERISTICS 4.1 Physical Barls (as shipped): Ligad 4.3 Cater: Colorisas 4.3 Oder: Like banzone; characteristic aromatic			28.3 dynas/cm = 0.0283 N/m st 20°C 12.9 Liquid Wriser Interfaced Tension: 37.8 dynas/cm = 0.0378 N/m st 20°C 12.10 Vaper (Das) Specific Gravity; Not performent 12.11 Ratio of Specific Heats of Vaper (San); 1.071 12.12 Latent Heat of Vaporization: 150 Bu/D = 81 cm/g =
5.1 Persensi Prol. pisso: giore 5.2 Symptome Fo etim. If bitm edems. If ing Kichay and I 5.3 Treetwort of I caypen II ng	S. NEJ active Equipment: Approval is and boots. Nowing Exposure: Vapors ca is ano lungs, causes averse co pacted, causes neures, vorvib ner demage can accur. Exposure: IN-NALATION: nam junct, call a doctor. INGESTIX	LTH HAZARDS carrieter or az-exposed mests; goggles or face sheat; use headache and dzzmess. Liquid interes eyes and ughing, datress, and rapidly developing putmonary ng, orange, headache, and come. Can be least. one to fresh bir; administer artificial respiration and Dh; do NOT induce vorming; call a doctor. EYEE:		SHIPPING INFORMATION     S. SHIPPING INFORMATION     S.1 Grades of Purity: Research: 98.8%;     Pure: 99.3%; Technical: 98.0%     S.2 Storage Temperstart: Antonin     S.3 Inert Atmosphere: No requirement     S.4 Verlag: Conn (Inere arcster) or     pressure-vectore	12.13 Heat of Combustien:17.558 Bu/b = 6784.7 cal/g = -409.41 X 10* J/kg 12.14 Heat of Documposition: Not partment 12.16 Heat of Polymortastar: Not partment 12.18 Heat of Polymortastar: Not partment 12.28 Heat of Polymortastar: Not partment 12.29 Heat of Polymortastar: Otto putperson 12.29 Linking Value: Data not available 12.27 Reid Vaper Pressure: 0.34 pais
Ruch with we 6.4 Threachold Line 6.5 Sheet Torm hit 6.7 Late Testolty by ing 6.7 Late Testolty: 6.8 Yaper (Geo) in system if pos 6.9 Liquid or Solid remark, may 6.9 Liquid or Solid	per for at seat 15 min, SKR- kit Value: 100 ppm in, SKR- battion (Janita: 300 ppm for gestier: Grade 3: LD+= = 80 Kdrey and Iver damage. Hant Characteristics: Vapor event in high concertrations. It is influent Characteristics: Min cause amorting and reddening to 10.05.min	wipe off, weak with scorp and weak? 20 min, to 500 mg/hg a cause a slight amarting of the syste or respiratory he effect is temporary. Amum hiszard, if spliled on clothing and allowed to y of the skin.			IMP 001
6.15 IDLH Valve: 10	ес чио рам 2,000 римп				0169
				····	UNE 1985

## o-XYLENE

Common Bynanyme Watery Iguad Colorises Sweet odor 1, 3-Consthylosrasine Xylol Posts on water. Flammable, inflating vapor is produced. Baco decharge # postble, Keep people array.		522	<ol> <li>FIRE MAZARDS</li> <li>Plank Paint: 63°F C.C.; 78°F O.C.</li> <li>Planumatite Limits is a date: 1.1°L-7.0°L</li> <li>Pire Extinguishing Agenta: Fouri, dry charmesi, or carbon deador</li> <li>Pire Extinguishing Agenta Mat to be Used: Water may to instruction</li> </ol>	14. HAZARD ASSESSMENT CODE (Bee Hussel Assessment Handbook) A-T-U	
Call for department Avoid contact with I leciste and remove Notify local health a	iquid and vapor. decharged material nd posuson control age			Bpecial Hassins of Cambuston Produsts: Not partners Besurver in Pric: Vapor is heavier than an and may travel considerable detence to a source of ignition and Reah back.	I.I. MALARU CLASSIFICATIONS     II.I Code of Foderal Regulations:     Plannetic Ruel     II.2 NAS Hazard Reting for Bult Weter     Transportation:
FLA Flag Vec Was Fire Cod	FLAMMABLE Reshback along vapor trail may occur. Vepor may explode if gynad in an enclosed area. West sent-concented breating spoarstus. Extinguish with loarn, dry chemical or garbon dicada. Wester may be eventactive on fire. Cool exposed containers with water.			Ignition Temperature: 800°F     Decring Relacing Chase I, Group D     Burning Relacing Relacing Chase I, Group D     Burning Relacing Temperature:     Deca not available     Test-orienment: At to Fuel Relac:     Deca not available     Plame Temperature: Data not available	Cotegery     Realing       Fire     3       Health     3       Vapor Wilant     1       Lopad or Bold Wilant     1       Posons     2       Waser Polyton     1       Human Tosochy     1       Aquetor Tosochy     3
Exposure Finantia Exposure Exposure Cont Cont Cont Cont Cont Cont Cont Cont	L FOR MEDICAL AD TOTA IC offee and the second and the cause headed at the second second at the second second second at the second second second second at the second second second second second at the second second second second second	hrost. ne. difficult breathing, or loss e stillicul respiration. argen. see, vomiting, or loss of ing and shoe. sing of water en and flush with plainty of water. a constcicuts, have within drink water G.	7.1 7.2 7.2 7.4 7.4 7.4 7.3 7.4 7.3	CREMICAL REACTIVITY     Resctivity With Water: No resction     Resctivity with Common Materials: No     maction     Resctivity with Common Materials: No     maction     Neutrafitting Agents for Aoles and     Casellos: Not partners     Neutrafitting: Agents for Aoles     neutrafitting: Agents     neutrafittin	Assthetic Effect
Water Pollution Not	percus to aquatic Me in ing to shoreine. De dangerous it enter hy local heath and wildli y operations of nearby to	high concentrations. 9 woler intelles. Ne officials. giver intelles			12. PHYSICAL AND CHEMICAL PROPERTIES 12.1 Physical State at 15°C and 1 size: Liquid 12.2 Molecular Weight 108.16 13.3 Seeling Point at 1 size: 291.97 = 144.4°C = 417.8°K
1. RESPONSE TO (Bue Response Metho Issue verning-high I Evecuste area Should be removed Oversical and physi	DISCHARGE inte Handbook) Remnestiky Cal treatment	2. LABEL 2.1 Category: Flammable Iquid 2.2 Class: 3		BATER POLLUTION     Aquetic Textolty:     >100 mp/195 hr/D. megns/TL_/twen     weter     Weterford Textolty: Data not available     Biological Grygen Demand (BOD):     0 B/D. 5 days: 2.5% (Peor.), 8 days	
CHEMICAL DE     L1 CG Compatibility Class     Hydrocarbon     S2 Fermulic o-CH4(CH4)     S3 MO/UN Designation:     L4 DOT ID No.: 1307     L5 CAS Registry Ne.: 85-4	SIGNATIONS & Aromatic 3.2/1907 47-6	4. OBSERVABLE CHARACTERISTICS     4.1 Physical Bits (as shipped): Liquid     4.2 Calor: Colories     4.3 Oder: Bertsno-But, characteristic aromatic		Data not evenezie	2010 Service Interfactor Construction     30.53 Gymas/cm = 0.030053 N/m at     15.5°C     12.8 Liquid Water Interfactor Tension:     38.06 Gymas/cm = 0.03806 N/m at     20°C     12.10 Yaper (Gas) Specific Gravity:     Not performent     12.11 Retic of Specific Heats of Yaper (Gas):     1.088
<ul> <li>8.1 Personal Protective II pastic gloves and b</li> <li>9.7 Symptoms Fallowing stin. If taken into ba edema. If ingested, Kidney and her dan</li> <li>5.3 Trestment ef Exposu onygen I required: or fluct with easy for i</li> <li>6.4 Thirmshold Linek Yaka</li> </ul>	5. HEAL Louispinent: Approved o costs. Exposure: Vapori celui rgs, causes servere coul causes nauses, vorniting mage can socur. re: R+ALATION: restrict all a doctor. INGEST el lessi 15 min. SKRE te ki 100 ppm	TH HAZARDS anieter or an-explicit meal; goggles or face shield; se headache and dizones. Liquid intelles eyes and phing, distrus, and repoly developing summery g, oramps, headache, and come. Can be tetal, ve to tresh alt; administer artificiel respiration and k; do NOT induce vomiling; cell a doctor. EYES: inje off, usah with scep and wear.	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1. SHIPPING INFORMATION Grades of Purity: Assessmith: 50.50%; Pury: 50.7%; Commercial: 55+% Storage Temperature: Ambient Inert Atmosphere: No reaction Venting: Open (fame amester) or pressure-vectors	<ul> <li>12.12 Latent Heat of Vaportation: 148 Bau/b = 82.9 ca/g = 3.47 X 10<sup>4</sup> /hg</li> <li>12.13 Heat of Combustien: -17.568 Bbu/b = -8754 7 ca/g =408.41 X 10<sup>4</sup> J/hg</li> <li>12.14 Heat of Doomposition: Not partnerst</li> <li>12.16 Heat of Public: Not partnerst</li> <li>12.35 Heat of Solution: Not partnerst</li> <li>12.35 Heat of Public: 30.44 Ca/g</li> <li>12.35 Heat of Public: Data not evaluate 12.37 Reid Vapor Pressure: 0.28 pais</li> </ul>
L.S. galart farm invanisor L.S. Taxloffy by ingestion: E.7 Late Textoffy: Kickey B.8 Vapor (Gas) britant C system if present in Ladd or Sold Inflam	t Grade 3; LDos = 50 1 and Iver demage. Nerectoristics: Vapors high concentrations. The d Characteristics: Man	o mar. 5 800 mg/hg cause a slight amarting of the eyes or respiratory a effect is temporary. Jum hazard i acabled on distinct and allowed to			ТМР ММ
Remain, may cause a 6.16 Oxfor Threahold: 0.05 6.11 IDLH Value: 10,000 pp	imenting and reddening ppm pm	of the skin.		ad a state of the	001 1
					0170

#### **m-XYLENE**

14. HAZARD ASSESSMENT CODE

mant Handback

(Bee Hazard Assess

Common Byner 1. 3-Dimetryberzene	nyme Watery Iquad	Colorises Sevent odor	& FIRE NAZARDS
A7~	Plosts on weiter, i	Flammable, initialing vapor is produced.	<ul> <li>8.2 Parminable Limits in Air: 1.1%-8.4%</li> <li>8.3 Pro Extinguishing Agentic Form, dry overcel, or carbon docade</li> <li>Among Agentic Agentic</li></ul>
Stop dechart	pe if possible. Kamp people awa	<u>у</u> .	Used: Water may be ineffective.
Avoid contact lineate and m	roment t with logaid and vepor. whowe decharged indenial.		E.S. Special Hazards of Californian Products: Not parlanent
Nowly local h	ealth and poliution control ager		6.6 Behavier in Pire: Vepor is heaver than a and may travel considerable detence to source of golicon and flash back.
	FLANMABLE		6.7 Ignition Temperature: 985'F
	Fissiplack along vapor trail ( Vapor may explode if syntad	may docur. I in an enclosed area.	6.9 Burning Rate: 5.8 mm/mm.
	Wear self-contained breathin Estinguish with foam, dry che	apparatus mucal, or parbon dicuste.	6.10 Adlabatic Plane Temperature: Data not evaluate
Fire	Copi exposed containers with	are. • wgber.	6.11 Stolchiometric Air to Fuel Ratio:
			6.12 Fame Temperature: Data not evaluable
	CALL FOR MEDICAL AID.		7. CHEMICAL REACTIVITY
	Warow Warow Himbied, wit cause headed	throat. the, difficult breathing, or loss of	7.1 Reactivity With Water: No reaction 7.2 Reactivity with Common Materials: No
	donecoulinees. Move to freeh air.	-	reaction 2.3 Biobility During Transport Biobio
	If breathing has stopped, give If breathing is difficult, give o	e artificial reapiration. Rygen.	7.4 Heutralizing Agents for Asids and
_			Caustics: Not partment 7.5 Polymerization: Not partment
Exposure	If swallowed, will cause neur	ass, vombing, or loss of consciousness.	7.6 Inhibitor of Polymoriastion.
	Fluen affected areas with ple IF IN EYES, hold evends one	inty of water. In and hush with planty of water.	7.7 Moler Partic (Reactant to
	IF SWALLOWED and vicem	a CONSCIOUS, have vicam dwak water	Product: Data not available
	DO NOT INDUCE VOMITING	l.	
Water	HARMFUL TO AQUATIC LI Fouring to shoreine.	FE IN VERY LOW CONCENTRATIONS.	
Pollution	May be dangerous a a ante		
	Notify operators of nearby w	Iter Friskes	
1. RESPO	NSE TO DISCHARGE	2 LABEL	E. WATER POLLUTION
lasue warter	ng-high figmmability	2.2 Close: 3	8.1 Aquific Testolty: 22 ppm/96 hr/bluepil/TL_/Ireah water
Evecuste ar			8.2 Waterfowl Taxiotty: Data not evaluable 8.1 Biological Occurso Descent (BOCh
Chemical an	d physical treatment		0 B/b. 5 days; 0% (theor.), 8 days
	· .		8.4 Food Chain Concentration Peterset: Data not evaluable
3. CHEMI	CAL DESIGNATIONS	4. OBSERVABLE CHARACTERISTICS	
1.1 CG Competibil	ty Cleas: Aromatic	4.1 Physical State (as shipped); Liquid	
1900ccarbor 3.2 Formula: m-C-I	) He(CH2)2	4.3 Odor: Like berzene; characteristic arometic	
3.3 INO/UN Deelge	nellon: 3.2/1307	-	
15 CAS Registry I	No.: 108-38-3		
	S. NEAL	I	1. SHIPPING INFORMATION
6.1 Personal Prot	active Equipment Approved o	erister or air-supplied mask; goggles or tace shield;	5.1 Grades of Purity: Research: 50.50%;
plastic glove 5.2 Symptoms Fo	is and boots. Rowing Exposure: Vapors cau	ee headache and dzziness. Liquid imitales eves and	Pure: 90.9%; Technical: 90.2%
skin. If taker	into lungs, causes severa cou	gling, distress, and rapidly developing putmonary	8.3 Inert Almosphere: No requirement
and liver der	yesed, carees nares, voman nege can occut.	g, crampa, macacria, and come; can be read. Kdhey	5.4 Venting: Open (feme arrester) or preseure-vecuum
8.3 Treatment et	Exposure: INHALATION: remo	ve to fresh air, administer artificial respiration and N: do NCIT induce wombing: cell a dwaw. EVER-	·
Such with w	mer for at least 15 min. SKIN: v	ips off, wash with scap and water.	
5.4 Threshold Lin 6.5 Short Term in	nit Value: 100 ppm Induition Limite: 300 ppm for 3	Ommin.	
6.8 Toxicity by In	gestion: Grade 2; LDss = 50 1	500 g/kg	
LITE LINE Texicity: 5.8 Vapor (Ges) in	rioney and liver demage. Hant Characteristics: Vapors	cause a slight smarting of the eyes or respiratory	
system if pro 8.9 Liquid or Solid	eant in high concentrations. Th d livituant Characteristics: Mini	e effect is temporary. num hazard. If spilled on clothing and allowed to	
remain, may	cause amening and reddening	of the skin.	
E.11 IDLH Value: 1	0.000 ppm		
			L

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A-T-U 11. NAZARD CLASSIFICATIONS 11.1 Code of Federal Regula Farmabis liquid 11.2 NAS Hazard Rating for B Transportation: Category Fre ..... . Health Vapor Initiant... 1 Liquid or Solid Infant ..... 1 Powers ...... , Water Polypon Human Toxonty... Aquetic Tanoty. Aesthetic Effect. 2 Other Charmonia 0 11.3 NFPA Hassered Ch Category Mith Hazard (Blue). mmability (Red)..... a \_ 2 enty (Yallow) 12 PHYSICAL AND CHEMICAL PROPERTIES Physical State at 15°C and 1 alex: 12.1 Liquid Noiscular Weight: 108.16 Belling Point at 1 abro 269.41F = 131.91C = 405.11K 12.2 12.3 200 4/F = 131.9°C = 405.1°K Pressing Paint -54.2°F = -47.9°C = 225.3°K Critical Temperature: 600.8°F = 343.8°C = 617.0°K Critical Pressure: 613.8 sen = 34.85 pm = 3.540 MN/m<sup>2</sup> 12.4 12.5 12.6 12.7 Specific Gravity: 0.864 at 20°C (lique) Liquid Burtace Tension: 28.6 dynas/cm = 0.0286 N/m at 20°C Liquid Water Interfacial Tension: 12.8 12.8 36.4 dynas/cm = 0.0364 N/m at 30°C Vapor (Gas) Specific Gravity: 12 Not personners 12.11 Retto of Specific Hasts of Yaper (Bas): 1.071 12.12 Latent Heat of Vaportaston: 147 Bu/lb = 81.9 ca/g = 3.43 X 10<sup>9</sup> J/kg 12.13 Heat of Combustion: --17.564 Bu/lb = -9752.4 cal/g = -408.31 X 10<sup>4</sup> J/kg set of Decomposition: Not parament --07524 cal/g = -400.31 x 1 72.14 Heat of Decomposition: Not perim 12.15 Heat of Solution: Not periment 12.16 Heat of Polymertzation: Not perim 12.28 Heat of Fusion: 26.01 cal/g 12.39 Limiting Value: Data not evaluate 12.37 Reid Vapor Pressure: 0.34 pais IMP T00 NOTES 0171

JUNE 1985

### POLYCHLORINATED BIPHENYL

Carrenon Bynony PCB Chorvessed behanyl Arochor Helogensted wares Polychoropolytenyle Skop decher Arod contac Call fire dep leaster and Notify local h	Image         Oty Board to solid         Light yellow locat, or Weak odor           powder         while powder           Binks in wear.           rge if possible Kear, people swey, ct with locat and and entiment, remove discharged material, nearth and poliusion control agencies.           Computable Estimption, with wear, loam, dry chemical, or perior dioxide.		6. FIRE HAZARDS     6.1 Plank Paint: >280°F     6.3 Planmains Limits in Arr.     Data not available     6.3 Pro Extinguishing Agents: Water, Ioem,     dy charactal, or carbon doade     6.4 Pro Extinguishing Agents Not to be     User: Not persons     6.5 Special Hazards of Cambustlen     Products: inflating gaess are generated     in Fre.     6.8 Behavior in Pro: Not persons     6.9 Barborior Parts	Ja. HAZARD ASSESSMENT CODE (Bee Hazard Assessment Handbook) H 11. NAZARD CLASSIFICATIONS 11.1 Code of Fedural Regulations: ORM-E 11.2 NAE Mazard Reting for Bulk Water Transportation: Not Nated 11.3 MFPA Hazard Classification: Not lated
Fire			6.10 Adabatic Flame Temperature: Desia nos evalable     6.11 Stoichiometric Air te Fuel Ratio: Desia not evalable     6.12 Flame Temperature: Data not evalable	
Exposure	CALL FOR MEDICAL AID LIDUND OR BOLID Flass to skin and area Flass the content of the skin weter. F in EYES, hold eyends open and flush with planty of water.		<ol> <li>CHEMICAL REACTIVITY</li> <li>Reactivity With Water: No reaction reaction</li> <li>Reactivity with Common Meserials: No reaction</li> <li>Biblity During Transport Stable</li> <li>Heutrafizing Agents for Acids and Caustics: Noi perferent</li> <li>Polymerization: No perferent</li> <li>Inhibitor of Polymerization: Noi perferent</li> <li>Inhibitor of Polymerization: Noi perferent</li> <li>Inhibitor Different to Product: Data noi available</li> <li>Reactivity Group: Data noi available</li> </ol>	
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERV LOW CONCENTRATIONS. May be designedus if it enters water intakes. Notify opensions of nearby water extenses.			PHYSICAL AND CHEMICAL PROPERTIES     Physical Base at 19°C and 1 asec.     Sould     Sould     Sould the second seco
I. RESPON     (See Response     Baue warren     Should be re     Chemical and     Chemical and     I. CR EMIK     I.1 CS Compatibilit     I.2 Formula: (C-I+H)     I.3 BIO/UN Design	HSE TO DISCHARGE Methods Handbook) g-wase containmant moved d physical treatment CAL DESIGNATIONS hy Class: Not lated i==JC, stor: Not lated	2. LABEL     2.1 Category: None     2.2 Class: Not perman     4. OBSERVABLE (NARACTERISTICS     4. Physical State (as shipped): Liquid     or solid     d category: Pale yellow Biquid): colonees	B. WATER POLLUTION     B.1 Aquattic Testiony:     0.278 ppm/86 tr/blueg8//TL_/treah     water     0.005 ppm/336-1080     tr/pmfar//TL_/sait water     B.2 Wateriosi Testoffy: LDxs 2000 ppm     (mailard duck)     B.3 Biological Caryon Demand (BOO):     Very low     B.4 Pose Chain Cencentration Petentiat:     High	12.6 Critical Pressure: Not perinant 12.7 Secting Gravity: 1.31.8 et 20°C (Roud) 12.8 Liquid Surtao: Tension: Not perinant 12.9 Liquid Water Interfactal Tension: Not perinant 12.10 Yasor (Gae) Specific Grevity: Not perinant 12.11 Ratio of Specific Heets of Vapor (Gae): Not perinant 12.12 Latent Heet of Vaporization: Not perinant 12.13 Heet of Combustion: Not perinant 12.14 Heet of Decomposition: Not perinant
Li DOT ID No. 23     Li CAS Registry H     Li Personal Prote     Li Personal Protein     Li Persona Protein     Li Personal     Li Personal     Li Persona Protein	13 Ibc: 1338-38-3 S. NEAL potive Equipment: Gloves and lowing Exposure: Acre tron is Exposure: Skills: Valas: Acre tron is N Value: C.5 to 1.0 mg/m <sup>1</sup> neistion Livite: Date not avail person: Characteristics: Vapore Reart Characteristics: Vapore Inform The control to Exercise	(addr) 4.3 Order: Practically adortees TN INZARDS protective germents. Ath contect. g and water. bits on rest. bith defects in binds cause servers initiation of systs and throat and causes d even all live concentrations	SNIPPING IRFORMATION     Suite and party: 11 grades (some louid, some solida) which diffe primary in their chlorine content (20%-68% by weight)     SJ Biorage Tempersture: Antient     SJ Iheri Asmosphere: No requirement     S4 Vendag: Open	12.15 Heat of Boykon: Not perman 12.16 Heat of Poynestition: Not perman 12.25 Heat of Pueson: Data not evaluable 12.36 Limiting Value: Data not evaluable 12.27 Reid Vapor Pressure: Data not evaluable
Liquid er Bold E.9 Liquid er Bold E.10 Odor Threehol E.11 IDLH Velue: 5	I mpry, may cannot be canade I mitant Characteristics: Cont Id: Data not evaliable to 10 mg/m <sup>3</sup>	o eren a on concentration. act with thin may cluse intelect.		ІМР
				лаз (100 година) Парадока (100 година) Парадока (100 година)
				0172
		<u></u>		

#### **TETRACHLOROETHYLENE**

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TTE

Cammon Byner Tetracep Perchargetylene Perchargetylene	rynna Waawy I Sirda in	quid Colorises Surel edor	6. FINE HAZARDI 6.1 Planti Paleti Noi farrina 6.2 Plannatin Limba in Al-	
Biop decharge Avoid contact teolese and ri Holify local h	pa if possible with liquid and vepor- imove decharged main earth and pollution con	rel rol agences	6.3 Pro Extinguisting Ages 6.4 Pro Extinguisting Ages Used: Not pertinent 6.5 Speedel Hearsts of Cas Products: Tools, Intil generated in Stra. 6.6 Seharder is Pro: Not pe 6.7 Spritten Temperature: 6.4 Product University in	
Fire	Not farwnable Polacinous gases a	e produced when healed.	6.3 Berring Rate: Not Barr 6.10 Administ: Pause Temps Data rol evaluation 6.11 Societatorenetic Air to P Data rol evaluation 6.12 Pause Temperature: Da	
Exposure	CALL FOR MEDICA VAPOR Interreg to eyes, in If interreg to eyes, in If ormating and account Moves to insult are in the start of anested interreg to dath an Hermony of anested Hermony of anested Files affected areas If in EYES, host ay If SWALLOWED an or mak.	L AID. See and Broat. I officult breathing, or loss of consciousness. pad, give artificial respiration. L give onygen. I open. d cooling and shoes. who planny of water mice open and those. I work then with planty of water d vicem is CONSCIOUS, have vicem data water	<ol> <li>CHEMICAL BEAC</li> <li>Pascithity With Water: A</li> <li>Rescithity with Commen- reaction</li> <li>Beathity During Transee</li> <li>Heathraching Agains ter. Caustias: Not perfect 2.8 Pelymertastes: Not perf 7.8 Webber of Pelymertast Not perform</li> <li>Pelymertaste: Not perf 7.8 Index Rutie (Rescituet te Product): Data not av</li> <li>Pascithity Group: Data n</li> </ol>	
Water Pollution	Effect of low concu May be dangerous Notify local health a Notify operators of r	ntrations on aquatic Ne is unknown. If it enters water statuce. Id wildhile officials agricy water intakas.		
L RESPO (Bee Response Brout be n Chemical ar	RESPONSE TO DISCHANGE     (Bise Response Methods Handbook)     Bhould be removed     Chemical and physical treatment			
3. CHEMI 8.1 CB Compatibilit 8.5 Permatric DoC- 3.3 IND/LM Design 3.4 DOT ID He.: 18 3.5 CAS Registry I	CAL DESIGNATIONS Ry Class Not Asted = CCls - matter: 8.0/1897 197 Na.: 127-18-4	OBSERVABLE CHARACTERISTICS     Of Physical Plate (as adapted): Liquid     Odar: Colorises     Oder: Efformat, Bie chicrolomic mildy     sweet		
<ul> <li>B.1 Personal Proc ar-appled</li> <li>Bywateme Fe</li> <li>Lipad may it</li> <li>B.3 Treatment of searn and op</li> <li>recommends</li> <li>intelion or k</li> <li>B.4 Threatment III</li> <li>B.5 Sheet Term in</li> <li>B.6 Testianty by in</li> <li>B.7 Late Testing</li> <li>E.8 Vaper (Bes) is present in Ni</li> <li>B.9 Unior Testing</li> <li>B.9 Unior Testing</li> <li>B.10 Oder Threatme</li> <li>B.11 BLN Value 3</li> </ul>	ective Equipment: Fo mest; characel gogpt deving Espeare: Ve misse atin star proton Espeare: NeVALATIC Late, and per module ation. EVES AND BIOM n/bry coore. at Value: 80 ppm helation Lindle: 100 p genetex: Grade 2: LDo None missi Characteristic ph concentration. The divitant Characteristic cause smarting and m de 3 ppm	L L BEALTH HAZARDS Inigh vegor concernsations use approved centeer or a or face shield; plantic gloves, por can effect onnite involue system and cause anesthesis, ped connect. May inflate eyes but causes no http:/. It il lineas occurs, remove patient to trach at, heap hen tention. NICESTICHE induce vonding only on physican's : Buch with planty of water and get medical attention if pen for 60 min. a = 0.5 to 5 g/tg : Yapons cause a alight anarting of the eyes or threat if effect is temporary. ios: Minimum heard. If splited on clothing and allowed to ddening of the ator.	8. SHIPPING WFOR 8.1 Grades of Purity: Dry de Industrial grades: 54- 52 Bioroge Temperature 8.3 Inset Almospheric: No re 8.4 Vending: Pressure-vector	
LII IDUI Value 9		· · · · · · · · · · · · · · · · · · ·		

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14. NAZARD ASSESSMENT CODE Bee Hamere A. t Hand HIR) Air: Not Re A-X te: Not pertinent in Hell to be 11. NAZARD CLASSIFICATIONS mitaling gases may be 11.1 Code of Foderal Regulations: ORM-A 11.2 IAS Hazard Rating for Bulk Water of perfinent a: Not the Тлинира int partiment Catagory dia. Fire 0 Health te Pusi Ratio Locust or Solid Inte Posone ..... Dete not a 2 Nater Polution Human Toxech Aquetic Tomoty.... Aesthetic Effect.... 3 2 EACTIVITY Citrative State Other Chernicals er: No reaction Wohn 0 an Matariata No. Self Reaction 1 11.3 MPPA Hearry Co wort: Distin or Asids and Not feled -12. PHYSICAL AND CHEMICAL PROPERTIES 12.1 Physical State at 18°C and 1 alm: Liquid 12.2 ecular Weight: 185.83 12.3 Bolling Point at 1 abr: 250°F = 121°C = 384°K Pressing Paint: -0.3"F = -22.4"C = 250.8"K 12.4 -0.3°F = --22.4°C = 250.3 Critical Temperature: 067°F = 347°C = 620°K Critical Preseurs: Not pertinent Specific Gravity: 12.5 its not mailed Date not availa 12.6 amand (BOD): 12.7 1.63 at 20°C (liquid) 1.83 at 20°C (Rq.id) 12.8 Liquid Burtson Tension: 31.3 dynas/om = 0.0313 N/m at 20°C 12.9 Liquid Water Interfacted Tension: 44.4 dynas/om = 0.0444 N/m at 23°C 12.10 Yaper (Rais) Specific Gravity: Not partnerst 13.11 Radio of Specific Hosts of Vaper (Res): 11.11 Radio of Specific Hosts of Vaper (Res): insting Palastic 1.118 Latent Heat of Vaportsation: 00.2 Blu/Ib = 50.1 cal/g = 2.10 X 10° J/kg 12.12 2.10 X 10<sup>2</sup> J/kg 12.13 Heat of Combustion: Not partners 12.14 Heat of Decomposition: Not partners 12.15 Heat of Solution: Not partners 12.16 Heat of Solution: Not partners 12.18 Heat of Fusion: Data not available 13.21 Lindling Value: Data not available 13.27 Red Vaper Pressure: Data not available FORMATION IMP 100 HOTES 017 ω

JUNE 1985

## PHENOL

C	·····	Million and a bala Surger term, and		
Cemmon Bynan Hydroxyberusne Cerbok: scol Phenic scol Phenyl hydroxos	yrea Solid crystals; or weatry liquid May ficat or and.	vinnie polici, or light — Biweet terry odor jamie ligand and misse slowly with welfar.	<ul> <li>E. FIRE NAZARDS</li> <li>Bash Peant: 185'F O.C.; 175'F G.C.</li> <li>Banneske Linits in Air: 1.7%-8.0%</li> <li>Brie Estimativing Agents: Weer fog. Ioam. carbon docade, or dry chemical</li> </ul>	18. HAZARD ASSESSMENT CODE (Bee Hazard Assessment Handbook) AP-Q
AVDID CON West gogod Evicuate an Evicuate an Noothy accel	AVOID CONTACT WITH LIXUUD AND SOLID: Keep becore every Wee goopes self-contained breating apprixals, and nabler overclothing (nctuding govers) Bloo decharge it possible. Call fire department Evicuale and emouse discharged metime! Notify local hearth and polurion control egencies Combustible PoisONOUS GASES ARE PRODUCED IN FIRE.		8.4 Pire Estinguishing Agents Not to be Used: Not between 8.5 Special Miszards of Combustion Preducts: Toxic and imitaling vepors are generated when heated. 6.6 Behaviors in Fire: Yatos Renmazie vepors when heated which will form explosive metures with ar 6.7 Spectroal Miszard: Not pertinent	11. NAZARD CLASSIFICATIONS     11.1 Cade of Federal Regulations:     Posion, 8     11.2 NAS Heater Rating for Buth Water     Transportation:     Collegory Rating     Free1     Heater
Fire	Entinguels with water carbo Cool exposed containers with	n decoda, dry chemical, or foam. In water	6.9 Burning Rate: 3.5 mm/mm 6.10 Adlabotic Plama Tamporature: Data not evaluative (Continued)	Vapor Invant
Exposure	CALL FOR MEDICAL AD LIQUID OR SOLID POSSONOUS IF SWALLOW We burn sun and syss Remove contamented color Fuen effected sness with pi IF IN EYES, hood system of a SWALLOWED and wear of mail. DO NOT INDUCE VOMITIN	TED. ang and tenoes. any of water an and flush with penny of water and flush with penny of water G.	7. CHEMICAL REACTIVITY     7.1 Reactivity With Water: No reaction     7.2 Reactivity with Common Materials: No     reaction     7.3 Blability During Transport: Stable     7.4 Readingting Agents for Acids and     Caustics: Not partment     7.5 Polymerization: Not partment     7.6 Indiater of Polymerization:     Not partment     7.7 Moler Retio (Reactant to     Preduct: Data not evaluable     7.8 Reactivity Group: 21	Asstruct: Effect
Water Pollution	HARMFUL: TO AQUATIC LI May be dangerous if it enter Notify local health and wild Notify operators of nearby s	FE IN VERY LOW CONCENTRATIONS. 1 with induces the officials velocities		12. PHYSICAL AND CHEMICAL PROPERTIES Sold of lique 12.1 Physical State at 15°C and 1 abrc Sold of lique 12.2 Molecular Weight: 94.11 12.3 Beiling Peint at 1 abrc 259.2°F = 191.8°C = 465.0°K
1. RESPO (Bee Response Indus warm Respict acc Should be n Chemical an	SPONSE 70 DISCHARGE     2 LABEL       Innee Methode Handbook)     21 Category: Posion       Inney-posion     22 Case: 6       access access a removed     2       I and physical Pearment     2       EMICAL DESIGNATIONS     4. 08SERVABLE CHARACTERISTICS       Billity Class:: Phanol, creacil (HsOH)     4.1 Physical Base (as shipped): Solid or motion liquid       Ident Characteretistics     4.2 Cater: Colorises to light print       Ident Characteretistics     4.3 Cater: Colorises to light print       Ident Characteretistics     Base: Light print		WATER POLLUTION     Aquatic Testolty:     1.5-20.5 mg///96 hr/baugit/TL_/Ivesh     veter     1.5 ppm/48 hr/nambow tout/TL_/Ivesh     veter     aster     aster     &2 Waterfoul Tostolty: Data not svalable     &3 Biological Oxygen Demand (BOD):	12.4         Freesing Point:           105.8 °F = 40.9°C = 314.1°K           12.5         Ortical Temperature:           790.0°F = 421.1°C = 604.3°K           12.6         Critical Pressure:           689 pais = 60.5 stm = 6.13 MN/m³           12.7         Specific Gravity:           1.056 at 41°C (spad)           12.8         Liquid Surface Tension:           36.5 dynes/cm = 0.0365 N/m at 55°C
3. CHEMIN 3.1 CG Compatibilit 3.2 Parmate: Carlut 3.3 MIO/UR Design 3.4 DOT ID No.: 16 3.6 CAS Registry II			200%. 5 days 6.4 Feed Chain Concentration Peternitet. None	12.9 Liquid Water Interfacial Tanaton: (est.) 20 Oynav/cm = 0.02 N/m at 42 12.19 Vapor (Gas) Specific Grovity: Not pariment 12.11 Ratio of Specific Heats of Vapor (Gas): 1.089 12.12 Laterni Heat of Vaporisation: 130 Bai/b = 72 cal/g = 3.0 X 10° J/kg
5.1 Personal Prot clobing, Mi 5.3 Symptoms Po perin enneste destin. 5.3 Transtment ef him quiet en HIGESTION: doctor imme of wster for	5. HEAl active Equipment: Freeh-air m face eveld. Rowing Esposure: Will burn ey on. Readly absorbed through s Esposure: INHALATION: If vici d warm, and call a doctor imme do NOT induce vomiting; give activity: no known anticidie; the at least 15 min; continue for at	TH HAZARDS self for continued areas; nubber gloves; protective es and stan. The analgesic action may cause loss of him, cauting increase in heart rese, convulsions, and an shows any ill effects, move him to treach air, lesep edetaily; if breathing stops, give antificial respiration, milk, egg whiles, or large amounts of water and call if the symptoms. EVES: immediately flush with penty tother 15 mm. If doctor has not tablen over, SIGN:	SHIPPING INFORMATION     S.1 Brades of Purity: 50-99% (solid), 60-85% Baudi, Technical: 62-82% (contains creacile)     S.2 Sterage Temperstarts: Ambient     S.3 Inert Abmosphere: No requirement     S.4 Venting: Pressure-vacuum	<ul> <li>a = 7.45 Cal/g =31.0 a/b</li> <li>12.14 Heat of Decomposition: Not persent</li> <li>12.15 Heat of Decomposition: Not persent</li> <li>12.16 Heat of Polymertzation: Not persent</li> <li>12.26 Heat of Fusion: Data not evaluate</li> <li>12.27 Reid Vapor Pressure: 0.3 page</li> </ul>
4 Threehold Lim 8.6 Threehold Lim 8.6 Bhort Term In 8.6 Textoly by in 8.7 Late Textoly:	p and water for al least 15 mm p and water for al least 15 mm halerton Linda: Data not avail gestion: Grade 2; LDso = 0.5 Carcinogenc in laboratory ann	(constant) and an process and two sources in sources (constant) and an encourtery or decard. exposure) able to 5 g/tg (ms) take		
5.8 Vapor (Cas) in Srd high con 5.8 Liquid er Solid degres bure 5.10 Odor Threeho	vitant Characteristics: Vapors contrations unpleased. The effe I initiant Characteristics: Farty I effer a few minutes' contact. Mc 0.05 ppm	Caule moderale initiation such that personnal will ct is lemporary. y severe also initiani; May Caulie Dain and ascond-	6.11 Biolchiometric Air te Fuel Rulle: Data not e 6.12 Plane Temperature: Data not evaluate	RUS (Leftmand) O Velable O I
6.11 IDLH Valve: 10				0174

### BUTYL BENZYL PHTHALATE

BPH

		Annual Annual Annual	ויר			
Common Synon Benzyl n-Dutyl phtheial		Colorises Silly con-			6. FIRE HAZARDS	
Philipping acid, benzyt bi gither	ether Sinks in uster			ũ	Planmable Limits in Air;	A-X
	Sinks in water				Deta not evenable Pire Extinguishing Agenta: Dry chemical,	
			-1 1		carbon dioxide, foam Riss E-stassisticate Assess Mint to be	
Avoid contact	ci with squad				Used: Water or toam may cause frolling	11. HAZARD CLASSIFICATIONS
Nosty local I	health and pollusion co	ntrol agencies			Special Hazarda of Conduction Products: Integes second of unburned	11.1 Cade of Federal Regulations: Not issued
					chemical may form in free	11.2 HAS Heard Rating for Bulk Water
				4.6 1.7	Behavior in Fire: Osta not evalable imition Temperature: Osta not evaluate	Calegory Ruling
	Combustole Instating gases may	be produced when heated	1	ŭ	Electrical Hazard: Data not evaluable	Fre
	Extinguish with dry Water may be net	chemicals, elcohol foam, or carbon dicisióe Ictive on fire			Burning Role: Data not available	Vapor Writant
Fire	Cool exposed cont	where with water		l	Deta not averable	Liquid or Solid Imtant
				6.11	Stoichiometric Air 16 Fuel Retio: Data not evalable	Water Polision
				6.12	Flame Temperature: Data not evalable	Human Topoty
			-1 1	<b> </b>		Assthetic Effect
	CALL FOR MEDIC.				7. CHEMICAL REACTIVITY	Reactivity
	Intaing to stun and	evel		7.1	Reactivity with Water: No reaction Reactivity with Common Meteriate Data	Water, 1
	Fush affected area	s with planty of water.			not avaiable	Self Reaction
				7.3	Bability During Transport: Stable Meudethition Annuals for Acids and	Cenegory Classification
					Cavatica: Not partnent	Health Hazard (Bive)
Exposure				7.5	Pelymerization: Not pertment Inhibitor of Polymerization:	Reactivity (Yellow)
					Not pertment	
				7.7	Noter Retto (Reactant to Preduct): Data not available	
				7.8	Reactivity Group: Data not available	1
				1		
				Į		12 PHYSICAL AND CHEMICAL PROPERTIES
			-	]		12.1 Physical State at 15°C and 1 atm:
14-4	Effect of low conce May be denoerous	Writions on aquetic Me is unknown. I it enters water intrikes		ţ		Land
Water	Notify local health	and wildlife Officials				12.2 Molecular Weight: 313 12.3 Boding Paint at 1 alm:
Pollution	Notify operators of	matty wells intakes	1			898'F = 380'C = 643'K
			-1	F		12.4 Preszing Point: Nol pertnent 12.5 Critical Temperature: Nol pertnent
	HSE TO DISCHOOLSE	Z. LABEL			L WATER POLLUTION	12.6 Critical Prossure: Not paranerit
Should be re	naroved	2.2 Class: Not parament		82	Aquelic Toxicity: Deta not available Waterfowl Texicity: Deta not available	12.7 Specific Gravity: 1.12 st 20°C (liquid)
Chemical an	d physical treatment			L L	Biological Oxygen Demand (BOD):	12.8 Liquid Burtace Tension: Dets not availa
					Feed Chain Concentration Peteritist	Data not available
			ľ		None	12.10 Vapor (Gas) Specific Gravity:
2 ANE MAN			-			12.11 Ratio of Specific Heats of Vapor (Gas)
3. CHEWI		4. UBSCHTABLE CRARACTERSTICS		Į –		Not pershent
3.2 Formula: CisHs	10.	4.2 Color: Coloriesa				Data not available
3.3 MO/UN Design	nation: Not hated	4.3 Onlor: Slight characteristic				12.12 Heat of Combustion:14.550 Btu/b
3.5 CAS Registry h	No.: 85-68-7					12.14 Heat of Decomposition: Not persions
						12.15 Heat of Solution: Not persnent 12.15 Heat of Polymerization: Not pertnent
		<u> </u>	4	<b> </b>		12.25 Heat of Fusion: Data not evaluate
		NEALTH NAZARDS		1	9. SHIPPING INFORMATION	12.25 Limiting Value: Data not available
5.1 Personal Proto	scove Equipment Pr	techne gloves and goggles		- M	Grades of Purky: Commercial	
ala aympionis ho plun.		we way consist with indust carries some substant of eyes and			prorage Temperature: Ambient Inert Almosphere: No recurrement	l
6.3 Treatment of	Esponere: EYES: Au	with water for 15 min. SKIN: wash wall with scap and water.		M	Venting: Open	
5.5 Short Term in	in value: Data not avi Instation Limits: Data	nggae NGK avallative		l		
5.6 Toxicity by in	gestion: Grade 1; and	nat š.Dee = 13,800 mg/kg		1		1
6.8 Vapor (Gas) in	when the events of the sector	Vapors are non-musting to eyes and throat.	ł	1		11
6.8 Liquid or Bolic	d Instant Characteriel	ice: No appreciable hazant; practically hannines to shin.	•	1		d M
1.11 IDLH Value: D	ata not available			ł		}
				1		
						0
				<b>1</b>		IOTES
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#### **p-DICHLOROBENZENE**

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Common Bynamyl Paradicticrobarcane	ha Şohd oyahin	White to clear Mothballs odor	11	6. FIRE HAZARDS 6.1 Plant Paint: 105'F C.C.; 190'F C.C.	18. HAZARD ASSESSMENT CODE (Bee Hazard Assessment Handbook)
Avoid contact Paradow Paradow Paramoth Sentochior Avoid contact Cell tra scion Isolate and ne Notify local he	Sinks in wear. with sold then! move decharged material with and polytion control ager	<b>1044</b> .		<ul> <li>Banmable Lindle in Air: Data not exalplin</li> <li>Pre Extinguishing Agents: Water, Isam, carbon discase or dry chemical</li> <li>Pre: Extinguishing Agents Met to be Used: Not partners</li> <li>Based: Hazards of Cambastien Products: Vigour are stratting. Test phones. hydrogen chloride, and</li> </ul>	II. IMAZARD CLASSIFICATIONS 11.1 Cade of Federal Regulations: ORM-A 11.3 IRAS Hazard Rating for Bulk Water Therearchicking but Market
Fire	Combustible POISCNOUS GASES ARE # Were googles and self-conta Eranguek with watter, on Cool exposed containers with	RODUCED IN FIRE ined breathing appendix. emocil, losin, or carbon dicade n water.		protection gassa may be generated to the . 5.6 Bahavior in Pinc Not partment 5.7 Ignition Tengenshare: Det not available 5.8 Decision Hazard: Not partment 5.9 Barring Rete: 1.3 mm/mm. (apros.) 5.10 Adaptetic Plane Tengenshare: Date not available	11.5         HPPA Nazard Casethonter:           Category         Category           Hath Nazard (Bus)         2           Fairn Matter         2           Reactivity (Yellow)         0
Exposure	CALL FOR MEDICAL AID. <b>BOLID</b> Imflating to skin and eyes. Hermitul if amatowed. Remove contenimised cloth Fuel and the set of the set of the Fuel And the set of the set of the F IN EYES. Not develop and victim or mile.	ng and shoes. Inly of water. In and Run with plently of water. Is CONSCIOUS, have weten dank water		Continued 7. CHEMICAL REACTIVITY 7.1 Reactivity With Water: No reaction 7.2 Reactivity With Centren Materials: No reaction 7.3 Babdity During Transport Stable 7.4 Westralizing Agents for Asta and Caustics: Not partnerst 7.5 Polymertastics: Not partnerst 7.5 Polymertastics: Not partnerst 7.5 Note Partnerst 7.5 Moder Retto (Reactant to Product): Data not available 7.8 Reactivity Group: 36	
Water Pollution	HARMFUL TO AGUATIC LIF Fouling to ahorebre May be dangerous if it entern Notify local feath and widel	E IN VERY LOW CONCENTRATIONS. 5 water interes. 9 officiality			12. PHYSICAL AND CHEMICAL PROPER 12.1 Physical Barle at 18°C and 1 alon: Solid 12.2 Molecular Weight: 147.01 12.3 Boiling Point at 1 alon: 345 875 - 174.2°C - 447.4°K
1. RESPONSE TO DISCHARGE     2. LABEL       (Bee Response Methods Hundhook)     2.2 Chas:: Not pertinent       Boud be removed     2.2 Chas:: Not pertinent       3. CHEMICAL DESIGNATIONS     4. GESEIVABLE CHARACTERISTICS       3. CHEMICAL DESIGNATIONS     4.1 Physical State (as shipped): Sold       1.2 Permute: p-CeH-Cls     3.3 BOO/H-Cls       3.3 BOO/HOR     4.3 Oder: Aromalic			WATER POLLITION     So ppm/*/tah/uthi/itraih water     So ppm/*/tah/uthi/itraih     water     So mg/1/48 hr/rainbow     bou/71/traih water     *No tene inserved specified     &2 Waterfeeld Testolary: Data not available     &3 Biological Oragen Demand (BOD):	12.4 Preasing Paint: 130°F = 53°C = 28°K 12.5 Ortical Temperature. Not pertners 12.6 Ortical Pressure: Not pertners 12.7 Specific Greekly: 1.456 at 20°C (acid) 12.8 Liquid Surface Tension: Not pertners 12.9 Liquid Writer Interfacted Tension: Not pertners 12.10 Veper (Gas) Specific Gravity:	
			8.4 Peed Chain Concentration Peterillat. Dete not evaluable	12.11 Metho of Specific Heats of Vapor (2 Not partnern 12.12 Lation Heat of Vapor Isabor: Not partnern 12.13 Heat of Combustion: Not partnern 12.14 Heat of Decomposition: Not partnern 12.15 Heat of Bohuttor: Not partnern 12.15 Heat of Polymerization: Not partnern 12.25 Heat of Polymerization: Not partnern 12.25 Heat of Polymerization: Not partnern 12.25 Heat of Polymerization: Not partnern	
E.1 Personal Protect concentrations     E.2 Symptoms Fold may cause det     E.3 Treatment of Es get medical at water and get     E.4 Threathold Limit     E.5 Short Term inte E.4 Threathold Limit     E.5 Short Term inte E.4 Threathold Limit     E.4 TextelTy: D     E.4 Vapor (Class) and     for cone	<ol> <li>NEAL three Equipment: Full face me a over 75 ppm; clean protectiv owing Exposure: IPHALATCO pression and injury to here any sposure: RPIALATCON: if any tention, if oversiting stops, piv- medical attention if ill enfects i Value: 75 ppm aleiton Livets: 50 ppm for 60 settion: Carde 5; LDue = 0.5 to less not available tent characteristics: Vapone antitotion uncesserie. The affects</li> </ol>	TH INZARDS at fined with organic vapor canister for a dothing: eye protection. It initiation of upper respiratory thict, over- exposure it isone, EVE CONTACT: pan and mild initiation. If effects develop, remove patient to break air and a artificial respiration. EVES: flush with planky of develop. SIGN AND INGESTION: no problem likely. min. a 5 g/mg cause moderate initiation such that personnel will act is temporary.		S. SHIPPING BEFORELATION     S.1 Grades of Purity: Solid: 5 grades, chamical purity close to 100% Liquid: 1-2% official purity close to 100% Liquid: 1-2% official purity close not available     S.3 thert Almosphere: Date not available     S.4 Venting: Date not available	12.36 Läwiting Value: Deta not evaluatie 12.37 Rend Vapor Pressure: Dota not evalu
6.5 Liquid or Bolti 1 remain, may ci 6.98 Oder Thrusheld 6.11 IDLH Value: 1,00	inflant Characteristics Minin muse anarting and Ruddening ( k.15-30 ppm 00 ppm	num hazard. If apilled on clothing and allowed to of the alth.		S. FIRE NAJ 8.11 Blokchlometric Air te Puel Puelle. Data no 8.12 Plane Temperature: Data not available	(ARDS (Centineed) A avaluate F
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JUNE 1985

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Common Synam Harobargol	ryma City tault	Light yellow its brown. Almond or show poller ador	6. FIRE HAZARDS 6.1 Planth Painte 1717 O.C.: 1807F C.C.	18. HAZARD ASSESSMENT CODE (Dee Magent Amagement Hundhook)
Cit of Mirbana	Sinka in water. Freezong point is 41°F.		<ul> <li>Burnnabie Linde in Air; 1.8% LEL (J.EL not available)</li> <li>Bur Estinguisting Agentic Water, Isan,</li> </ul>	A-X-Y
AVOLD CON Wear channe Biop deschar Call fire dep lacate and r Notity local /	TACT WITH LICUID Neep pro cel protective suit with sail-come graf it possible. artman, artman, memore discharged material, health and possible control age	uras aven uras brauliving appartikuk. 1088.	Carbon Boalds, of any analysis 6.4 Pine Extinguishing Agents Hot is be Used: Not particent 6.5 Special Humands of Combustion Productic Not partners 6.6 Behavior in Pine, Not partners 6.7 lightlem Tangarasatric 5247	11. NAZARD CLASSIFICATIONS 11.1 Code of Poteral Regulations: Poteon, B 11.2 NAS Hazard Rolling for Bulk Water Transportation:
Fire	Combustible, POISONDUS VAPOR IS PR Wear character postche su Extriguen with vester, dry ch Cool exposed contenens in t	DDUCED WHEN HEATED I with self-contained breathing appendixe. emical, item, or gerbon dicaste. revear.	6.3 Electrical Hearrie Not pertinent     6.3 Electrical Hearrie Not pertinent     6.10 Adductor Plans Temperature:     Data not available     6.11 Stochtemetric Air to Plant Radio:     Data not available     6.12 Planse Temperature: Data not available	Contegery Restre Fire
Exposure	CALL FOR MEDICAL AID LIQUED POSSOWOUS IF SWALLOWED OR IF SKIN IS EXPOSED. Will turn sma. Remove consummated clothing and shoes. Fund affected areas with planty of water. IF BI EYES, hold events open and funn with planty of water. IF BI EYES, hold events open and funn with planty of water. IF BI EYES, hold events open and funn with planty of water. IF BI EYES, hold events open and funn with planty of water.		7. CHEBICAL REACTIVITY     7.1 Reactivity With Weller: No reaction     7.3 Reactivity with Columns Meteriate No     reaction     7.4 Studiety Curring Transport: Status     7.4 Reutratizing Agence for Astle and     Counties: Not partment     7.8 Industries of Polymeritestees:     Not partment     7.9 Industries: Not partment     7.9 Reactivity Group: 42	Aserbase Effect
Water Pollution	HARBAFUL TO AQUATIC LI May be dangerous if it enter Notify local health and widdl Notify operators of nearby a	TE IN VERY LOW CONCENTRATIONS. 8 water Internet. 19 officials. 21 officials.		12. PHYSICAL AND CHEMICAL PROPERTIES 12.1 Physical Bases at 18°C and 1 asin: Lipsd 12.2 Biological 12.11 12.3 Bolling Paint at 1 asin: 411.6°F = 210.9°C = 484.1°K 12.4 Physican Paints
1. BESPO (Bee Response Issue warmin Restrict soo Should be ru Chemical an	NISE TO DISCHARGE a Matthedia Handbook) ng-polision een een eenoved enoved ng physical treatment	2. LABEL 3.1 Category: Polson 3.3 Obsec 6	A WATER POLLITION     Aquette Testicity:     20 ppm/6 tr/munow/tathal/tresh water     2 Waterfowl Testicity: Date not evaluate     3 Biological Oxygen Demand (BOO):     0%, 5 days     4 Peed Chain Concentration Persentiat:     None	4127 - 6.1°C = 278.3°K 12.5 Critical Temperature: 8057F = 447°C = 720°K 12.6 Critical Pressure: 700 pss = 41.92 stm = 4.824 stM:/m1 12.7 Specific Growty: 1.204 st 20°C (squid) 12.8 Liquid Surface Temeion: 4.9 dynatros Temeion: 4.9 dynatros = 0.0438 N/m at 20°C
3. CHEM) 3.1 CG Compatibili 3.2 Permula: CaHal 3.3 MIO/URI Dealay 3.4 DOT ID No.: 10 3.5 CAS Registery II	CAL DESIGNATIONS Hy Class: Nikocompounds NOs nesser: 6.1/1852 N2 Na: 89-85-3	4. ORSERVABLE CHARACTERISTICS 4.1 Physical Plate (as anispend): Liquid 4.2 Ceser: Light greater-pallow 4.3 Galar: Like pasts shoe polish		12.9 Liquid Water Interfacial Tanatacc 25.66 dynas/om = 0.02306 N/m at 20°C 12.10 Vapor (Gas) Specific Gravity: Not perturent 12.11 Ratio of Specific Heats of Vapor (Gas): Not perturent 13.12 Later Heat of Vaportization: 160 Bu/b = 86 ca/g = 3.4 V shi Unio
<ul> <li>8.1 Personal Protein Nubber giove Busphy.</li> <li>8.2 Symptoms For or smallower posoring pr</li> <li>8.3 Transment of </li> </ul>	<ol> <li>HEAL sective Equipment: Respirator a security Exposure: Highly toxic d. Prot symptome are a blue de rockces headsche, pictures, wi rockces headsche, pictures, wi rockces headsche, pictures, with sectioner in the security of the sec- tion of the section in the sec- tion of the section of the section of the sec- tion of the section of the section of the sec- tion of the section of the section of the sec- tion of the section of</li></ol>	TH MAZARDS oproved by U.S. Burneu of Mines for organic vepors, in burnain, assely shower and madical oxygan when absorbed through the stich, inhaled as vepor, colonation of the lipe, nells, and stim. Acute setmess, manses, vomiting, and come.	S. SHIPPING INFORMATION 6.1 Grades of Purity: Technical: 86.5-100% 6.2 Biorrage Tumperstum: Ambient 6.3 Inert Almospheric No requirement 6.4 Venting: Open (Ilene amesiar)	12.13 Heat of Combuster10.420 Bh/b 8.791 cat/g942.5 x 10 <sup>4</sup> J/lg 12.14 Heat of Decomposition: Not persent 13.15 Heat of Solution: Not persent 13.16 Heat of Polymerization: Not persent 13.26 Heat of Polymerization: Not persent 13.26 Heat of Polymerization: Not persent 13.27 Heat of Polymerization: Not persent 13.28 Leveling Value: Data not ovelable 13.27 Reid Vapor Pressure: 0.01 pain
Interimentatively fusion to the provide of the set			IMP 00	
Usumy Diet 6.0 Liquid of Soli short epoce 6.11 OLH Value 2 ,	ear industrier of right happed con a hittens Chernoclaristica ant, may cause secondary burns de 5.94 ppm 00 ppm	es anaring of the side and inst-degree butte on on long esposies.		ns 0177
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Common Synon 1. 2-Dichlorobergene	yees Liqued	Colorises Plaqueril ador	6. FIRE INJARDS	. H. HAZARD ASSESSIBENT CODE
Orthodichiorobanzane Dowtherm E	Sinks in water,		<ul> <li>C. Parmatic Links in Arr. 279-825</li> <li>C. Parmatic Links in Arr. 279-825</li> <li>C. Pro Estinguishing Agents: Weter, Isan, By chemical, or carbon disate</li> <li>A. Die Felmanishie Architektie in Internet.</li> </ul>	A-X-Y
Avoid contail Wear popple Stop dechar Call the dech jectete and Notify jocal i	ci with lique, le and self-contained breathing ge if possible, artiment, remove decharged material, remove decharged material, seath and poliution control age	apperika.	Li Prov Extinguisting Agents Net to so Unext Not pertraint     E.S. Special Hazards of Combustion     Products: Intelling vapon Including     Hydrogen chloride gas, chlorocerbons,     chloride     E.S. Balevior in Pinc Not pertinent	11. MAZAED CLASSIFICATIONS 11.1 Cases of Federal Regulations: ORMAA 11.2 RAS Hazard Rating for Bulk Water Transportation;
Fire	Combustble POISONOUS GASES ARE I Ware popular and self-cont Entriguent with water, by ci Cool exposed contenens we	PRODUCED IN FIRE. Insid breating appartue. remical. Ioan, of carbon dicade. In water	6.7 Epolition Temperature: 11877     6.8 Electrical Hasant: Not partners     6.9 Electrical Hasant: Not partners     6.10 Administric Plane Temperature:     Data not evaluable     6.11 Statisticonetric Air to Fuel Reste:     Data not evaluable     6.12 Plane Temperature: Data not evaluable	Classpory         Pusing           Pire         1           Health         2           Uouid or Sold Intern         1           Poseons         1           Water Fouldon         1           Human         1           Aquetic Toxicity         3           Aquetic Toxicity         1
Exposure	CALL FOR MEDICAL AID. LIQUID Intering to star and even. Hermony or sontamustad doof Ruan anected areas with pip IF NE TES. hold events of B SMALLOWED and vicem or make and have vicem CONVALSIONS, do not	ing and shoes. any of water: a CONSCIOUS, have widen dink water shoes vortike widen dink water shoes vortike and the shoes of the shoes a UNCONSCIOUS OR HAVING http://www.com.vert.	<ol> <li>CHEMICAL REACTIVITY</li> <li>Reactivity With Water: No reaction</li> <li>Reactivity with Common Materials: No reaction</li> <li>Reactivity with Common Materials: No reaction</li> <li>Readmitty During Transport: Stable</li> <li>Readmitty During Transport</li> <li>Readmitty During Transport</li> </ol>	Anathesic Effect
Water Pollution	Effect of the concentrations May be dangerous if it ensu- Notify cost heath and polit. Notify operators of nearby t	on squastic Me di unitroven. 9 veleti intakes. eser intakes.		12. PHYSICAL AND CHEMICAL PROPERTIES 12.1 Physical Blate at 16°C and 1 date: L Dated 12.2 Belevater Weight, 147.01 12.3 Boling Point at 1 atro: 256.0°F = 180.5°C = 453.7°K 12.4 Pressing Paint: 0.3°F = 17.8°C = 255.8°K
EESPO     (See Response     laple warrin     Should be re     Chemical an     Chemical an     Chemical an     Arytocasten     Nytocasten     S.2 Permute o-CH     S.3 MO/UN Design     S.4 DOT ID No.19     S.5 CAS Registry II	NSE TO DISCHARGE I Betrods Handbook) q-veser consummant moved d physical seament CAL DESIGNATIONS Ny Classe: Halogensted InCls witten: 8.1/1691 01 te.; 36-80-1	2. LABEL 2.1 Category: None 2.2 Class: Not pertment 4. OBSERVABLE CHARACTERISTICS 4.1 Physical Blate (as although: Liquid 4.3 Color: Colorises 4.3 Oder: Aromalic, characteristic	WATER POLLUTION     L1 Aquastic Testafry:     13 ppm/*/marine planktion/no growth/     all water     "Time period not specified.     Waterfewir Testafrity: Data not evaluatio     L3 Biological Carygen Domand (BCO):     <0.1% (macr.), 1/8 day     L4 Feed Chain Concentration Peterstat:     Date not evaluatio	13.6     Critical Temperature: Not partment       13.6     Critical Presence: Not partment       13.6     Critical Presence: Not partment       13.7     Bpecific Gravity: 1.306 et 20°C (liquid)       12.8     Liquid Surface Temeton: 37 dynas/on = 0.037 N/m at 20°C       13.9     Critical Specific Gravity: Not partment       12.9     Liquid Wider Interfactul Temeton: (est.) 40 dynas/on = 0.04 N/m at 20°C       13.16     Vapor (Gas) Specific Gravity: Not partment       12.11     Ratio of Specific Heats of Veper (Gas): 1.000       12.12     Laterrit Heat of Veperfactor: 115 Bu/b = 40.9 car/g = 2.68 X 10 <sup>4</sup> J/bg       12.13     Heat of Cembustor: ~7986 Bu/b = ~4427 car/g = -166 4 X 10 <sup>4</sup> J/bg
<ul> <li>8.1 Personal Prote chanical ast burnical ast burnical ast burnical ast burnical aster call a physic vombra est medical aster 8.4 Threached Lin L3 Sheri Term Ivit 8.4 Testerbiet Lin</li> </ul>	5. HEAl softwe Equipment: Organic was left apoctacles, too arnied; no flowing Exposure. Townic this and leftwys. Acat wepor expor- tal system depresent and tran- May cause dermatilie. Exposure: SHALATION: memo- ien promptly. NIGESTION: no li get medical attention promptly into itor eyec; network contami di Value: 50 ppm healation Liante: 50 ppm fer 15 penter: Cause 5, Llow = 0.5	TH NAZARDS or-acid gas respirator; recorrens or vinyl gloves; ber footweer, sprox, protective otditing, allation of mait or vapors may result in demage to user can cause employme ranging from coughing to alivint anesthesis. Inflating to skin, eyes, and mucous ve victim to fresh air, leep him guiet and warm, and noum anticole; treat symptometically, induce . EVES AND SIGH: fluen with planty of water; get maked dothing and wateh before relace. min. to 6 gring	<ol> <li>SHIPPING INFORMATION</li> <li>S.1 Grades of Partly: Technicat 95.5% min. dichlorobenzene (psic-onto + para/mess: 80 min.) Technicat: 85% ortioochlorobenzene. 14.0% paradichlorobenzene. 14.0% artito. 17% para, 2% mes Pare: not less than 99.5% ortho, not more than 0.5% para</li> <li>Storrage Tempersture: Data not evaluate 6.3 feart Atmosphere: Data not evaluate 6.4 Venting: Data not evaluate</li> </ol>	12.15 Heat of Southpasson's Not partment 13.15 Heat of Polymerization. Not partment 13.16 Heat of Polymerization. Not partment 13.28 Heat of Polymerization. Not partment 13.28 Heat of Polymerization. Not partment 13.27 Reld Vepor Pressure: 0.05 pm 14.27 Reld Vepor Pressure: 0.05 pm 14.27 Test Vepor Pressure: 0.05 pm
<ol> <li>Late Textolity;</li> <li>Late Textolity;</li> <li>Lapor (Cas) in Brid high con</li> <li>Lapold or Bolid remain; may</li> <li>Lapold or Threaden</li> <li>BOLId Value: 1,</li> </ol>	Causes lidney and her demag ritant Cheracteristics Vapora contrastions unpleasars. The ef- I systamt Cheracteristics: Minis cause smarting and reddening de 4.0 ppm; 30 ppm 700 ppm	e in rais, Effects unknownin humans, cause moderate initiation such thet personnel will each is sergrounny, num hazard. If spilled on clothing and allowed to of the skin.		00] 0178
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# 2,4-DINITROTOLUENE

Common Synom DNT	~	Bold or healed to	and Yallow to red actid or <b>Silg</b> M odor yellow toped		E.
2. 4-Onitrockuol 1-Aserry-2. 4-Onitrockercisme Liquid solidifies. Sol			olid and liquid sink in water.		6.2 Planned 6.3 Pire Est chami
AVOID CON	TACT WITH	LIQUED AND SOL	O KEEP	1	6.4 Phy Ext
PEC Wear nubber	OVERCIONAL	(. g (including gloves).		ł ł	Unot: La Special
Call fire depi	artment.	harged material.			Produ
Noily local	health and p	solution control age			6.6 Behavia
	Combust	DIE GASES MAY E	e produced in eve	11	
	Containe Week op	rs may explode in \$ opies and self-corro	re. Intel prestiving appendix.		6.7 Ignition
Fire	Enrous	arbon decide	emicais, toim, or		6.3 Surning
	Cook earp	load containers we			6.10 Adhebed Data r
		<u> </u>			
	CALL FC	A MEDICAL AD			7. C
	POISON	DUS IF SWALLOW	ED OR IF SKIN IS EXPOSED.		7.1 Reactivit
	I section	red will cause neue	es, vonvilling or loss		Machi
	Remove Flush aff	contaminated clothi	ing and shoes. Inty of water.	[ [	7.3 95404771 482"F
	IF IN EY	ES, hold evelop ap LOWED and victim	en and fluen with planty of water a CONSCIOUS, have victim drink water		7.4 Neutraliz
Exposure	# SWAL	LOWED and victim	IN UNCONSCIOUS OF HAVING CON-		7.5 Pelyment
	, vu	SIONS, do nothing	azoapt keep vicam warm.	[ ]	7.8 beliefor
					7.7 Mainr Re
					Produ 7.8 Reactive
Water	Effect of May be d	low concentrations langerous if it enter	on aquatic Me is unknown. 5 wgsir filâkes.		
Pollution	Notify in:	al health and wide	e officiels		
		nerezone or neerby w			
1. RESPO	NSE TO DIS	CHARGE	2. LABEL	1 1	Ł
(See Response Insue versio	Methods P	tendecok) der	2.1 Category: None 2.2 Class: Not pertnent		8.1 Aquette
contarte	nent				8.3 Biologics
Restrict acci Should be re	nus moved				Deta r 6.4 Feod Ch
Chemical and	d physical w	epiment			Deta r
1 CHEMH	AL DESIGN		A ORSERVARIE CHARACTERISTICS		
1.1 CG Convertibilit	v Class: No	at Refect	4.1 Physical State (as shaped):		
8.2 Formula: 2, 4-(h	Oz)sCoHsC	Ma	Solid or liquid		
8.3 1910/UN Deelgn 6.1/1600	etton: Sold	: 6.1/2038; hquate	4.2 Celler: Yellow (Rquid); yellow to red (solid) 4.3 Oslor: Wesk		
3.4 DOT ID No.: 16 3.5 CAS Registry M	00 (Liqued); ; io.: 121-14-2	2036 (Sold)		Í	
		S. HEAL	TH HAZARDS		1. S
E.1 Personal Prote	ictive Equip	ment: Ar-Ine meal	a or self-contained breathing apparetus; ealery boots: arbitrative clathing		1.1 Grades e
8.2 Symptoms Fol	lowing Exp	course ingestion or	overexposure to vepors from hot light can cause		as an S-ison
lons of color. skin. Protono	. heuses, he ed ekin-com	usdacha, dizzoneka, i tact with solid can d	trowaness, collepse. Hot liquid can burn eyes and two same symptoms as after inhalation or incention.	ĮÍ	Maard 9.3 Macrosof 1
8.3 Treatment of I	Exposure: I	NHALATION: remov	e victim from exposure: get medical attention for		>90%
methemogict SKIN: wash	unemis. EYI well with pos	ES: Rush with copio ap and water. INGE	us amounts of water and get medical etiention. STICN: induce vomiting, if victim is conscious; sive	11	5.3 Ineri Atm
gastric lavag	e and seline	celhertic; get med	cal stiention.		
6.6 Threshold Lin 6.6 Short Term Ini	n valuti: 1.) Valution (Ja	e mg/m* what Data not availe	Èle I		
6.8 Yesticity by ing	netter: Gre	ida 4; onei L.D =	30 mg/hg (mit)		
- 6.8 Vapor (Gas) In	ittant Chart	ctorialize; Not per			
5.9 Unit or Sold	instant Ch	eractoristics; Data available	not available	ļļ	
6.11 BLH Value: 20	10 mg/m²				
					6.11 Stolchio
					ana rayna I
•		•			
				1 L	

S. FIRE IMZARDS     Planth Realt: 604 FF C.C.     Plannmabe Limits in Air: hot perment.     Pro Estimpushing Agents Water, dry chemical, carbon dicade from protected location.     Proc. Estimpushing Agents Not to be Usest: Date not evaluate in Productes and damas Mack smaller. Proc. Comment and damas Mack smaller. Produced in a Bre.     Behavier in Pire: Decomposition a self-automary at 80°C. Comments may explose in a Inc.     Behavier in Pire: Decomposition a self-automary at 80°C. Comments may explose in a Inc.     Behavier in Pire: Decomposition a self-automary at 80°C. Comments may explose in a Inc.     Behavier in Pire: Decomposition a self-automary at 80°C. Comments may explose in a Inc.     Behavier in Pire: Decomposition a self-automary and the rest Not pertinent.     Behavier Status Heavier Not pertinent.     Behavier Status Heavier Not pertinent.     Behavier Status Not pertinent.     Adhubric Flame Temperature: Data not evolution     Contenued?     7. CHEMICAL REACTIVITY     Rescaring Agents for Automatics Not pertinent.     Behavier During Transport. Status below     482°F (250°C)     Houtralizing Agents for Automates     Behavier Status for pertinent.     Behavier Status For Pertinent Status Not pertinent Status Pertinent Pertin	H. MAZARD ASSESSMENT CODE (Bee Huzard Assessment Harnbeek) A-X-Y-H 11. MAZARD CLASSIFICATIONS 11.1 Code of Pederal Regulations: ORM-E 12.3 MAR Huzard Rating for Buth Water Transportations: Not Back 11.3 MPPA Huzard Constituation: Category Classification Health Huzard (Bac) 2 Planmability (Ped) 1 Reactivity (Yellow) 3
Resolvity Group: Data not available     Resolvity Group: Data not available     Resolvity Group: Data not available     Water four Textolly: Data not available     Water four Textolly: Data not available     Water four Textolly: Data not available     Resol Chain Concentration Potentiat:     Data not available      SHIPPING INFORMATION     Grades of Purity: Technical: Matures such     s on 80-20 minure of 2. 4- and 2.     Seconses an also available. The     nezerid properties are sender.     Silonage Tempershare: Anduent (solid);     > SO'C Reput)	<ul> <li>12. Physical Base at IS°C and 1 atra: Sold</li> <li>12.3 Boling Point at 1 atra: Decomposen</li> <li>12.4 Boling Point at 1 atra: Decomposen</li> <li>12.4 Pressing Paint: 1387F = 70°C = 343°K</li> <li>12.5 Critical Temperature: Not perment</li> <li>12.6 Critical Temperature: Not perment</li> <li>12.7 Bit 20°C (Baud)</li> <li>12.8 Linket Surface Tension: Data not available</li> <li>12.9 Under Weight Heats of Vapor Ideas: Not perment</li> <li>13.17 Bit 20°C (Baud)</li> <li>12.1 Under Surface Tension: Data not available</li> <li>12.9 Under Weight Heats of Vapor Ideas: Not perment</li> <li>13.11 Retice of Specific Heats of Vapor (Can): Not perment</li> <li>13.13 Heat of Computation: 17.0 Bau/De = 53 cal/g = 2.3 X 10° J/bg</li> <li>13 Heat of Computation: Not perment</li> <li>13.14 Cal/g = -183.0 X 10° J/bg</li> <li>13 Heat of Decomposition: Not perment</li> <li>12.15 Heat of Permentation: Not perment</li> <li>12.16 Heat of Permentation: Not perment</li> <li>12.17 Heat of Permentation: Not perment</li> <li>13.18 Heat of Decomposition: Not perment</li> <li>13.19 Heat of Permentation: Not perment</li> <li>13.27 Heat of Permentation: Not perment</li> <li>13.3 Heat of Permentation: Not perment</li> <li>13.4 Heat of Permentation: Not perment</li> <li>13.5 Heat of Permentation: Not perment</li> <li>13.6 Heat of Permentation: Not perment</li> <li>13.6 Heat of Permentation: Not perment</li> <li>13.7 Heat of Perment: Data not available</li> <li>13.7 Heat Network Perment: Data not available</li> <li>13.7 Heat Network Perment: Data not available</li> </ul>
A Venting: Open (fleme arrestar)	IMP
K. FillE HAZA     Stolchiometric Air to Puel Reflex Date not a     12 Plane Temperature: Data not available	ADS (Centinued)
	0179

JUNE 1985

### ISOPHORONE

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Common Synon	7 <b>~~</b>	rme Liquid Colortees Camphor-tike ador				6. FHE HAZARDS	10. NAZARD ASSESSMENT CODE		
3.5.5-Transbyl-2- cyclonesane-	-1-one Flosts and muse slowly with water,					Bash Peint: 205'F O.C., 184'F C.C.     Parmable Limits in Air: 0.84's-3.9's     Pre Extinguishing Agents: Dry chemical,     form, celon docude     4- Pre Extinguishing Agents: Net to be	(Bee Hazard Assessment Handbook) A-P-Q-T-U		
Stop decharge if possible. Keep people away Call the department spoke and remove decharged material stopby local health and possion control agencies.						Lock Water may be indicate     Lock Water may be indicate     S Special Nazards of Consumtion     Products: Not perment     S. Behavior In Price Not perment     S. Ignition Temperature: 564 °F     S. Behavior Interact Data not available     S. Benting Rets: 40 mm/mm.	11. NAZARD CLASSIFICATIONS     11.1 Code of Federal Regulations: Nol Issied     11.2 NAS Hazard Rating for Buth Water Transportation: Category Reting		
Fire	Compuestole. Estruguesh with dry chemicale, loarn or carbon dicaide. Waler may be instructive on fire					Adabatic Parme Temperature: Deta not avaitable     Batic Parme Temperature:     Deta not avaitable     Batic Parme Temperature: Deta not avaitable     End	Fire		
Exposure	CALL FOR MEDICAL AID LICUDO Internet to stur, and eves, Harmour is sensioned Remove contaminated (cotting and shoes, Fills sturced areas with penty of water, if BYTES, hot synka open and lice th planky of water, if SYALTMEE and users a CONSCOUS, have within any water SYALTMEE and users a CONSCOUS, have within any water DO NOT INDUCE VOMITHING.					7. CHEMICAL REACTIVITY     7.1 Reactivity With Water: No reaction     7.2 Reactivity with Common Meteriaes: No     reaction     7.3 Stability During Transport: Stable     7.4 Neutralizing Agents for Acids and     Caustics: Not perment     7.5 Polymerization: Not perment     7.6 Invited of Polymerization:     Not perment     7.7 Moter Retio (Reactant to     Preduct): Data not evaluate     7.8 Reactivity Group: 16	Asstratic Effect		
Water Pollutior.	Effect of low concentrations on squattic the is unknown, Fouling to shorehre, May be dangerous if a enters weter intakes. Notify local health and weldfe officials.						12. PHYSICAL AND CHEMICAL PROPERTIES 12.1 Physical Blate at 15°C and 1 aprc Louid 12.2 Molecular Weight: 136.2 12.3 Boiling Point at 1 atrc: 419.5°F = 215.3°C = 486.5°K		
RESPO     (Bee Response     (Base Network     Restrict acc     Machanical Should be in     Chemical an     Chemical     Chemical an     Chemical an     Chemical     Chem	Notify operators of nearby water interves           MSE TO DISCHARGE         2. LABEL           I Methods Nemebook)         3.1 Category: None           g-water containment         3.2 Clease Not pertnent           est         Containment           containment         3.3 Clease Not pertnent           est         Clease Not pertnent           containment         4. OBSERVABLE CHARACTERISTICS           Hy Clease Ketore         4.1 Physical State (as ehipped): Liquid           1 = C(CH)/CHs/CHs/Intervent         4.3 Celor: Cotoness           tai not available Intervent         4.3 Celor: Like camphor					WATER POLLUTION     A.1 Aquatic Testicity:     430 ppn/24 in /shive shrinp/TL,     43 Biological Oxygen Demand (BOD):     Data not evaluable     64 Feed Chain Concentration Potentiat:     None	124 Pressing Point:		
S. NEALTH NAZARDS     Sevenal Protective Equipment: Self-contained breathing apparatus with full face mask; nubber gloves     goves     Symptome Following Exposure: Intelation Initiates eye, nose and Broat; causes central depression and has some anesthetic effect. Contact of Ruid with eyes causes severe intelation and possible teaux damage. Skin is initiated by load and may crack on protonged contact. Ingeston causes intelation of mouth and stomes.     Treatment of Exposure: NAHLATION: remove vicitim pompity from contentinated atmosphere; if byreating his stopped, give antikoal respiration and dargen. EVES: flood with water for at least 16 min; compatit an eye speciest as soon as possible. Skith: flood with water. NGESTICH: do				Nal face music rubber cituase central causes severe imasion prolonged contact aminased asmosphere, il web reser for at least weber. INGESTION: do		SHIPPING INFORMATION     SHIPPING INFORMATION     Standard of Parity: 50 + %     Sale Standard St	0.900 cet/g376 X 10 <sup>6</sup> J/kg 12.14 Meet of Boutdon: Not pertnernt 12.15 Meet of Southor: Not pertnernt 12.15 Meet of Southor: Not pertnernt 12.25 Meet of Fusion: Data not available 12.27 Rest of Vapor Pressure: Low		
NOT induce voments; call a doctor. 5.4 Travehold Lanki Value: 5 ppm 5.5 Bhort Term Inhalston Lants: Data not available 8.8 Tasicity by Ingestion: Grade 2, onal LDee = 2,330 mg/hg (bst) 5.7 Late Tasicity: Data not evaluable 8.8 Yayor (Gae) Instant Charactaristics: Vapors cause moderate inflation such that personnel will 9.9 Yayor (Gae) Instant Charactaristics: Vapors cause moderate inflation such that personnel will 9.9 Hold constraints unpleasant. The effect is temporary.							P 001		
6.9 Liquid er Solt grort exposu 6.19 Oder Threeto 6.11 IDLM Value: 80	Liquid or Solid Irritant Characteristics: Causes smarting of the skin and first-degree burns on gront exposure, may cause second-degree burns on long exposure.     Odor Threehold: Deta not available     IDLH Value: 800 ppm					•	0180 0180		
							111ME 100		

### DIOCTYL PHTHALATE

DOP

Control By Herry Professionant Control Dop Bio (2-othythamy) prista Di (2-othythamy)) prista Di (2-othythamy)) prista Octori Stop Gacher()	Pices on water.			<ul> <li>FIEL MILATED</li> <li>Plank Paint: 425'F O.C.</li> <li>Plannaki Limits In Air: Not partnerni</li> <li>Piro Estinguishing Agents: Dry powder. carbon dicada, loam</li> <li>Piro Estinguishing Agents Not is be Used: Water or loam may cause trofwing</li> </ul>	III. INJAND ASSISSMENT CODE     (Bee Heard Assessment Handbook)     A-T-U-X-Y      II. INJAND CLASSIFICATIONS     III. Gode of Foderal Regulations:     Not lead     II.2 MAB Heard Reding for Bulk Weter     Transportstor, Not lead     II.3 INFA Heard Classification:     Category Classification:		
Call the decid labelete decid Noeky local h	erment erge if possible nearth and pollution control ager Combustble Estimutes with dry chemical,	kaes		Special Hezznia of Combustion Products: Nons     Software: In Proc. Not pertnent     Ignition Temperature: Data not evaluate     Sectifical Hazane: Not pertnent     Surning Rets: Data not available     Additabal: Found Temperature:			
Fire				Data not evaluble 11 Biochiometric Air te Puel Rello: Data not evaluble 12 Pleme Tampersture: Data not evaluble	Health Hazard (Blue)		
Exposure	Not hermful		7 7 7 7 7 7 7 7 7	2. CHEMICAL BEACTIVITY     1. Reactivity With Water: No reaction     3. Reactivity with Carmon Materials: No     reaction     3. Stability During Transport: Stable     4. Meutralisting Agents for Aolds and     Caustion: Not pertnerst     5. Pelymerization: Not pertnerst     4. Meutralistics: Not pertnerst     5. Interference     7. Weier Ratio (Reaction) to     Preduct): Data not available     8. Reactivity Group: 24	i Pio		
Water Pollution	Effect of low concentrations Fouling to shoreine May be dangerout if it enter Nothy local nearth and widh Nothy operations of nearby w	on squatic life is unknown. ) uster makes w officient any makes			12. PHYSICAL AND CHEMICAL PROPERT 12.1 Physical Base at 18°C and 1 alor: Lipad 12.2 Monocular Weight 300.5 12.3 Balling Point at 1 alor: 727F = 380°C = 660°K 14.4 Genetics Point Mit Instant		
1. BESPON (Bee Response Machancal o Chamical and	NSE TO DISCHARGE   Methodis Hendbesk) congerment d physical Weathers	2. LABEL 2.1. Category: None 2.3. Class: Not pertment		WATER POLLUTION     Aswett: Testatty: Data not evaluable     Waterfevel Testatty: Data not evaluable     Waterfevel Testatty: Data not evaluable     Waterfevel Testatty: Data not evaluable     Data not evaluable     A Feed Chain Concentration Peterstatt     None	12.5     Critical Tempersturs: Not persnemt       12.5     Critical Pressurs: Not persnent       12.7     Specific Growiny:       0.960 at 25°C (liquid)       12.1     Liquid Burtace Tensace: (est.)       15 dynes/cm = 0.015 N/m at 20°C       12.8     Liquid Burtace Tensace: (est.)       15 dynes/cm = 0.015 N/m at 20°C       12.9     Liquid Burtace Tensace: (est.)       13.10     Verser (Ges) Specific Growing:		
1. CHEMIK 1.1 CB Compatibilit 3.2 Fermula: 0-CeH4[COO 3.3 BIO/UN Destign 3.4 DOT ID No.: Del 3.5 CAB Registry N	CAL DESIGNATIONS by Classe Estar ICH+C+HC+H+3+C(H+3+C(H+3+C)+3) antidiate. Not larged fail available loc: 117-04-0	4. OBSERVABLE CHARACTERISTICS 4.1 Physical Bate (as shipped): Solid 4.2 Celetor: Colories 4.3 Odder: Very skytt			Not pennent 12.11 Ratio of Specific Heats of Vapor (Gen Not pertnent 12.12 Laterri Heat of Vaporization: Not partnent 12.13 Heat of Combustion:15,130 Bu//b 		
IEALTH MAZARDS     IEALTH MAZARDS     IEALTH MAZARDS     Symptoms Following Exposure: Produces no if effects at normal temperatures but may give off     Practing vecor at high temperature.     So Treatment of Exposure: Larve contennuated area: weak stan with scep and water; flush eyes     with water     Lo Threated Linet Value: Not pertinent     Le Short Tom invaluation Linets: Not pertinent				SHIPPING INFORMATION     Grades of Purity: Data not available     Storage Tamperabure: Antiant     Storage Tamperabure: An requirement     Venting: Open (Name areater)	12.15 Here of Fusion Data not averable 12.35 Limiting Value: Data not averable 12.37 Reld Vapor Pressure: Low		
5.6 Testolty by ing 5.7 Late Testolty: I 5.8 Vapor (Cas) in 6.9 Liquid or Solid 5.10 Odor Throshol 5.11 IDLH Value: Do	peetin: Grade (), LLus above 1 Not established riteris Characteristics: Norwite I Initiant Characteristics: No aj le: Not pertinent es not evaluate	is grag party ang to the eyes and twost. ppreciable hazard. Practically harmeses to the skin.		•	IMP		
					001 (		
	. 1				0181		
	<u></u>		JL				

#### CHEMICAL TOXICITY AND OTHER INFORMATION

		ACC		
•	TLV	OR STEL		
COMPOUND	<u>(mg/m<sup>3</sup>)</u>	(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.	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.
			·	<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. <u>FIRST AID</u> : Ingestion: Vomiting followed by medical attention Direct Contact: Wash with soap immediately <u>INCOMPATIBILITIES</u> : Commound specific
Barium Compounds	0.5		Yellow, white or colorless crystals or powder. Appearances of individual compounds vary.	Exposure to barium poisioning results effects to the skin, eyes and throat, Flammable at room temperature when in powder form. <u>SYMPTOMS</u> : Direct Contact: Causes irritation of eyes, nose, throat and skin Ingestion: Symptoms vary depending upon compound. <u>First Aid</u> : Direct contact with skin and eyes: Flush immediately
Cadmium <sup>*</sup> Salts, dusts, and fumes	0.5	0.2	Silver/White/Blue tinged metal compounds have different	Ingestion: medical attention immediately 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. <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 inflamation. 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. <u>FIRST AID</u> : Ingestion: Conscious persongive large amounts of water immediately and seek medical advice. <u>INCOMPATIBILITIES</u> : Strong oxidizers, elemental sulfur, selenium, zinc, hydrobenzoic acid, ammonium nitrate.

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## CHEMICAL TOXICITY AND OTHER INFORMATION (continued)

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COMPOUND	TLV (mg/m <sup>3</sup> )	STEL (mg/m <sup>3</sup> )	PHYSICAL STATE	REMARKS
Chlorides			Dependent upon compound	Toxicity varies greatly among the individual compounds. When heated to decomp- osition 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> SO4 & HCI.
Copper Fume Dust & mist as copper	0.2 1.0	2.0	Reddish, lustrous metal No odor	SYMPTOMS: Inhalation: Copper and Copper oxide fumes may cause metal fume feverchills, 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. FIRST AID: Ingestion: Seek medical attention. (Pennillamine or triethylenetetramine dihydrochloride may be beneficial in reducing body burden.) INCOMPATIBILITIES: 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 memebers. <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.

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#### CHEMICAL TOXICITY AND OTHER INFORMATION (continued)

| COMPOUND                                                       | TLV<br>(mg/m³) | ACC<br>OR<br>STEL<br>(mg/m <sup>3</sup> ) | PHYSICAL STATE                                                         | REMARKS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|----------------------------------------------------------------|----------------|-------------------------------------------|------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Mercury*<br>Alkyl compounds<br>All forms except<br>Alkyl vapor | 0.01<br>0.05   | 0.03                                      | Silvery mobile odorless<br>liquid                                      | Highly toxic by skin absorption and inhalation of fume or vapor and ingestion.<br>Spillage requires caution due to droplet proliferation.<br>SYMPTOMS:<br>After absorption mercury causes dermatitis, stomatitis, tremors and psychic<br>disturbances. Irritation of mucous membranes are also noted. Exposure to mercury<br>first causes excessive salivation, pain in chewing and gingivitis.<br>FIRST AID:<br>Eyes: Irrigate immediately<br>Skin: Wash immediately with soap<br>Breath: Artificial respirator<br>Ingestion: Immediate medical attention<br>INCOMPATIBILITIES:<br>Acetylenes, ammonia gas, and strong oxidizers (i.e. chlorine gas).                                                                                                                                                                                                                                                                                                               |
| Nickel<br>Soluble nickel<br>Compounds                          | 1.0<br>0.1     | 0.3                                       | Silvery white malleable metal<br>White or colored crystal or<br>powder | <ul> <li>Nickel is an insoluble metal, but most common salts are soluble.</li> <li><u>SYMPTOMS</u>: (from nickel dust and salts)</li> <li>Inhalation: Dust and mists can cause lung irritation, shortness of breath, coughing and wheezing.</li> <li>Skin: Itching, burning and sores referred to as "nickel rash"</li> <li>Eyes: Irritation and damage to cornea.</li> <li>Ingestion: Giddiness and nausea</li> <li>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.</li> <li><u>FIRST AID</u>:</li> <li>Ingestion: Consume large amounts of water. Seek medical attention.</li> <li><u>INCOMPATIBILITIES</u>:</li> <li>Nickel dust is flammable. Reacts violently with fluorine, strong mineral acids; liberates H<sub>2</sub>, ammonium nitrate, etc.</li> </ul> |

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#### CHEMICAL TOXICITI AND OTHER INFORMATION

| COMPOUND               | TLV<br>(mg/m³) | ACC<br>OR<br>STEL<br>(mg/m <sup>3</sup> ) | PHYSICAL STATE                                                | REMARKS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|------------------------|----------------|-------------------------------------------|---------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Seleniuza*             | 0.2            |                                           | White, red or orange powder<br>depending on specific compound | Selenium dusts or fumes are severe irritants of the respiratory tracts.<br>Elemental Selenium has low toxicity, however, some compound have high toxicity.<br>SYMPTOMS:<br>Chronic exposure to inorganic compound causes dermatitis, pallor, nervousness,<br>depression and digestive disturbances.<br>FIRST AID:<br>Eyes: Irrigate immediately<br>Skin: Soap wash immediately<br>Breath: Artificial respiration<br>Ingestion: Immediate medical attention<br>INCOMPATIBILITIES:<br>Acids and strong oxidizing agents                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Zinc<br>Zinc Chloride* |                |                                           | Blue powder                                                   | Zinc is considered an essential trace element, necesary for normal growth and<br>development. Most zinc compounds have a relatively low order of toxicity however,<br>occupational exposure to zinc chloride and zinc oxide has been associated with<br>adverse health effects. Spontaneous combustion may occur if zinc dust is stored<br>in damp place. Zinc dust forms an explosive mixture with air.<br><u>SYMPTOMS</u> :<br>Inhalation: Inhalation of mists of fumes may cause respiratory or<br>gastrointestional irritation, shortness of breath, a feeling of constriction in<br>the chest and coughing with phlegm and bloody sputum. It may also produce a<br>cyanosis, resulting in a blue color of the skin and lip. Exposure to freshly<br>formed zinc oxide fumes can cause a flu-like illness called metal fume fever, with<br>symptoms similar to those encouptered with viral influenza.<br>Skin: Skin contact with zinc chloride may produce dermatitis.<br>Ingestion: 12 grams of zinc metal over two days has caused sluggishness, light<br>headedness; a staggering gait and difficulty in writing.<br><u>INCOMPATIBILITIES</u> :<br>Acids, strong alkalies, amines, chlorides, chlorates, nitrates, oxides, fluorine,<br>S, CB <sub>2</sub> . |

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\*See page 42, "References."

