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SAMPLING AND ANALYSIS PLAN FOR SITE BOUNDARY SOIL SAMPLING AT OPERABLE
UNIT 1 (OU 1) NAS JACKSONVILLE FL
2/1/1992
ABB ENVIRONMENTAL

**SAMPLING AND ANALYSIS PLAN
FOR SITE BOUNDARY SOIL SAMPLING
AT OPERABLE UNIT 1**

**NAVAL AIR STATION JACKSONVILLE
JACKSONVILLE, FLORIDA**

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Prepared for:

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SCOPE

The purpose of this Sampling and Analysis Plan (SAP) is to outline the scope of the site boundary soil sampling along the periphery of Operable Unit 1 (OU-1). It presents a summary of the locations, frequency, types, and methods of soil sampling in an abbreviated format. Detailed information sources and methodologies are described in the Work Plan (i.e., Sampling and Analysis Plan, Quality Assurance Project Plan, Health and Safety Plan, etc.) for OU-1 which are included by reference.

The site boundary soil sampling event at OU-1 has two immediate objectives. The first is to obtain current surface soil contamination data along transportation routes to and from the site to assess the potential of "drag-out" of contaminants (specifically, polychlorinated biphenyls [PCBs]) due to site activities. The second objective is to verify that surface soil conditions in selected portions of the adjacent residential area have not been impacted by drag-out or wind-borne contamination (i.e., PCBs).

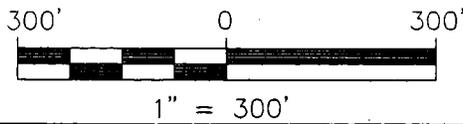
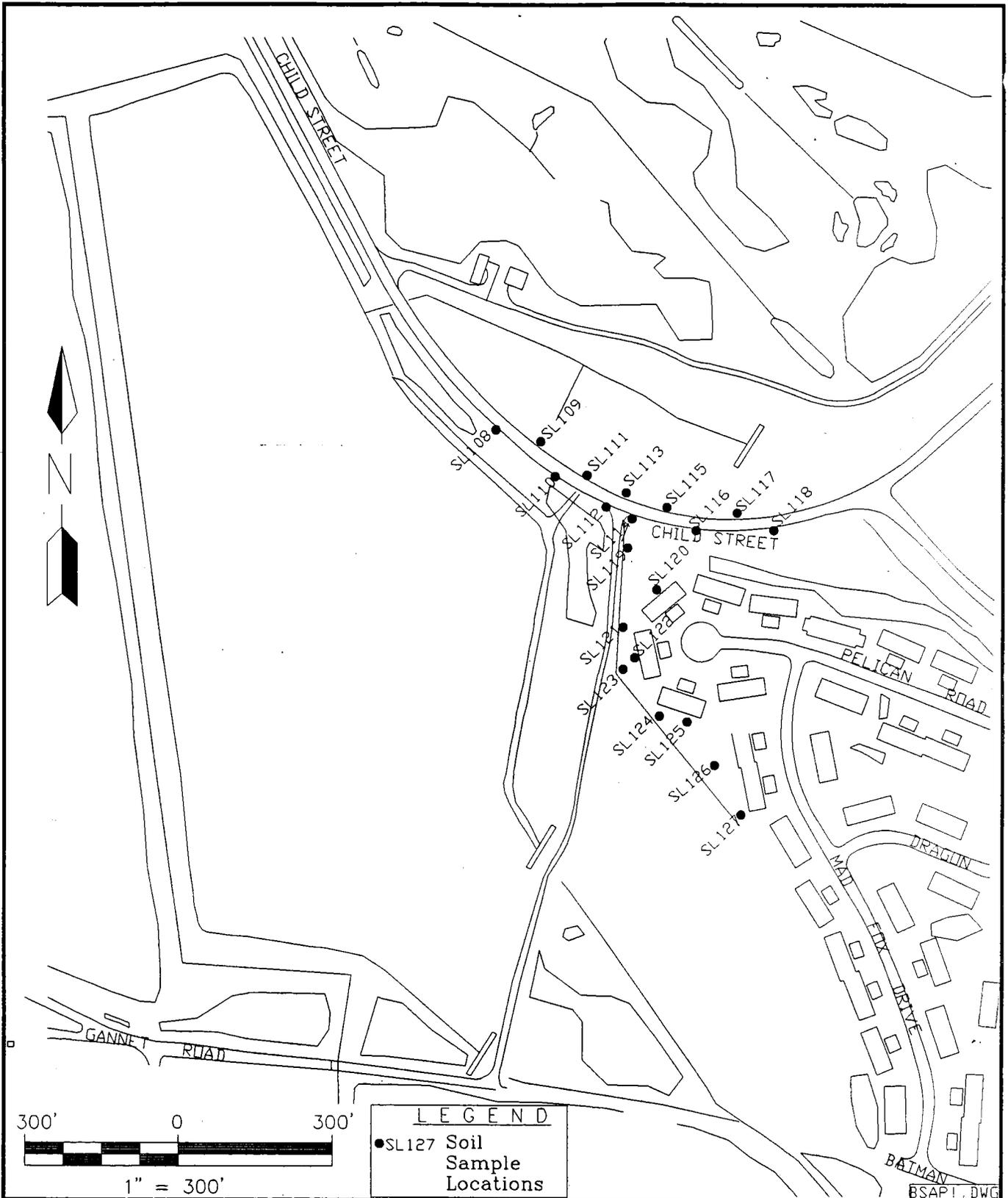
The data obtained during the initial soil sampling event will be incorporated into the project data base for site characterization, as appropriate. Sample collection and analysis will conform to the standards specified in the Work Plan.

LOCATIONS AND SAMPLES

Proposed sampling locations are presented in Figure 1. The frequency and type of samples are summarized in Table 1. Samples will be collected following the methods described in the Quality Assurance Project Plan, Appendix 5.4.1, and the OU1 Field Sampling Plan, Appendix 5.4.2 of Volume V of the Work Plan. Background sample locations will be selected at the discretion of the field sampling team and Field Operations Leader based on field observations. The underlying criteria for background sample location selection will be to identify sample points which are independent of OU-1 and other PSCs, and appear typical of regional conditions.

ANALYSES

The type of analyses are summarized in Table 1 of this section, and detailed in Table 1-1 Selected Constituents, Methods of Analysis, and Numbers of Surface-water, Sediment, Ground-Water, and Soil Samples to be Analyzed During the RI at OU1, NAS Jacksonville, of the Quality Assurance Project Plan, Appendix 5.4.1 of Volume V, of the Work Plan. Sample results will be validated in accordance with NEESA Level D requirements.



LEGEND
 ● SL127 Soil Sample Locations

BSAP1.DWG

OU1, OIL AND SOLVENTS
 DISPOSAL PITS AREA

Figure 1
 Boundary Soil Sample Locations
 REVISION 1



RI/FS WORK PLAN
 FOR OU1

NAS JACKSONVILLE

A:\BUNSOIL.WK1 02/23/92		TABLE 1: SAMPLE FREQUENCY AND TYPES NAS Jacksonville OU-1 Site Boundary Samples						
ASSMUPTIONS		No.	UNITS					
Sampling Events		1	event (no demob of greater than 48 hours AND total duration is <= than 14 Days)					
Field Days		4	days per event					
Equipment Blanks		1	per day					
Field Blanks		1	per sampling event (no demob of greater than 48 hours)					
Trip Blanks		1	per VOA Cooler					
No. of VOA Coolers		0	Coolers					
Field Duplicates		10%	of total per sampling event					
MS/MSD		10%	of total for sampling event (of less than 14 days)					
Sample Location	Media	BNA	VOC	PCB	METALS	RAD	DIOXIN	
SL108	Soil	0	0	1	0	0	0	
SL109	Soil	0	0	1	0	0	0	
SL110	Soil	0	0	1	0	0	0	
SL111	Soil	0	0	1	0	0	0	
SL112	Soil	0	0	1	0	0	0	
SL113	Soil	0	0	1	0	0	0	
SL114	Soil	0	0	1	0	0	0	
SL115	Soil	0	0	1	0	0	0	
SL116	Soil	0	0	1	0	0	0	
SL117	Soil	0	0	1	0	0	0	
SL118	Soil	0	0	1	0	0	0	
SL119	Soil	0	0	1	0	0	0	
SL120	Soil	0	0	1	0	0	0	
SL121	Soil	0	0	1	0	0	0	
SL122	Soil	0	0	1	0	0	0	
SL123	Soil	0	0	1	0	0	0	
SL124	Soil	0	0	1	0	0	0	
SL125	Soil	0	0	1	0	0	0	
SL126	Soil	0	0	1	0	0	0	
SL127	Soil	0	0	1	0	0	0	
SL128(B)	Soil	0	0	1	0	0	0	
SL129(B)	Soil	0	0	1	0	0	0	
SL130(B)	Soil	0	0	1	0	0	0	
SL131(B)	Soil	0	0	1	0	0	0	
SL132(B)	Soil	0	0	1	0	0	0	
Subtotal		0	0	25	0	0	0	
*** QA/QC SAMPLES ***								
Equipment Blanks	Water	0	0	4	0	0	0	
Field Blanks	Water	0	0	1	0	0	0	
Trip Blanks	Water	0	0	0	0	0	0	
Field Duplicates	Soil	0	0	3	0	0	0	
MS/MSD	Soil	0	0	3	0	0	0	
TOTAL		0	0	36	0	0	0	

NOTE: (B) Indicates Background Samples.

GENERAL CONDITIONS

Management of Investigative Derived Wastes (IDW) will be in accordance with Section 5.15, Disposal of Investigation-Derived Wastes, of the Remedial Investigation/Feasibility Study Work Plan for OU1, Oil and Solvents Disposal Pits Area, Volume 5, of the Work Plan.

Health and safety procedures will be in accordance with the *Generic Health and Safety Plan, Navy CLEAN Program*, Appendix 1.5, located in Organization and Planning, Volume I of the Work Plan, and the *Health and Safety Plan, RI Field Work, Operable Unit 1*, Appendix 5.5, located in the Remedial Investigation/Feasibility Study Work Plan for OU1, Oil and Solvents Disposal Pits Area, Volume 5, of the Work Plan.

APPENDIX 5.5

**SITE SPECIFIC
HEALTH AND SAFETY PLAN**

OUI SITE SPECIFIC
HEALTH AND SAFETY PLAN
FOR
NAVAL AIR STATION
JACKSONVILLE, FLORIDA

Prepared for
SOUTHERN DIVISION
DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
CHARLESTON, SOUTH CAROLINA

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February 1992

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Attachments

OSHA Poster

SITE SPECIFIC
HEALTH AND SAFETY PLAN

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REFERENCES

The following chapters of the Comprehensive Long-term Environmental Action Navy (CLEAN) Program District I Generic HASP are applicable for the work anticipated at the Site.

<u>x</u>	2.0	AUTHORITY AND RESPONSIBILITY OF HEALTH AND SAFETY PERSONNEL
<u>x</u>	3.0	TRAINING PROGRAM
<u>x</u>	4.0	MEDICAL SURVEILLANCE PROGRAM
<u>x</u>	5.0	ENGINEERING CONTROLS
<u>x</u>	6.0	PERSONAL PROTECTIVE LEVEL DETERMINATION
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___	8.0	ZONATION
<u>x</u>	9.0	WORK PRACTICES
___	10.0	CONFINED SPACE ENTRY PROCEDURES
___	11.0	EXCAVATION AND TRENCHING
<u>x</u>	12.0	TEMPERATURE EXTREMES
	<u>x</u>	HEAT STRESS
	<u>x</u>	COLD STRESS
<u>x</u>	13.0	DECONTAMINATION
<u>x</u>	14.0	EMERGENCY PLANNING
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	<u>x</u>	ACCIDENT REPORT FORM
	___	HEALTH AND SAFETY OFFICER (HSO) CHECKLIST FOR FIELD OPERATIONS
	<u>x</u>	MATERIAL SAFETY DATA SHEETS
	___	LIQUI-NOX
	___	ETHYL ALCOHOL (denatured)
	___	TRISODIUM PHOSPHATE
	<u>x</u>	OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA) POSTER
	<u>x</u>	DAILY HEALTH AND SAFETY AUDIT FORM

SITE SPECIFIC
HEALTH AND SAFETY PLAN

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REFERENCES (continued)

- x 16.0 RESPIRATORY PROTECTION PROGRAM
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1.0 GENERAL

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

1.2 PROJECT PERSONNEL.

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

1.2.2 General Site Supervisor The General Site Supervisor has vested authority from the TOM to carry out day-to-day site operations.

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

1.2.4 Other Functional Titles The following is a list of other personnel who will be involved in this project and their general responsibilities:

<u>Position Title</u>	<u>Responsibilities</u>
Field Engineer/Scientist	Drilling/Field Sampling

This category includes engineers, scientist, and technicians who will perform site reconnaissance, geophysical/seismic surveys, surface water and sediment sampling, soil sampling, groundwater sampling and air sampling.

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

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

2.0 SITE CHARACTERIZATION AND ANALYSIS

2.1 SITE NAME, LOCATION, AND SIZE Operable Unit 1 (OU1) is located in the south-central area of Navel Air Station-Jacksonville (NAS/JAX) (Figure 2-1). It is northwest of the intersection of Thrush Road and Gannet Road and southwest of Child Street (Figure 2-2). OU1 is also known as the Old Main Registered Disposal Area which is comprised of Potential Source of Contamination No. 26 (PSC 26) and the former PCB Storage Area PSC 27.

2.2 SITE HISTORY AND LAYOUT PSC No. 26-Old Main Registered Disposal Area. The Navy used this area for the disposal of a variety of wastes, including spent solvents and spent oils. Before 1940, the U.S. Army controlled and utilized the area for disposal of debris. From 1940 to 1968, the Navy operated the PSC as a disposal area for solid waste, demolition and construction debris, and spent solvents and oil. The Navy burned these wastes at the edge of trenches and pits, with the remains bulldozed into the trenches and pits and covered. Air pollution control requirements halted burning, and the solid wastes were then hauled off-site by a contractor. However, the Navy continued to dump spent solvents and oil in the pits. The Navy officially closed the area on January 15, 1979.

The Navy also used a portion of PSC 26 as a disposal area for low level radioactive waste during World War II. Instruments with Radium 226 and other low level radioactive waste were placed in a pit at PSC 26. The disposal area is reported to have been decontaminated. A contractor for the Navy excavated and placed material in approximately 500 steel drums for disposal in an approved facility in Barnwell, South Carolina.

PSC 27 the former PCB Storage Area is located on the southeastern edge of OU1 (Figure 2-2). PSC 27 was used for the outdoor storage of transformers containing PCB oils. Reportedly, vandalism to the transformers in 1978 resulted in other spillage of transformer oil on the ground.

2.3 SCOPE OF WORK (WORK PLAN) Installation Restoration Program: Investigate the environmental impacts associated with past activities. Remedial Investigation & Feasibility Study (RI/FS) will be conducted to determine and implement corrective action alternatives. The IRP will be conducted in accordance with CERCLA/RCRA and the NCP. The field activities at OU1 include an ecological inventory, sediment and surface-water sampling, air sampling, geophysical and seismic surveys, soil sampling, soil gas sampling, soil borings, monitor-well installation, in situ permeability testing, and ground-water sampling.

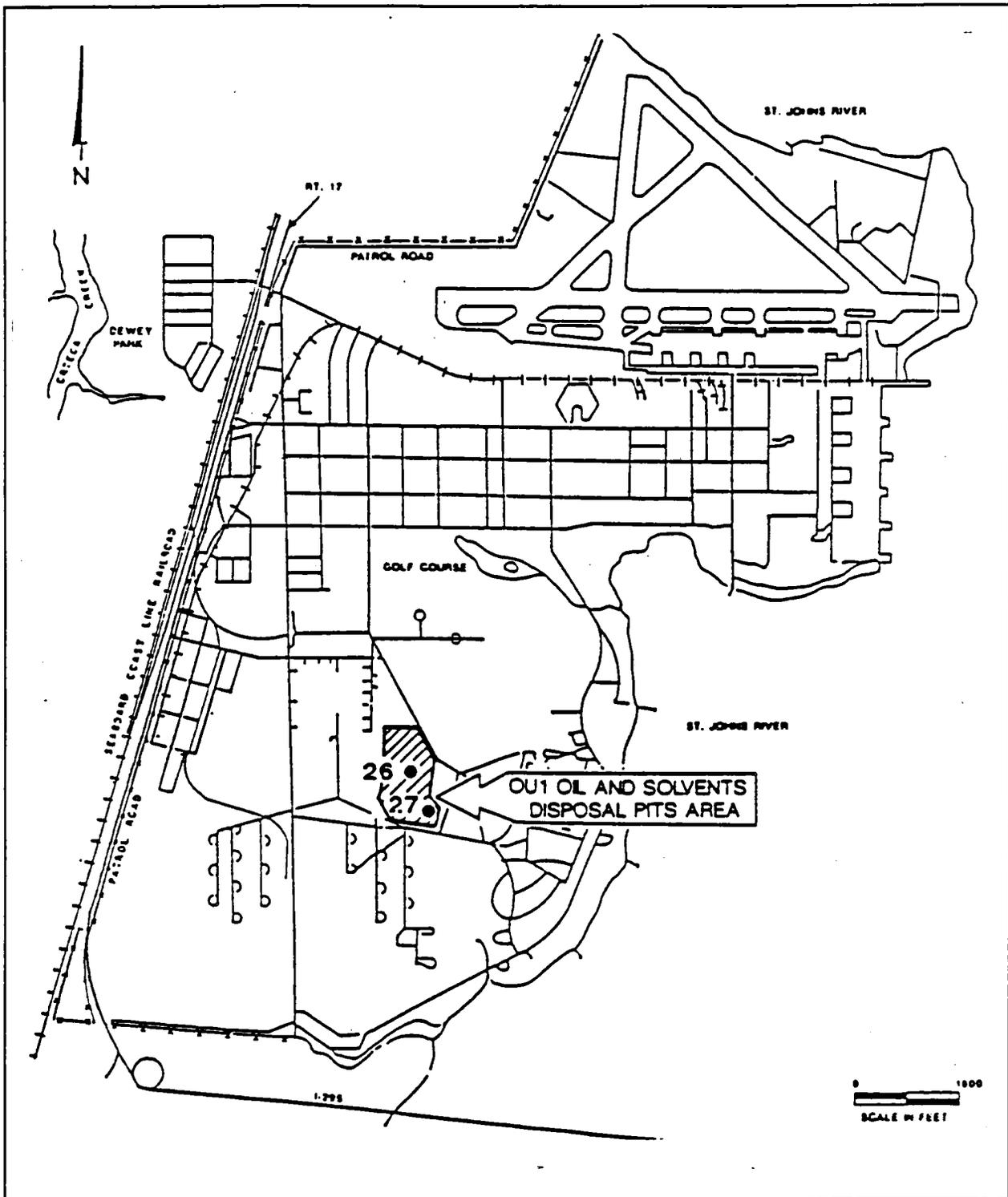


FIGURE 2-1
LOCATION OF OU1, OIL AND SOLVENTS
DISPOSAL PITS AREA
PSC-26 AND PSC-27



SITE SPECIFIC HASP
FOR OU1

NAS JACKSONVILLE
JACKSONVILLE, FLORIDA

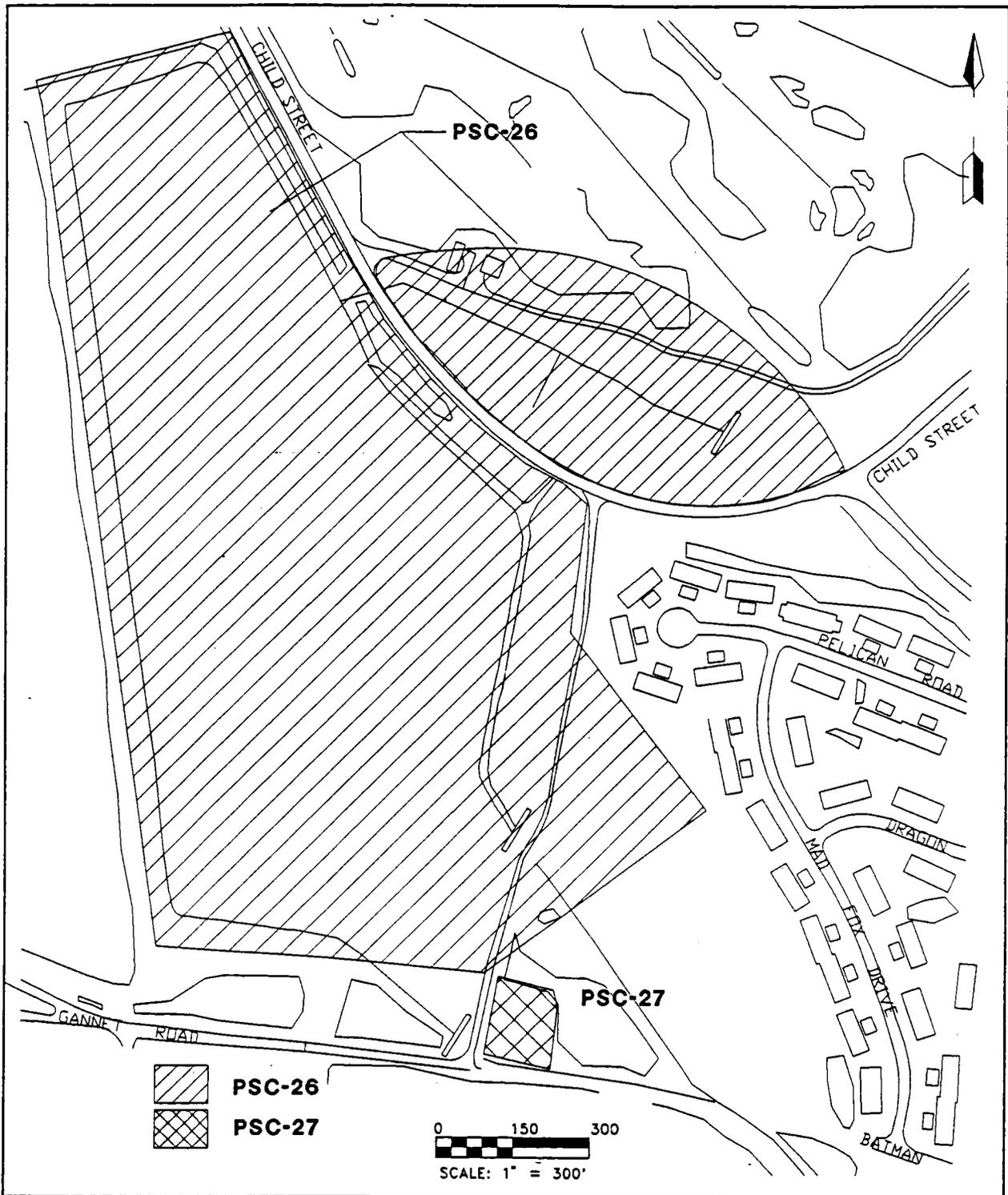


FIGURE 2-2
DISPOSAL PITS AREA INCLUDING
PSC-26, OLD MAIN REGISTERED AREA
AND PSC-27, FORMER PCB
STORAGE AREA



SITE SPECIFIC HASP
FOR OU1

NAS JACKSONVILLE
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3.0 TASK ANALYSIS

3.1 TASK ONE

3.1.1 Hazardous Substances Based on the available data the contaminants of concern known or suspected to be present on site, along with any established exposure limits for those substances, are listed in Table 3-1.

3.1.2 Site Risks The following are the health hazards and safety hazards that are anticipated to be encountered at the site.

3.1.2.1 Health Hazards Contaminants to which personnel may be exposed are gasoline and diesel fuels and their constituents; chlorinated solvents; heavy metals and PCBs. Hazardous substance information forms (Material Safety Data Sheets, MSDS) for the contaminants of concern are listed in Part II of the HASP, Appendix N.4. All activities at this site will be conducted in unconfined areas. This will help minimize the chances of exposure of on-site personnel to high vapor concentrations of any of the substances listed in Appendix N.4.

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

Power substations, powerlines, underground utilities, and underground pipelines are to be avoided during drilling operations. Necessary work permits for activities will be obtained from the Public Works Department or the appropriate department (e.g., fire department, etc.). Safety hazards and methods to reduce employee/contamination exposure to hazardous substances is addressed in more detail in Part II of the HASP in Appendix E, Personal Protective Equipment; Appendix F, Monitoring Equipment; Appendix G, Zonation; Appendix H, Work Practices; Appendix I, Confined Space Entry Procedures (not planned for this work); Appendix J, Excavation and Trenching; Appendix K, Temperature Extremes; Appendix L, Decontamination, and Appendix M, Emergency Planning.

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

TABLE 3-1

Contaminants of Concern

Constituent	Max. ¹ Rep. Conc.	PEL/TLV ²	Media ³	Koc ⁴
<u>Volatiles</u>				
1,2-Dichloroethane	54	100	Soil	14
1,2-Dichloroethene	3,150	200	Soil	59
Chloroform	180	2	Soil	31
1,1,1-Trichloroethane	8	NA	Soil	152
Acetone	580	250	Soil	2.2
Tetrachloroethane	6	1	Soil	3
Trichlorethene	2,000	25	Soil	126
Toluene	270	100	Soil	300
Ethylbenzene	24,000	100	Soil	1,100
Chlorobenzene	2,500	75	Soil	330
Xylenes	2,900	100	Soil	240
N-Butyl Acetate	Trace	150	GW	NA
Ethyl Acetate	Trace	400	GW	NA
Methylene Chloride	Trace	50	GW	8.8
Methyl Ethyl Ketone	188	200	GW	4.5
Methyl Isobutyl Ketone	40	50	GW	NA
Trichloroethene	62	50	GW	126
Xylenes	120	100	GW	240
<u>Semi-Volatiles</u>				
Phenol	64	5	Soil	14.2
1,2-Dichlorobenzene	11,000	50	Soil	1,700
4-Chloro-3-Methylphenol	45,000	NA	Soil	NA
Dibenzofuran	2,500	NA	Soil	NA
Bis(2-Ethylhexyl)phthalate	5,600	NA	Soil	NA
Polynuclear Aromatic Hydrocarbons				
Naphthalene	27,000	10	Soil	NA
Phenanthrene	1,800	NA	Soil	98
Fluoranthene	19,000	NA	Soil	38,000
Pyrene	310	NA	Soil	NA
Benzo(a)Anthracene	450	NA	Soil	1,380,000
Chrysene	630	NA	Soil	200,000
Benzo(a)Pyrene	200	NA	Soil	5,300,000
Indeno(1,2,3-cd)pyrene	190	NA	Soil	1,600,000
Dibenz(a,h)anthracene	120	NA	Soil	3,300,000
Benzo(g,h,i)perylene	260	NA	Soil	1,600,000

TABLE 3-1, continued

Contaminants of Concern

Constituent	Max. ¹ Rep. Conc.	PEL/TLV ²	Media ³	Koc ⁴
<u>Metals</u>				
Cadmium	76.7	NA	Soil	NA
Chromium	218	NA	Soil	NA
Lead	4,100	NA	Soil	NA
Mercury	12.3	NA	Soil	NA
Nickel	79.9	NA	Soil	NA
Zinc	8,190	NA	Soil	NA
<u>PCBs</u>				
Polychlorinated Biphenyls	1,000	NA	Soil	530,000

Notes:

1. Maximum reported concentration mg/l (water), mg/kg (metals), mg/kg (volatiles, semi-volatiles, PCBs).
2. Permissible exposure limit/threshold limit value (parts per million).
3. Ground water, surface, water, soil, or air.
4. Organic carbon partition coefficient (milliliters per gram).
5. Criteria or Value Not Available.

3.1.3 Protective Measures The following are the protective measures that will be used at the site.

3.1.3.1 Engineering Controls Whenever needed, engineering controls (i.e., fans to blow volatilized chemicals away from the work area) will be used. Engineering controls are described in more detail in Part II of the HASP in Appendix D.

3.1.3.2 Levels of Protection Level D Protection should only be used when the atmosphere contains no known hazard, all potential airborne contaminants can be monitored for, and work functions preclude splash, immersion, or the potential for unexpected inhalation or contact with hazardous levels of any chemical.

Higher levels of personal protection will be used as dictated by conditions discovered in the field and as directed by the HSO. Guidance on selection of the level of personal protection is provided in Part II of the HASP in Appendix E.

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

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

The following sampling equipment will be used at the Site. Refer to Chapter 7.0 of the CLEAN HASP for information on the calibration and maintenance of the equipment.

1. Foxboro Organic Vapor Analyzer 128 (OVA)
2. Mini-Ram Sun # Shield Model PDM-SNS

If the OVA detects a steady measurable quantity of organic vapors greater than 5 parts per million (ppm) in the breathing zone, the field team will withdraw from the Site until health and safety conditions at the site are re-evaluated. If the organic vapors can be identified, action levels will be determined by the appropriate PEL/TLVs, as applicable.

Dust in the breathing zone will also be monitored. Initially, the dust monitoring readings will be recorded once per 30 minutes during field activities which could potentially generate dust hazards. If initial dust monitoring readings are consistently below threshold criteria, the frequency of dust monitoring and recording will be reduced at the discretion of the Field Operations Leader or their representative. Dust masks will be required if dust readings exceed $10 \text{ } \mu\text{g}/\text{m}^3$. Engineering controls such as wetting may be used to reduce the potential for generating dust.

Additional monitoring equipment that may be utilized at the site are described in Part II of the HASP in Appendix F.

3.1.4.2 Personal Monitoring Personal monitoring will be undertaken to characterize the personal exposure of high risk employees to the hazardous substances they may encounter on-site. Personal monitoring will be conducted on a representative basis. Personnel who conduct a high risk work task will be noted in field logs.

Because of the past use of the site for the disposal of the Radium 226 materials the following personal monitoring equipment will be used at the site. Refer to Chapter 7.0 of the CLEAN HASP for information on the maintenance and calibration of the equipment.

1. Thermoluminescent Dosimetry Body Badge

Because documentation of the removal of the Radium 226 material exist no other monitoring for radioactive material is planned. Additional information concerning personal monitoring, if required, is provided in Part II of the HASP in Appendix F.2.

4.0 SITE CONTROL

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

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

Zonation of waste sites and "floating" decontamination stations are described in Part II of the HASP in Appendix G Zonation and Appendix L Decontamination. A "fixed" site decontamination area will be established adjacent to the OUI field operation trailer. A diagram of the "fixed" decontamination station is provided in Figure 4-1. The purpose of the "fixed" decontamination station is to provide a central area for the decon of field sampling and equipment, vehicles and large field equipment (tractors, drill rigs, trucks, etc).

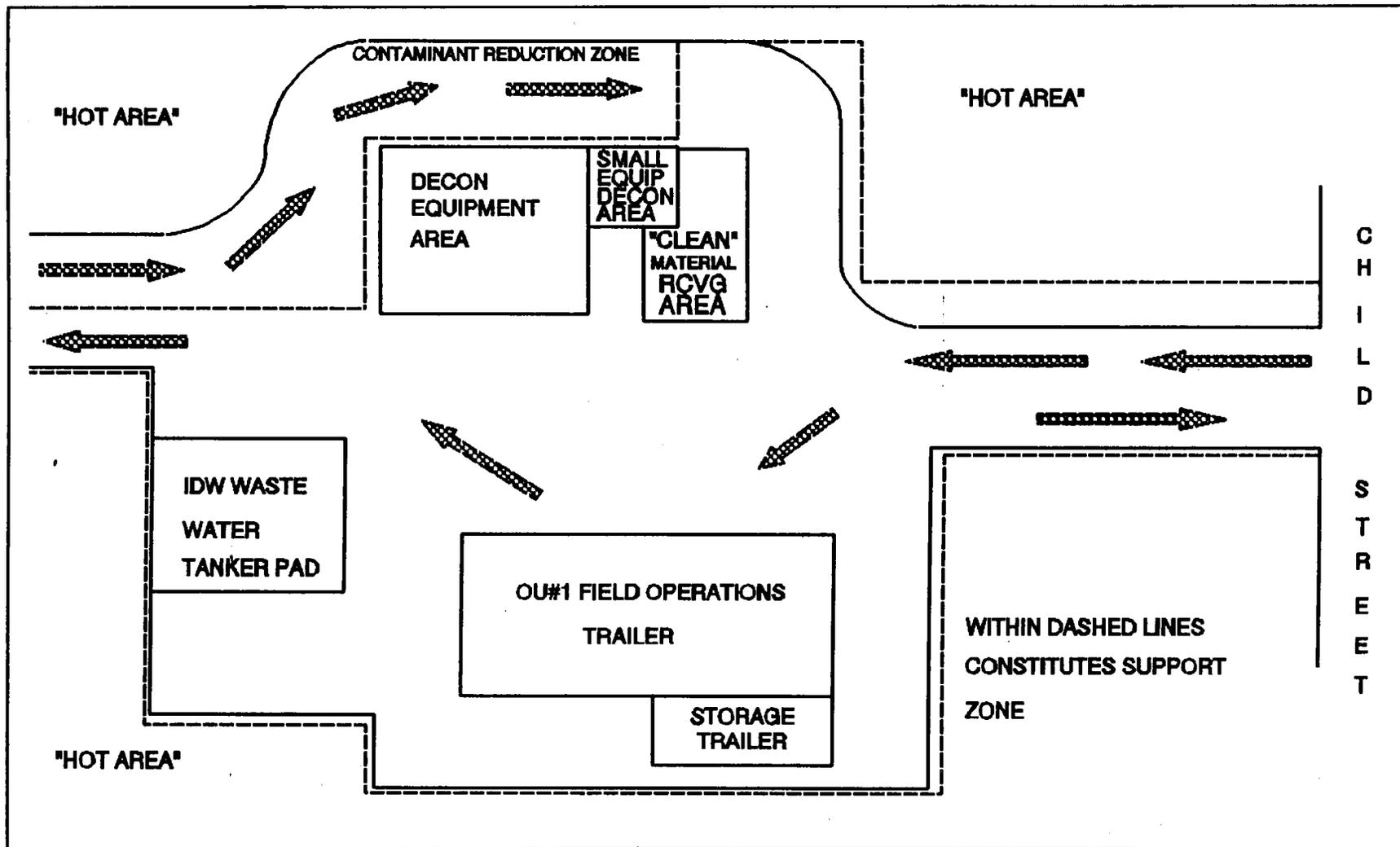
4.2 COMMUNICATIONS. When radio communication is not used, the following air horn signals will be employed:

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

The air horn will be kept in the Exclusion Zone or Support Zone. Site communication and work practices are discussed in more detail in Part II of the HASP in Appendix H.

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

- Work and sampling will be conducted in Level D clothing and equipment, unless site specific conditions are discovered that require a higher level of personal protection.



4-2

FIGURE 4-1
FIXED DECONTAMINATION AREA
OU1 FIELD OPERATIONS TRAILER



RI/FS HEALTH AND SAFETY
PLAN FOR OU1
NAS JACKSONVILLE
JACKSONVILLE, FLORIDA

Zonation of site work areas, typical work practices and levels of personal protection are discussed in more detail in Part II of the HASP in Appendix G Zonation, Appendix H Work Practices and Appendix L Decontamination.

5.0 DECONTAMINATION AND DISPOSAL

All personnel and/or equipment leaving contaminated areas of the Site will be subject to decontamination, which will take place in the contamination reduction zone. The decontamination areas will consist of either the "fixed" decontamination station (Figure 4-1) located on-site for work conducted at OUI and "floating" decontamination stations for work conducted off-site. General decontamination practices are described in Chapter 13.0 of the CLEAN HASP and in Part II of the Site Specific HASP in Appendix L.

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

5.1.1 Small Equipment Decontamination Small equipment will be protected from contamination as much as possible by keeping the equipment covered when at the site and placing the equipment on plastic sheeting, not the ground. Sampling equipment used at the site will be used only once or will be field cleaned between samples. Small equipment decontamination is described in more detail in Part II of the HASP in Appendix L.2.

5.1.2 Heavy Equipment Decontamination Drilling equipment will be protected from contamination as much as possible by placing the equipment on plastic sheeting, not the ground. The drill rig and associated drilling equipment will be cleaned with high pressure water or high pressure steam followed by a soap and water wash and rinse. Loose material will be removed by brush. The person performing this activity will be at the level of protection used during the field investigation. Heavy equipment decontamination is described in more detail in Part II of the HASP in Appendix L.3.

5.2 COLLECTION AND DISPOSAL OF DECONTAMINATION PRODUCTS All disposable protective gear, decontamination fluids (for both personnel and equipment), other disposable materials will be disposed at the site. Disposable material (e.g., gloves and Tyveks) will be bagged and disposed of properly. Collection and disposal of decontamination products is described in more detail in Part II of the HASP in Appendix L.4.

6.0 EMERGENCY AND CONTINGENCY PLAN

This section identifies emergency and contingency planning that has been undertaken for operations at this site. Most sections of the HASP provide information that would be used under emergency conditions. General emergency planning information is addressed in Chapter 14.0 of the CLEAN HASP and in Part II of the Site Specific HASP in Appendix M. The following subsections present site-specific emergency and contingency planning information.

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

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

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

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

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

Project: _____

Name: _____

Address: _____

Home Telephone: Area Code () _____

Age: _____ Height: _____ Weight: _____

In case of emergency, contact: _____

Address: _____

Telephone: Area Code () _____

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

Allergies: _____

List medication(s) taken regularly: _____

Particular sensitivities: _____

Previous/current medical conditions or exposures to hazardous chemicals:

Name of Personal Physician: _____

Telephone: Area Code () _____

7.5 EMERGENCY TELEPHONE NUMBERS.NAS Jacksonville

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

Other Contacts

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

EMERGENCY CONTACTS

Dr. Frank Lawrence	(207) 871-2617
Bruce Campbell, RPh	(207) 871-2449
Florida Poison Control Center	(800) 282-3171
ABB-ES (Maine)	(800) 476-0460
ABB-ES (Florida)	(904) 656-1293
USEPA Emergency Response	(800) 414-8802

7.6 ROUTES TO EMERGENCY MEDICAL FACILITIES. The primary source of medical assistance for the site is:

Facility Name: Saint Vincent's Hospital

Address: 1800 Barrs, Jacksonville, FL

Telephone Number: (904) 387-7395

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

Exit NAS via the main gate and take a right onto Roosevelt Blvd. (Hwy 17) heading north. Proceed north to Park Street and take a right (east) onto Park Street. Proceed on Park to Barrs and take a right. At the end of Barrs on the right is St. Vincent's.

Alternative source of medical assistance:

Facility Name: Riverside Hospital

Address: 2033 Riverside Avenue, Jacksonville, FL

Telephone Number: (904) 387-7070

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

Exit NAS via the main gate and take a right onto Roosevelt Blvd. (Hwy 17) heading north. Proceed north to Park Street and take a right (east) onto Park Street. Proceed on Park Street to Margaret Street and take a right. At the corner of Margaret Street and Riverside is Riverside Hospital on the right.

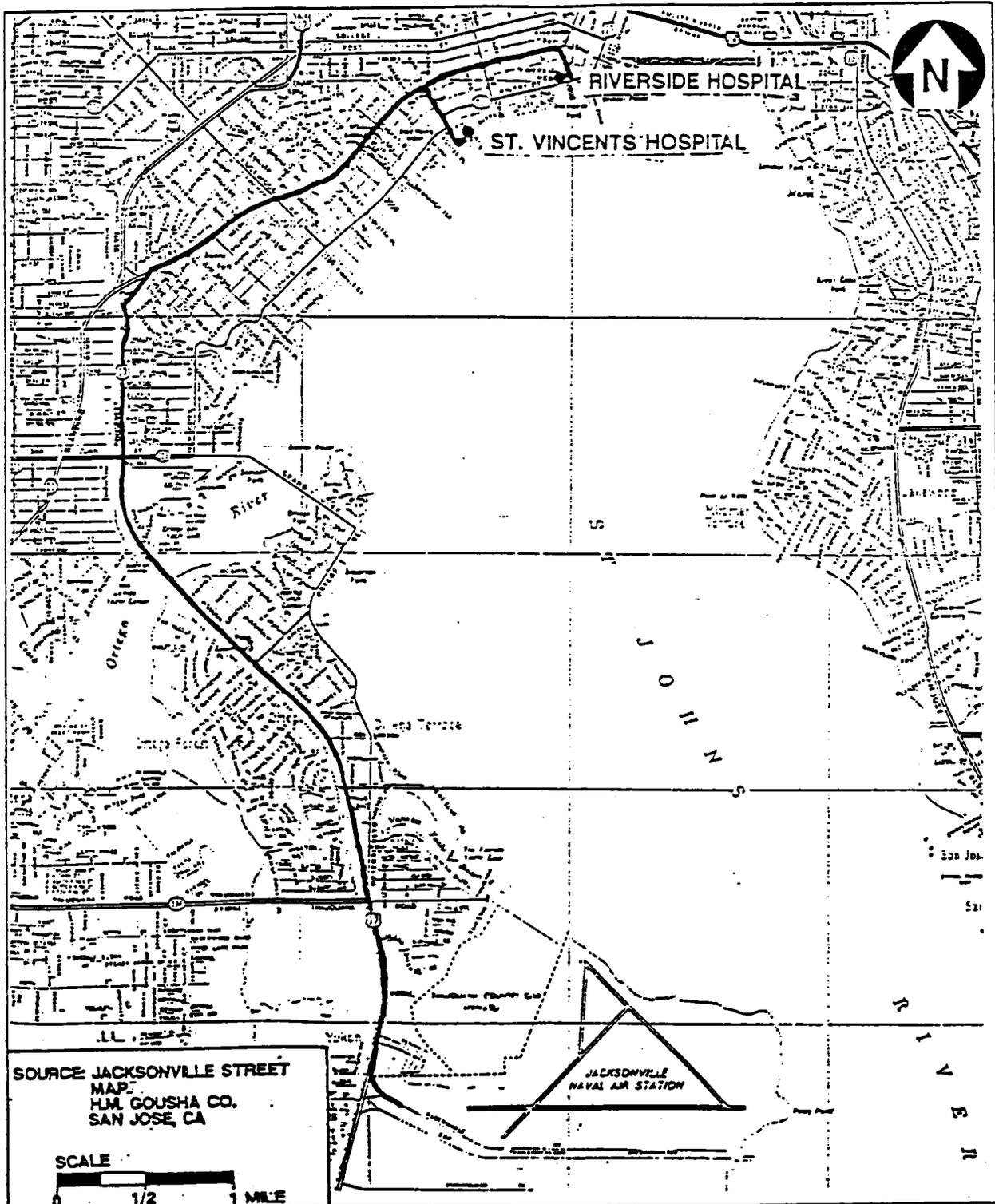


FIGURE 7-1
ROUTE TO HOSPITALS



HEALTH AND SAFETY PLAN
NAVAL SUPPLY CENTER JACKSONVILLE, FLORIDA

JOB SAFETY & HEALTH PROTECTION

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

Employers

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

Employees

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

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

Inspection

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

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

Complaint

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

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

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

Citation

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

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

Proposed Penalty

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

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

Voluntary Activity

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

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

Consultation

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

POSTING INSTRUCTIONS

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

More Information

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

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

Washington, D.C.
1989 (Revised)
OSHA 2203

Elizabeth Dole, Secretary of Labor
U.S. Department of Labor
Occupational Safety and Health Administration

Under provisions of Title 29, Code of Federal Regulations, Part 1903.2(a)(1) employers must post this notice (or a facsimile) in a conspicuous place where notices to employees are customarily posted.

APPENDICES

HEALTH AND SAFETY PLAN PART II

FOR

RI/FS WORK PLAN ACTIVITIES AT

OPERABLE UNITE NUMBER ONE
NAVAL AIR STATION
JACKSONVILLE, FLORIDA

FEBRUARY 1992

ABB ENVIRONMENTAL SERVICES, INC.
2590 Executive Center Circle East
Berkeley Building
Tallahassee, Florida 32301

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PART II

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APPENDIX A

**AUTHORITY AND RESPONSIBILITY
OF
HEALTH AND SAFETY PERSONNEL**

APPENDIX A

This appendix describes the health and safety designations and general responsibilities that will be employed for the project.

A.1 HEALTH AND SAFETY MANAGER

The Health and Safety Manager (HSM), ABB Environmental Services, Inc. (ABB Environmental), can be reached by telephone at (207) 775-5401 in Portland, Maine. The HSM has final authority over health and safety issues that are not resolved at the site or through the Health and Safety Supervisor (HSS), and has overall responsibility for ensuring that the policies and procedures of this Health and Safety Plan (HASP) are implemented by the Health and Safety Officer (HSO). In the various regions, the HSM may delegate additional functions to the Regional HSS.

A.2 HEALTH AND SAFETY SUPERVISOR

The Health and Safety Supervisor (HSS) is the health and safety professional serving as the ABB Environmental HSM's designee for this project. As such, the HSS will be responsible for (1) approval of the individual chosen to serve as the site HSO for this field operation; (2) review and approval of site-specific HASPs developed by the HSO, as well as any significant changes made over time to the site HASP; (3) oversight of the daily efforts of the HSO; (4) resolution of site disputes involving health and safety issues; and (5) implementation of the HASP by the HSO. The HSS will notify the HSM of any Stop Work Orders issued by an HSO.

A.3 HEALTH AND SAFETY OFFICER

The Health and Safety Officer (HSO) will be responsible for the implementation of the Site Specific Health and Safety Plan (HASP). The site HSO also will insure that; 1) appropriate health and safety monitoring is conducted, 2) that all procedures specified in the HASP are followed, and 3) that documentation of compliance/non-compliance with the HASP is provided in the Health and Safety Log Book.

APPENDIX B

TRAINING PROGRAM

APPENDIX B

All personnel working on an ABB Environmental site who potentially may be exposed to toxic substances or hazardous materials will participate in an initial and an annual refresher and/or supervisory training (as appropriate), as well as site-specific training before commencement of the on-site assignment. The initial Health and Safety Training Program consists of the 40-hour training program required and designated by the Occupational Safety and Health Administration (OSHA) standard 29 CFR 1910.120. In addition to the initial training, ABB Environmental uses 8-hour annual refresher and supervisory training elements, which are augmented by site-specific training regarding site hazards and specialized problems and protocols.

B.1 INITIAL TRAINING

All site-assigned personnel who are potentially exposed to toxic substances or hazardous materials will be required to participate in a training course on hazardous waste site operations. This training is required under provisions of the OSHA standard, and must consist of 40 hours covering the following areas:

- familiarity with the regulations and implications of OSHA regulations in 29 CFR 1910.120
- familiarity with the organizational structure responsible for site health and safety
- explanation of the medical surveillance requirements, including recognition of health hazards
- instruction in the use and maintenance of personal protective equipment
- identification and analysis of site chemical and physical hazards
- instruction regarding monitoring equipment, including personnel and environmental sampling instruments
- site control and decontamination procedures
- contingency planning
- confined-space entry procedures

B.2 ANNUAL REFRESHER/SUPERVISORY TRAINING

Annually, all personnel required to participate in the initial training will take an 8-hour refresher training course. Those personnel with either site supervisory or health and safety responsibilities will also have an additional 8 hours of training beyond the initial 40 hours. The 8-hour supervisory training meets requirements of the annual refresher.

B.3 SITE-SPECIFIC TRAINING

All personnel assigned to an ABB Environmental site must participate in the site-specific training presentation, which will cover major elements of the site HASP, as well as health and safety procedures regarding an individual's specific job responsibilities and tasks. The site HSO or health and safety designee will provide this training before an individual is permitted to work in a downrange position.

B.4 OTHER TRAINING

Additional training will be provided as determined by the HSM or the HSS, and may include additional refreshers on personal protective equipment, instrumentation, CPR, first aid, or any other pertinent health- or safety-related subject.

APPENDIX C

MEDICAL SURVEILLANCE PROGRAM

APPENDIX C

C.1 HEALTH MONITORING PROGRAM

All on-site ABB Environmental personnel and laboratory staff must be enrolled in the Health Monitoring Program, which is implemented through Environmental Medicine Resources, Inc., a company consisting of a team of physicians and support personnel who specialize in occupational medicine. The health monitoring program consists of an initial medical examination to establish the employee's general health profile, which provides important baseline laboratory data for later comparative study and annual examinations. The contents of the initial comprehensive physical examination and laboratory testing routine are listed in Table C-1. Follow-up examinations are completed annually for all personnel enrolled in the health monitoring program, or more frequently if project assignments warrant testing following specific field activities.

C.2 REVIEW OF EXPOSURE SYMPTOMS

Symptoms of exposure to hazardous materials will be reviewed for each site 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 HSO will watch for outward evidence of changes in worker health. Symptoms may include skin irritations, skin discoloration, eye irritation, muscular soreness, fatigue, nervousness or irritability, intolerance to heat or cold, or loss of appetite. Employees will routinely be asked to assess their general state of health during the project. Special medical monitoring may be identified for certain sites.

TABLE C-1
BASELINE HEALTH MONITORING PROGRAM

PHYSICAL EXAMINATION

medical history
medical examination
vision: - ~near/distant
 - ~color
audiometry
radiology: PA/LAT
spirometry
electrocardiogram

LABORATORY ANALYSIS

Complete Blood Counts and Chemistries

white blood count
differential cell counts
methemoglobin
uric acid
lactic dehydrogenase
alkaline phosphatase
calcium
phosphorus
cholesterol
urea nitrogen
glucose
albumin
globulin
total protein
total bilirubin
serum glutamic oxalacetic transaminase
hemoglobin and/or hematocrit

TABLE C-1 (Continued)
BASELINE HEALTH MONITORING PROGRAM

Urine Analysis

color and character
specific gravity
pH
protein
acetone
glucose
microscopic examination

Biotox Panel

APPENDIX D

ENGINEERING CONTROLS

APPENDIX D

Whenever feasible, engineering controls will be used at the site to reduce employee exposure to hazardous substances. Feasible engineering controls include the following:

- the use of pressurized cabs or control booths
- the use of remotely operated materials-handling equipment
- the use of industrial-sized fans to blow hazardous vapors from the breathing zone when exposure is from a point source and a power source is available

APPENDIX E

PERSONAL PROTECTIVE EQUIPMENT

APPENDIX E

E.1 PERSONAL PROTECTION LEVEL DETERMINATION

The level of personal protective equipment required will be determined by the type and levels 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 on-site are unknown, the hazards are not clearly established, or the situation changes during on-site activities, the HSO must make a reasonable determination of the level of protection that will ensure the safety of investigators and response personnel until 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.

E.2 LEVELS OF PROTECTION

The following subsections describe the basic composition of the generally recognized protective ensembles to be used for site operations. Specific components for any level of protection will be selected based on hazard assessment; additional elements will be added as necessary. Disposable protective clothing, gloves, and other equipment, exclusive of respirators, should be used when feasible to minimize risks during decontamination and possible cross-contamination during sample handling.

E.2.1 Level A

Level A protection provides the highest level of protection for skin, eyes, and the respiratory system. It is appropriate for conditions where there are potential or actual high concentrations of atmospheric vapors, gases, or particulates. Level A should be used if site operations or work functions involve a high potential for splash, immersion, or exposure to unexpected vapors, gases, or particulates of materials that are harmful to the skin or capable of being absorbed through the intact skin. Level A is used primarily for emergency situations or when the following conditions exist: (1) vapors or mists of strong acids; (2) known or probable immediately dangerous to life and health (IDLH) atmospheres with dermally active compounds; (3) high atmospheric concentrations of compounds that can be absorbed through the skin; and (4) operations

that must be conducted in a confined, poorly ventilated area, where conditions requiring Level A have not yet been eliminated. The fully encapsulating suit and the pressure-demand self-contained breathing apparatus (SCBA) or hoseline respirator are the key elements in Level A personal protective equipment (PPE).

Level A equipment includes the following items:

- SCBA (pressure demand) OR supplied air respirator (pressure demand with escape mask)
- total encapsulating suit
- coveralls (optional)
- long underwear (optional)
- gloves (outer, chemical-resistant)
- gloves (inner, chemical-resistant)
- boots (chemical-resistant, steel-toed, steel shank)
- hardhat (optional)
- disposable protective suit, gloves, and boots (to be worn over or under encapsulating suit)
- two-way radios (optional)

E.2.2 Level B

Level B protection should be used when the type and atmospheric concentration of substances have been identified and require a high level of respiratory protection; however, the atmospheric contaminant, splashing liquid, or other direct contact will not adversely affect or be absorbed through any exposed skin. This includes atmospheres with IDLH concentrations of specific substances that do not (1) represent a severe skin hazard, or (2) meet the criteria for use of air-purifying respirators. Level B has the same respiratory protection criteria as Level A; however, dermal exposure is not as severe.

Level B equipment includes the following items:

- SCBA (pressure demand) OR supplied air respirator (pressure demand with escape SCBA)

- hooded chemical-resistant clothing (coated Tyvek)
- coveralls (optional)
- gloves (outer, chemical-resistant)
- gloves (inner, chemical-resistant)
- boots (chemical-resistant, steel-toed, steel shank)
- boot covers (chemical-resistant) (optional)
- hardhat (optional)
- two-way radio (optional) (to be worn under outside protective clothing)
- face shield (optional)

E.2.3 Level C

Level C protection should be used when the atmospheric contaminant, liquid splashes, or other direct contact will not adversely affect or be absorbed through any exposed skin. In addition, the types of air contaminants must have been identified, the concentration measured, and an air-purifying respirator must be available that can remove the contaminants. An air-purifying respirator can only be used if the oxygen content in the air is at least 19.5 percent, the contaminant has adequate warning properties (e.g., odor, taste, and irritating effect thresholds within two times the Threshold Limit Value), the concentration of the contaminant does not exceed the IDLH, and the worker has been fit-tested. Level C has the same splash protection as Level B; however, cartridge respirators are used instead of SCBAs.

Level C equipment includes the following items:

- full-face respirator (cartridge)
- chemical-resistant clothing (un-coated or coated Tyvek if splash, immersion or if potential for unexpected contact exists)
- coveralls (optional)
- gloves (inner, chemical-resistant)

- gloves (outer, chemical-resistant)
- boots (chemical-resistant, steel-toed, steel shank)
- boot covers (chemical-resistant) (optional)
- hardhat (optional)
- escape mask (optional)
- two-way radios (optional) (worn under outside protective clothing)
- face shield (optional)

E.2.4 Level D

Level D is a work uniform affording minimal protection and is used for nuisance contaminants only. Level D protection should only be used when the atmosphere contains no known hazard, all potential airborne contaminants can be monitored for, and work functions preclude splash, immersion, or the potential for unexpected inhalation or contact with hazardous levels of any chemical.

Level D equipment includes the following items:

- coveralls
- gloves (optional)
- boots (chemical-resistant, steel-toed, steel shank)
- boot covers (chemical-resistant) (optional)
- safety glasses or chemical splash goggles (optional)
- hardhat (optional)
- escape mask (optional)
- face shield (optional)

APPENDIX F
MONITORING EQUIPMENT

APPENDIX F

The work environment will be monitored to ensure that IDLH or other dangerous conditions are identified. At a minimum, monitoring will include evaluations for combustible atmospheres, oxygen-deficient environments, hazardous concentrations of airborne contaminants, and radioactivity.

F.1 AIR SAMPLING: EQUIPMENT, CALIBRATION, AND MAINTENANCE

To the extent feasible, the presence of airborne contaminants will be evaluated through the use of direct-reading instrumentation. Information gathered will be used to ensure the adequacy of the levels of protection being used at the site, and may be used as the basis for upgrading or downgrading levels of protection, at the discretion of the site HSO.

F.1.1 ISD Dual Detector

This meter monitors for combustible gases and oxygen. It can be used to determine (1) if an area contains concentrations of combustible gases with readings in percentage of the lower explosive limit (LEL); and (2) the percentage of oxygen. This equipment will be calibrated in accordance with the manufacturer's instructions.

F.1.2 Explosimeter

This instrument is calibrated to methane and monitors combustible gases in the percentage of the lower explosive limit. It will be calibrated in accordance with the manufacturer's instructions.

F.1.3 ISD HS267

The instrument monitors for the presence of hydrogen sulfide in parts per million (ppm). It will be calibrated in accordance with the manufacturer's instructions.

F.1.4 Organic Vapor Analyzer (Flame)

The Organic Vapor Analyzer (OVA) is a total organic vapor analyzer capable of detecting volatile organic compounds (VOCs) that can be ionized by hydrogen flame ionization. The OVA is commonly used on-site to estimate the presence of VOCs for purposes of crew protection, well screen placement, and selection of samples for

further analysis. The principle of operation is twofold: (1) the ambient temperature gas chromatograph, which breaks down mixtures of VOCs into individual components identified by retention time; and (2) detection accomplished by ionization in a hydrogen flame. The charged component then moves to an electrode which, in turn, results in a meter deflection proportional to the concentration of the contaminant. This instrument does not read out directly in ppm unless calibrated against the material being measured; therefore, results must be interpreted conservatively and with care. Calibration and maintenance will be performed in accordance with the manufacturer's instructions.

F.1.5 Organic Vapor Analyzer (Photoionization)

Like the OVA, the photoionization detector (PID) operates on the basis of ionization of the contaminant, which results in a meter deflection proportional to the concentration of the contaminant. In the PID, ionization is caused by a UV light source. The strength of the UV, measured in electron volts (eV), determines which contaminants can be ionized. Three different-strength UV sources, including 9.6, 10.2, and 11.7 eV photionization type OVAs typically are used. Calibration and maintenance will be performed in accordance with the manufacturer's instructions.

F.1.6 Detector Tubes (MSA and Draeger)

A colorimetric detector tube is a direct-reading instrument consisting of a glass tube impregnated with an indicating chemical, which is connected to a piston cylinder or bellows-type pump. A known volume of air is drawn through the glass tube. The contaminant in the air reacts with the indicator chemical, producing a stain the length of which is proportional to the contaminant's concentration. Care must be taken when using the detector tubes because reliability of the results depends on the proper pump calibration, the degree of stability of the reacting chemical, and the ambient temperature. Interfering gases or vapors can also positively or negatively affect measured results. Calibration and maintenance will be performed in accordance with the manufacturer's instructions.

F.2 PERSONAL MONITORING: EQUIPMENT, CALIBRATION, AND MAINTENANCE

Personal monitoring will be undertaken to characterize exposure of high-risk employees to hazardous substances encountered on-site.

F.2.1 Personal Sampling Pumps

These devices can be worn by an employee to draw air samples through appropriate collection media. The units can be used to draw volumes from 2 to 3 liters per minute. Calibration will be conducted using standard industrial hygiene protocols before and after each sampling session (i.e., each day's use).

F.2.2 Passive Dosimeters or Gas Badges

These devices are nonmechanical collection devices used to monitor for organic vapors and various gases. The device is worn by an employee and then sent to an industrial hygiene laboratory for analysis.

F.2.3 Thermoluminescent Dosimetry Body Badges

These devices are nonmechanical collection devices used to monitor for x-ray, beta, and gamma radiation exposure. The badges are worn by ABB Environmental employees and sent quarterly to Tech/Ops Landauer, Inc., for analysis.

APPENDIX G

ZONATION

APPENDIX G

The site itself will normally be divided into three zones: (1) the majority of the work area, considered the Exclusion Zone; (2) limited areas serving as the Support Zone; and (3) an area for decontamination called the Contamination Reduction Zone (CRZ).

G.1 EXCLUSION ZONE

The Exclusion Zone isolates the area of contaminant generation and restricts (to the extent possible) the spread of contamination from active areas of the site to support areas and off-site locations. The Exclusion Zone is demarcated by the Hot Line (i.e., a tape line or physical barrier). Personnel entering the Exclusion Zone must (1) enter through the CRZ; (2) wear the prescribed level of protection; and (3) be otherwise authorized to enter the Exclusion Zone. Any personnel, equipment, or materials exiting the Exclusion Zone will be considered contaminated. Personnel will be subject to decontamination; equipment and materials will either be subject to decontamination or containerized in uncontaminated devices.

Within the Exclusion Zone, specific locations or restricted areas (clearly marked or identified) will be established (as necessary) for particular locations or around specific site operations. In the case of well drilling or excavation operations, a restricted area will be established that includes a minimum 30-foot radius from the drill rig or excavation operation. Other restricted areas may include drum areas, active site areas, sources of combustible gases or air contaminants, or other dangerous areas as they are identified. Access for emergency services to areas of specific site operations will be established.

G.2 CONTAMINATION REDUCTION ZONE

Moving out from the Exclusion Zone, starting at the Hot Line and continuing to the Contamination Control Line, is the CRZ. The CRZ is a transition zone between contaminated and uncontaminated areas of the site. When "hot" or contaminated personnel, equipment, or materials cross the Hot Line, they are assumed to be as hot or contaminated as they are going to be from site operations. Being subjected to the decontamination process, they become less contaminated; when they reach the Contamination Control Line, they are clean and can exit the CRZ without spreading contamination.

Within the CRZ is the Contamination Reduction Corridor, where materials necessary for full personnel and portable equipment decontamination are kept. A separate facility will be established for heavy equipment decontamination. In addition, certain safety equipment (e.g., emergency eye wash, fire extinguisher, stretcher, and first aid kit) are staged in this zone.

G.3 SUPPORT ZONE

The Support Zone is the outermost zone of the site, separated from the CRZ by the Contamination Control Line; it is considered a clean area. Movement of personnel and materials from the Support Zone into the CRZ is generally unrestricted, except as required through access points controlled for administrative purposes. However, only uncontaminated/decontaminated personnel or materials may enter the Support Zone from the CRZ.

The Support Zone contains the necessary support facilities (including personal hygiene facilities) for site operations. It also serves as the communications center and source of emergency assistance for operations in the Exclusion Zone and CRZ. A log of all persons entering the site will be maintained by the HSO, the field operations leader, or the site designee.

APPENDIX H

WORK PRACTICES

APPENDIX H

H.1 GENERAL

Workers will be expected to adhere to the established safe work practices for their respective specialties (e.g., drilling, laboratory analysis, and construction). The need to exercise caution in the performance of specific work tasks is made more acute due to (1) weather conditions; (2) restricted mobility and reduced peripheral vision caused by the protective gear itself; (3) the need to maintain integrity of the protective gear; and (4) 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 the following:

- In any unknown situation, always assume the worst conditions and plan responses accordingly.
- Use the buddy system. Under no conditions will any person be permitted to enter the Exclusion Zone alone. Establish and maintain communications. In addition to radio communications, it is advisable to develop a set of hand signals, because conditions may greatly impair verbal communications.
- Because no personal protective equipment is 100 percent effective, all personnel must minimize contact with excavated or contaminated materials. Plan work areas, decontamination areas, and procedures accordingly. Do not place equipment or drums on the ground. Do not sit on drums or other materials. Do not sit or kneel on the ground in the Exclusion Zone or CRZ. Avoid standing in or walking through puddles or stained soil.
- Disposable items will be used, when possible, to minimize risks during decontamination and possible cross-contamination during sample-handling.
- Smoking, eating, or drinking in the work area and before decontamination will not be allowed. Oral ingestion of contaminants is a likely means of introducing toxic substances into the body.

- Avoid heat and other work stresses related to wearing protective gear. Work breaks should be planned to prevent stress-related accidents or fatigue.
- Maintain monitoring systems. Conditions can change quickly if subsurface areas of contamination are penetrated.
- Conflicting situations that may arise concerning safety requirements and working conditions must be addressed and resolved rapidly by the HSO to avoid any motivation or pressure to circumvent established safety policy.
- To the extent feasible, handling of contaminated materials should be done in a remote area, particularly when drummed or other containerized hazardous waste materials are found on-site. Every effort should be made to identify the contents of containers found on-site before they are subject to material-handling applications.
- Personnel must be observant of not only their own immediate surroundings but also that of others. Everyone will be working under constraints; therefore, a team effort is needed to notice and warn of impending dangerous situations. Extra precautions are necessary when working near heavy equipment while using personnel protective gear because vision, hearing, and communication can be restricted.
- Contact lenses are not allowed to be worn on-site; if corrosive or lachrymose substances enter the eyes, proper flushing is impeded.
- All facial hair that interferes with the face piece fit must be removed before donning a respirator at all sites requiring Level C or Level B protection.
- Rigorous contingency planning and dissemination of plans to all personnel minimizes the impact of rapidly changing safety protocols in response to changing site conditions.
- Personnel must be aware that chemical contaminants may mimic or enhance symptoms of other illnesses or intoxication. Avoid excess use of alcohol or working while ill during field investigation assignments.
- The site leader, HSO, and sampling personnel will maintain project records in a bound notebook (e.g., daily activities, meetings, incidents, and data). Notebooks will remain on-site

for the project duration so that replacement personnel may add information, thereby maintaining continuity. The notebooks and daily records will become part of the permanent project file.

H.2 SITE ENTRY PROCEDURES

In most cases, ABB Environmental teams are not the first on-site investigators. Considerable knowledge of site history and current status allows preparation of a HASP 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 personal 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 following steps.

1. Recognize that ABB Environmental's presence on-site implies a perceived contamination potential by the client.
2. Assume that the site is contaminated and conduct a site safety reconnaissance, consisting of the following activities:
 - Establish a CRZ (decontamination area).
 - Survey the site at the highest level of protection practicable, beginning with a perimeter survey and gradually covering all areas of proposed activity with the following (as appropriate):
 - HNU PI meter or equivalent
 - OVA
 - radiation survey meter
 - personal air sampling pumps
 - chemically reactive indicator tubes
 - oxygen-deficiency meter
 - explosive mixture meter
 - Establish a "hot zone."
 - Review data, assess risk, and select the appropriate level of protection.

3. Prepare a summary site HASP and document all data acquired.

APPENDIX I

CONFINED-SPACE ENTRY PROCEDURES

APPENDIX I**I.1 CONFINED SPACE CLASSIFICATION**

Confined spaces are classified according to existing or potential chemical and physical hazards. Classification is based on characteristics of the confined space, oxygen level, flammability, and toxicity. Table I-1 defines the parameters of each classification. If any hazard presents a situation that is IDLH, the confined space is classified as Class A. Classification is determined by the most hazardous condition of entering, working in, and exiting a confined space. Class B confined spaces have the potential for causing injury and illness but are not IDLH. Class C entry is one in which the chemical hazard potential is minimal and does not require any special modification in work procedures.

I.2 ENTRY PROCEDURES**I.2.1 Team Size**

A minimum of three workers is required for each confined space activity; that is, two entry and one standby, or one entry, one rescue, and one standby. If the former arrangement is used, all three workers must be ABB Environmental employees. If the latter arrangement is used, the standby could be a non-ABB Environmental team member, assuming he or she has comparable training, is proficient in the assigned duties, and is capable of using all safety equipment.

The one entry/one rescue/one standby arrangement should only be used when the confined space is relatively small and/or the entry person will be in the line of sight at all times. In this instance, the rescue person acts as the second person in the "buddy system."

The two entry/one standby arrangement is used when the area of the confined space is larger, and the tasks may take the worker away from the entryway. Again, care must be taken using this arrangement because the standby person cannot enter the confined space and attempt rescue unless adequately protected (i.e., respiratory and dermal) and replaced by another qualified standby person.

Three workers is the minimum number required for these activities and, in most cases, should only be used for relatively nonhazardous confined spaces. Additional crew may be needed if entering a Class A or Class B confined space, including rescue, decontamination, and line-of-sight personnel.

TABLE I-1
 CONFINED SPACE CLASSIFICATION TABLE

PARAMETERS	CLASS A (LEVEL A OR B PPE)	CLASS B (LEVEL B OR C PPE)	CLASS C (LEVEL D PPE)
Characteristics	Immediately dangerous to life: Rescue procedures require the entry of more than one individual fully equipped with life-support equipment; maintenance of communication requires an additional standby person stationed within the confined space.	Dangerous, but not immediately life-threatening: Rescue procedures require the entry of no more than one individual fully equipped with life-support equipment; indirect visual or auditory communication with workers.	Potential hazard requires no modification of work procedures: Standard rescue procedures, direct communication with workers from outside the confined space.
Oxygen	19.4 percent or less *(122-mm Hg) or greater than 25 percent *(190 mm Hg)	19.5 to 21.4 percent *(122- to 147-mm Hg) or 21.5 to 25 percent (163- to 190-mm Hg)	19.5 to 21.4 percent *(148- to 163-mm Hg)
Flammability Characteristics	20-percent or greater LEL	10- to 19-percent LEL	10-percent LEL or less
Toxicity	**IDLH	Between the TLV/PEL and the **IDLH. If air-purifying respirators are used, maximum level based on breakthrough time (1,000 ppm maximum).	Less than the TLV/PEL
Respiratory Protection	SCBA or supplied air respirator with escape bottle.	SCBA, supplied air respirator with escape bottle or air-purifying respirator.	None.

* Based on total atmospheric pressure of 760-mm Hg (sea level).

** Immediately Dangerous to Life or Health, as referenced in NIOSH Registry of Toxic and Chemical Substances, Manufacturing Chemists data sheets, industrial hygiene guides, or other recognized authorities.

NOTES: Hg = mercury; LEL = Lower Explosive Limit; PEL = Permissible Exposure Limit;
 SCBA = Self Contained Breathing Apparatus; TLV = Threshold Limit Value
 PPE = Personal Protective Equipment

I.2.2 General Entry Procedures

The following steps must be taken when entering a confined space:

1. Inspect all pieces of equipment to ensure they are in good working order. DO NOT ENTER CONFINED SPACE WITH DEFECTIVE EQUIPMENT.
2. Conduct a background check to identify all potential hazards that may be encountered in the confined space. Determine whether there is potential for fire and/or explosion hazards, as well as a toxic or oxygen-deficient atmosphere.
3. Before entry, the atmosphere inside the confined space must be tested. An attempt should be made to test the atmosphere without opening the entryway (i.e., through a vent line or a small opening). If the entryway must be opened to test and only low levels are expected in the confined space, crack open the entryway, test the breathing zone first, and then test the confined space. If potentially high levels are expected in the breathing zone, respiratory protection should be worn before opening the entryway cover.
4. If an explosive, toxic, or oxygen-deficient atmosphere is detected, purge or ventilate the confined space prior to entry. Retest the atmosphere three times at 5-minute intervals. A person can enter the confined space without respiratory protection only if all three test results are below the Permissible Exposure Limit/Threshold Limit Value (PEL/TLV), 10 percent of the LEL, and above 19.5-percent oxygen (all three conditions must be met). (NOTE: Any downward deflection of the readings on the oxygen meter from background [i.e., 20.9 percent] should be viewed as potential for an IDLH atmosphere. Unless contaminants are known to be nontoxic, do not enter the confined space without respiratory protection if the oxygen level is below background.)
5. Install a blank or a block, or otherwise isolate, lockout, and tag all chemical, physical, and/or electrical hazards wherever possible.
6. If using an air-purifying respirator or if an IDLH and/or explosive atmosphere exists, air monitoring must be on a continuous basis. If respiratory protection is not used and there is potential for atmospheric conditions to change due to work practices or conditions, air monitoring should be done periodically. In all these cases, a 5-minute escape pack must be used.

CONFINED SPACE ENTRY CHECKLIST

GENERAL ENTRY

Site Name: _____ Entry Date: _____

Site Location: _____

Type of Confined Space: _____ Weather: (if applicable) _____

Work to be Performed: _____

Level of Personal Protection: _____

Potential Hazards: (Check all that apply)

<input type="checkbox"/> Corrosive	<input type="checkbox"/> Reactive	<input type="checkbox"/> Radioactive	<input type="checkbox"/> Hot Equipment
<input type="checkbox"/> Ignitable	<input type="checkbox"/> Volatiles	<input type="checkbox"/> Noise	<input type="checkbox"/> Falling Objects
<input type="checkbox"/> Toxic	<input type="checkbox"/> Biological	<input type="checkbox"/> Sharp Objects	<input type="checkbox"/> Pressure Systems
<input type="checkbox"/> Other: (list) _____			

Yes No N/A

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
--------------------------	--------------------------	--------------------------

Will work performed produce additional hazards (e.g. cleaning)?

List: _____

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Were instruments calibrated prior to entry?

Was confined space ventilated prior to entry?

Will ventilation continue during entry?

Is air intake of the ventilation system located in an area free of exhaust and combustible/toxic substances?

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Has space been isolated from other systems?

Has mechanical equipment been locked-out or disconnected?

Has mechanical equipment been blocked, chocked, disengaged, and/or disconnected where necessary?

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Are safety lines and harnesses used?

Will wrist-type harnesses be used if entryway is less than 18 in.?

Are nonsparking tools and intrinsically safe/explosion-proof powered tools and lighting used?

Entry Person(s): _____

Standby Person: _____ Rescue Person: _____

Other: _____

HSO: _____

CONFINED SPACE ENTRY CHECKLIST WORKSHEET

INITIAL ATMOSPHERE TESTING RESULTS: Record time and results of initial testing. If ventilation is necessary, record readings when the atmosphere stabilized and at 5-minute intervals.

	Breathing Zone	Initial	Atmosphere Stabilized	@ 5 min.	@ 10 min.
Time					
Combustible Gas Meter (%LEL)					
Oxygen Meter (%Oxygen)					
Hydrogen Sulfide Meter (ppm)					
PID Meter (ppm)					
Draeger Tube (ppm) Tube:					
Other List:					

ENTRY ATMOSPHERE TESTING RESULTS: Record time and the results of monitoring at initial entry and at 10-minute intervals. If no change in levels, extend to every 15 minutes. If significant fluctuations occur, reduce to every 5 minutes. (Note: Meters should be operated continuously in the confined space.)

	Initial				Final
Time					
Combustible Gas Meter (%LEL)					
Oxygen Meter (%Oxygen)					
Hydrogen Sulfide Meter (ppm)					
PID Meter (ppm)					
Draeger Tube (ppm) Tube:					
Other List:					

7. Record all results of the tests for hazardous conditions including the location, time, date, and weather (if applicable); and readings on the PID, combustible gas meter, oxygen-deficiency meter, Draeger tubes, and any other equipment used on the Confined-Space Entry Checklist-General Entry form (Figure I-1) and the Confined-Space Entry Checklist (Figure I-2). Send a copy of the completed form to the HSM or the HSS.
8. Wear appropriate clothing for site conditions, as determined by the HSO.
9. A safety belt or harness with lifeline must be worn if hazardous conditions exist, although good safety precautions dictate their use regardless of "existing" conditions. If the diameter of the entryway is less than 18 inches, the wrist-type harness must be used and special provisions made if a supplied-air respirator is necessary.
10. One person (i.e., standby) must remain at the entryway at all times and must keep continuous contact with the person entering the confined space. Contact can be maintained by line of sight, listening for sounds, the safety line, and/or radio. The standby person must not enter the confined space unless another trained person is available to act as standby, and he or she is equipped with adequate respiratory and dermal protection. (In most cases, respiratory protection would be an airline respirator or SCBA.)
11. Do not smoke when working in or near confined spaces and do not take flash-lit photographs when explosive gases are known or suspected to be present.
12. Do not rely on permanent ladders because they are often in poor condition. If they must be used, be sure of footing. Inspect permanent ladders for deterioration before entering and while descending. Try each step with one foot, while standing on the step above. When in doubt, use either a portable ladder of adequate height to reach 3 feet above opening or a rope ladder, or lower the entry person using the tripod. If a portable ladder is used, it should be tied off, if possible; otherwise, it should be held in place by the standby person.
13. Do not work without adequate lighting. Use only "explosion-proof" lights or hand lamps if combustible atmospheres are possible.

14. The entry person must not remain in the confined space if he or she becomes even slightly drowsy, faint, dizzy, or otherwise uncomfortable. Many of the gases that cause the most problems are odorless, tasteless, and invisible.

I.2.3 Manhole/Sewer Entry

When preparing to enter a manhole/sewer, the following safety measures must be taken:

1. Inspect all pieces of equipment to ensure they are in good working order. DO NOT ENTER CONFINED SPACE WITH DEFECTIVE EQUIPMENT.
2. Park the vehicle near the manhole (DO NOT leave the vehicle running). If the manhole is in the street, it is best to park so as to detour oncoming traffic around the manhole. The vehicle's emergency flashers and portable yellow warning beacon must be ON. The vehicle serves as protection from oncoming traffic, can be used to store emergency equipment (e.g., SCBA and first aid kit), and can be used in an extreme emergency to slowly pull an injured person from the confined space if a tripod with hoist attachment is unavailable or inoperative.
3. Erect portable barricades or cones around the manhole and in front of the vehicle to see that traffic is adequately diverted and to prevent pedestrians from falling in. Reflective vests should be worn so that workers are visible to approaching traffic.
4. If there are openings large enough to admit sampling tubes, test for the presence of explosive and toxic gases before removing each manhole cover. Otherwise, raise one side of the cover using the cover hook or pick, prop it slightly open, and conduct the tests.
5. If toxic or explosive gases are detected in the sewer, report this immediately to the local fire department and/or department of public works.
6. Using the Manhole/Sewer Entry Log Form, record the results of tests for hazardous conditions, including location, manhole number (if applicable), time, date, weather (if applicable), and readings on the PID, combustible gas meter, oxygen-deficiency meter, and Draeger tube (Figure I-3). Send a completed copy of the form to the HSS.

7. Remove manhole covers with a cover hook or pick; do not improvise. Be careful of fingers and toes; the cover is usually heavy and difficult to handle. Unless the cover is extremely heavy, it is safer for only one worker to handle it.
8. Test the atmosphere; if a toxic, flammable, or oxygen-deficient atmosphere exists, ventilate the sewer. Depending on the hazard, ventilation can be accomplished in various ways, for example: (1) remove and vent the adjoining upstream and downstream manhole covers, as soon as possible and well in advance of entering the manhole (high hazard); and (2) vent the manhole in which entry will occur (very low hazard). If a blower is used, it is desirable to establish a flow of air in the sewer, in one manhole and out another. Ensure that the air intake is well away from automobile exhaust, and combustible and/or toxic atmospheres. Appropriate traffic control measures must be taken by barricading or otherwise marking the open manholes.
9. After ventilating, test for explosive and toxic gases and oxygen deficiency in the manhole at ground level and at the bottom; record the results. If entering the sewer itself, make the same tests at the manholes at either end. If ventilation is necessary, monitor the atmosphere in the manhole while work progresses, or continue operation of the blower. Continuous monitoring (i.e., equipment ON during entire entry) is imperative because conditions within the sewer may change rapidly. Do not enter a manhole while there is an oxygen deficiency without a pressure-demand, air-supplied breathing apparatus. If the oxygen level is lower than 20.9 percent of background, caution must be taken because an IDLH atmosphere may exist.
10. When entering manholes or tanks, wear hardhats, protective clothing, and unless inappropriate, respiratory protection and safety belt or harness with lifeline. If the manhole is less than 18 inches in diameter, a wrist-type harness must be used and special provisions made if air-supplied respirators are necessary. When working in manholes greater than 12 feet deep, in the sewer itself, or where potential exists for gases to appear unexpectedly, a 5-minute emergency egress air supply is required (unless the time required to don the emergency respirator is greater than what would be needed to exit the manhole).

MANHOLE/SEWER ENTRY LOG

Location: _____ Date: _____
 Crew Chief: _____ Others: _____
 HSO: _____

Two-way radio available and working? _____
 Traffic control equipment in place? _____
 Location of nearby emergency telephone: _____
 Level of personal protective equipment to use: _____
 Safety harness with lifeline used? _____
 Monitoring equipment calibrated prior to use? _____

INITIAL ATMOSPHERE TESTING RESULTS

	Time	Hydrogen Sulfide	PID	Oxygen	LEL	Other
Manhole Opened						
Begin Ventilation						
Atmos. Stabilized						
@ 5 minutes						
@ 10 minutes						

ENTRY ATMOSPHERE TESTING RESULTS

	Time	Hydrogen Sulfide	PID	Oxygen	LEL	Other
Entry						
@ 10 minutes*						
@ 20 minutes*						
@ 30 minutes*						

* More often if needed

11. At least one person (i.e., standby) must remain at the manhole at all times and must keep continuous contact with the person entering the sewer. Contact can be maintained by line of sight, listening for sounds, and the safety line and/or radio. The standby person must not enter the manhole unless another trained person is available to act as standby and has adequate respiratory and dermal protection available. (In most cases, respiratory protection will be an airline respirator or SCBA.) The standby/rescue person should be suited up (but not yet on air) before the work crew enters the confined space.
12. Do not smoke when working in or near manholes. Do not take flash-lit photographs when explosive gases are known or suspected to be present.
13. Do not rely on the manhole ladders because they are often in poor condition. If they must be used, be sure of footing. Inspect manhole ladders for deterioration before entering and while descending. Try each step with one foot, while standing on the step above. When in doubt, use a portable ladder of adequate height to reach 3 feet above the manhole opening, a rope ladder, or lower the entry person using the tripod. If a portable ladder is used, it should be tied off if possible; otherwise, it should be held in place by the standby person.
14. Do not work without adequate lighting. Use only "explosion-proof" lights or hand lamps in the manhole or sewer.
15. The entry person must not remain in the manhole or sewer if he or she becomes even slightly drowsy, faint, dizzy, or otherwise uncomfortable. Remember that carbon monoxide, carbon dioxide, methane, and hydrogen sulfide, which cause the most trouble, are odorless (hydrogen sulfide has a distinct odor only during initial exposure), tasteless, and invisible.

APPENDIX J

EXCAVATION AND TRENCHING

APPENDIX J

J.1 EXCAVATION PROCEDURES

Because excavations and trenches pose a hazard to employees, structures, and equipment, all excavations created during site operations will be done in accordance with 29 CFR 1926 Subpart P. The following steps summarize the excavation procedures that will be followed by all ABB Environmental personnel:

- Prior to excavating or trenching, all surface encumbrances located so as to create a hazard to the employees will be removed or supported, and all underground utilities will be determined and located.
- Entry into excavations will be avoided at all costs. If entry is unavoidable, the excavation will be considered a confined space; as such, entry will be done in accordance with the Confined Space Entry Program (see Appendix I).
- Under no circumstances will site personnel enter excavations that are not adequately protected from cave-ins by shoring or sloping.
- Stairways, ladders, or ramps will be located in trenches deeper than 4 feet and situated to require no more than 25 feet of lateral travel.
- Excavations below the base of a building or structure will not be permitted unless the building or structure is adequately supported or a registered professional engineer determines that the excavation will not pose a hazard to the employee.
- All equipment will be kept at least 2 feet from the edge of the excavation.
- Any excavation left open and unattended will be barricaded or covered until it can be backfilled.

J.2 SLOPING

Acceptable options for sloping or benching include the following:

Option 1. A slope of 1½ horizontal to 1 vertical (34 degrees measured from the horizontal).

Option 2. Determination of the maximum allowable slope based on soil conditions and in accordance with the conditions and requirements set forth in 1926 Subpart P, Appendices A and B (see Attachment A).

Option 3. Designs of sloping or benching systems using tabulated data approved by a registered professional engineer.

Option 4. Other systems designed by a registered professional engineer.

J.3 SHORING

Acceptable options for shoring include the following:

Option 1. Designs using Appendices A, C, and D of 1910.126 Subpart P (see Attachment A).

Option 2. Designs using manufacturers tabulated data.

Option 3. Designs using tabulated data approved by a registered professional engineer.

Option 4. Other support systems designed by a registered professional engineer.

ATTACHMENT A

**29 CFR 1926 SUBPART P
APPENDICES A THROUGH D**

OCCUPATIONAL SAFETY AND HEALTH STANDARDS - EXCAVATIONS

ATTACHMENT A

29 CFR 1926 SUBPART P
APPENDICES A THROUGH D

OCCUPATIONAL SAFETY AND HEALTH STANDARDS - EXCAVATIONS

(ii) Installation of a support system shall be closely coordinated with the excavation of trenches.

(f) *Sloping and benching systems.* Employees shall not be permitted to work on the faces of sloped or benched excavations at levels above other employees except when employees at the lower levels are adequately protected from the hazard of falling, rolling, or sliding material or equipment.

(g) *Shield systems*—(1) *General.* (i) Shield systems shall not be subjected to loads exceeding those which the system was designed to withstand.

(ii) Shields shall be installed in a manner to restrict lateral or other hazardous movement of the shield in the event of the application of sudden lateral loads.

(iii) Employees shall be protected from the hazard of cave-ins when entering or exiting the areas protected by shields.

(iv) Employees shall not be allowed in shields when shields are being installed, removed, or moved vertically.

(2) *Additional requirement for shield systems used in trench excavations.* Excavations of earth material to a level not greater than 2 feet (.61 m) below the bottom of a shield shall be permitted, but only if the shield is designed to resist the forces calculated for the full depth of the trench, and there are no indications while the trench is open of a possible loss of soil from behind or below the bottom of the shield.

Appendix A to Subpart P

Soil Classification

(a) *Scope and application*—(1) *Scope.* This appendix describes a method of classifying soil and rock deposits based on site and environmental conditions, and on the structure and composition of the earth deposits. The appendix contains definitions, sets forth requirements, and describes acceptable visual and manual tests for use in classifying soils.

(2) *Application.* This appendix applies when a sloping or benching system is designed in accordance with the requirements set forth in § 1926.652(b)(2) as a method of protection for employees from cave-ins. This appendix also applies when timber shoring for excavations is designed as a method of protection from cave-ins in accordance with appendix C to subpart P of part 1926, and when aluminum hydraulic shoring is designed in accordance with appendix D. This Appendix also applies if other protective systems are designed and selected for use from data prepared in accordance with the requirements set forth in § 1926.652(c), and the use of the data is predicated on the use of the soil classification system set forth in this appendix.

(b) *Definitions.* The definitions and examples given below are based on, in whole or in part, the following: American Society for

Testing Materials (ASTM) Standards D653-85 and D2488; The Unified Soils Classification System, The U.S. Department of Agriculture (USDA) Textural Classification Scheme; and The National Bureau of Standards Report BSS-121.

Cemented soil means a soil in which the particles are held together by a chemical agent, such as calcium carbonate, such that a hand-size sample cannot be crushed into powder or individual soil particles by finger pressure.

Cohesive soil means clay (fine grained soil), or soil with a high clay content, which has cohesive strength. Cohesive soil does not crumble, can be excavated with vertical sideslopes, and is plastic when moist. Cohesive soil is hard to break up when dry, and exhibits significant cohesion when submerged. Cohesive soils include clayey silt, sandy clay, silty clay, clay and organic clay.

Dry soil means soil that does not exhibit visible signs of moisture content.

Fissured means a soil material that has a tendency to break along definite planes of fracture with little resistance, or a material that exhibits open cracks, such as tension cracks, in an exposed surface.

Granular soil means gravel, sand, or silt (coarse grained soil) with little or no clay content. Granular soil has no cohesive strength. Some moist granular soils exhibit apparent cohesion. Granular soil cannot be molded when moist and crumbles easily when dry.

Layered system means two or more distinctly different soil or rock types arranged in layers. Micaceous seams or weakened planes in rock or shale are considered layered.

Moist soil means a condition in which a soil looks and feels damp. Moist cohesive soil can easily be shaped into a ball and rolled into small diameter threads before crumbling. Moist granular soil that contains some cohesive material will exhibit signs of cohesion between particles.

Plastic means a property of a soil which allows the soil to be deformed or molded without cracking, or appreciable volume change.

Saturated soil means a soil in which the voids are filled with water. Saturation does not require flow. Saturation, or near saturation, is necessary for the proper use of instruments such as a pocket penetrometer or shear vane.

Soil classification system means, for the purpose of this subpart, a method of categorizing soil and rock deposits in a hierarchy of Stable Rock, Type A, Type B, and Type C, in decreasing order of stability. The categories are determined based on an analysis of the properties and performance characteristics of the deposits and the environmental conditions of exposure.

Stable rock means natural solid mineral matter that can be excavated with vertical sides and remain intact while exposed.

Submerged soil means soil which is underwater or is free seeping.

Type A means cohesive soils with an unconfined compressive strength of 1.3 ton per square foot (tsf) (144 kPa) or greater. Examples of cohesive soils are: clay, silty clay, sandy clay, clay loam and, in some

cases, silty clay loam and sandy clay loam. Cemented soils such as caliche and hardpan are also considered Type A. However, no soil is Type A if:

(i) The soil is fissured; or
(ii) The soil is subject to vibration from heavy traffic, pile driving, or similar effects; or

(iii) The soil has been previously disturbed; or

(iv) The soil is part of a sloped, layered system where the layers dip into the excavation on a slope of four horizontal to one vertical (4H:1V) or greater; or

(v) The material is subject to other factors that would require it to be classified as a less stable material.

Type B means:

(i) Cohesive soil with an unconfined compressive strength greater than 0.5 tsf (48 kPa) but less than 1.3 tsf (144 kPa); or

(ii) Granular cohesionless soils including: angular gravel (similar to crushed rock), silt, silt loam, sandy loam and, in some cases, silty clay loam and sandy clay loam.

(iii) Previously disturbed soils except those which would otherwise be classed as Type C soil.

(iv) Soil that meets the unconfined compressive strength or cementation requirements for Type A, but is fissured or subject to vibration; or

(v) Dry rock that is not stable; or

(vi) Material that is part of a sloped, layered system where the layers dip into the excavation on a slope less steep than four horizontal to one vertical (4H:1V), but only if the material would otherwise be classified as Type B.

Type C means:

(i) Cohesive soil with an unconfined compressive strength of 0.5 tsf (48 kPa) or less; or

(ii) Granular soils including gravel, sand, and loamy sand; or

(iii) Submerged soil or soil from which water is freely seeping; or

(iv) Submerged rock that is not stable, or

(v) Material in a sloped, layered system where the layers dip into the excavation on a slope of four horizontal to one vertical (4H:1V) or steeper.

Unconfined compressive strength means the load per unit area at which a soil will fail in compression. It can be determined by laboratory testing, or estimated in the field using a pocket penetrometer, by thumb penetration tests, and other methods.

Wet soil means soil that contains significantly more moisture than moist soil, but in such a range of values that cohesive material will slump or begin to flow when vibrated. Granular material that would exhibit cohesive properties when moist will lose those cohesive properties when wet.

(c) *Requirements*—(1) *Classification of soil and rock deposits.* Each soil and rock deposit shall be classified by a competent person as Stable Rock, Type A, Type B, or Type C in accordance with the definitions set forth in paragraph (b) of this appendix.

(2) *Basis of classification.* The classification of the deposits shall be made based on the results of at least one visual and at least one manual analysis. Such analyses

shall be conducted by a competent person using tests described in paragraph (d) below, or in other recognized methods of soil classification and testing such as those adopted by the American Society for Testing Materials, or the U.S. Department of Agriculture textural classification system.

(3) *Visual and manual analyses.* The visual and manual analyses, such as those noted as being acceptable in paragraph (d) of this appendix, shall be designed and conducted to provide sufficient quantitative and qualitative information as may be necessary to identify properly the properties, factors, and conditions affecting the classification of the deposits.

(4) *Layered systems.* In a layered system, the system shall be classified in accordance with its weakest layer. However, each layer may be classified individually where a more stable layer lies under a less stable layer.

(5) *Reclassification.* If, after classifying a deposit, the properties, factors, or conditions affecting its classification change in any way, the changes shall be evaluated by a competent person. The deposit shall be reclassified as necessary to reflect the changed circumstances.

(d) *Acceptable visual and manual tests.*—

(1) *Visual tests.* Visual analysis is conducted to determine qualitative information regarding the excavation site in general, the soil adjacent to the excavation, the soil forming the sides of the open excavation, and the soil taken as samples from excavated material.

(i) Observe samples of soil that are excavated and soil in the sides of the excavation. Estimate the range of particle sizes and the relative amounts of the particle sizes. Soil that is primarily composed of fine-grained material is cohesive material. Soil composed primarily of coarse-grained sand or gravel is granular material.

(ii) Observe soil as it is excavated. Soil that remains in clumps when excavated is cohesive. Soil that breaks up easily and does not stay in clumps is granular.

(iii) Observe the side of the opened excavation and the surface area adjacent to the excavation. Crack-like openings such as tension cracks could indicate fissured material. If chunks of soil spill off a vertical side, the soil could be fissured. Small spills are evidence of moving ground and are indications of potentially hazardous situations.

(iv) Observe the area adjacent to the excavation and the excavation itself for evidence of existing utility and other underground structures, and to identify previously disturbed soil.

(v) Observe the opened side of the excavation to identify layered systems. Examine layered systems to identify if the layers slope toward the excavation. Estimate the degree of slope of the layers.

(vi) Observe the area adjacent to the excavation and the sides of the opened excavation for evidence of surface water, water seeping from the sides of the excavation, or the location of the level of the water table.

(vii) Observe the area adjacent to the excavation and the area within the excavation for sources of vibration that may affect the stability of the excavation face.

(2) *Manual tests.* Manual analysis of soil samples is conducted to determine quantitative as well as qualitative properties of soil and to provide more information in order to classify soil properly.

(i) *Plasticity.* Mold a moist or wet sample of soil into a ball and attempt to roll it into threads as thin as 1/8-inch in diameter. Cohesive material can be successfully rolled into threads without crumbling. For example, if at least a two inch (50 mm) length of 1/8-inch thread can be held on one end without tearing, the soil is cohesive.

(ii) *Dry strength.* If the soil is dry and crumbles on its own or with moderate pressure into individual grains or fine powder, it is granular (any combination of gravel, sand, or silt). If the soil is dry and falls into clumps which break up into smaller clumps, but the smaller clumps can only be broken up with difficulty, it may be clay in any combination with gravel, sand or silt. If the dry soil breaks into clumps which do not break up into small clumps and which can only be broken with difficulty, and there is no visual indication the soil is fissured, the soil may be considered unfissured.

(iii) *Thumb penetration.* The thumb penetration test can be used to estimate the unconfined compressive strength of cohesive soils. (This test is based on the thumb penetration test described in American Society for Testing and Materials (ASTM) Standard designation D2488—"Standard Recommended Practice for Description of Soils (Visual—Manual Procedure).") Type A soils with an unconfined compressive strength of 1.5 tcf can be readily indented by the thumb; however, they can be penetrated by the thumb only with very great effort. Type C soils with an unconfined compressive strength of 0.5 tcf can be easily penetrated several inches by the thumb, and can be molded by light finger pressure. This test should be conducted on an undisturbed soil sample, such as a large clump of spoil, as soon as practicable after excavation to keep to a minimum the effects of exposure to drying influences. If the excavation is later exposed to wetting influences (rain, flooding), the classification of the soil must be changed accordingly.

(iv) *Other strength tests.* Estimates of unconfined compressive strength of soils can also be obtained by use of a pocket penetrometer or by using a hand-operated shearvane.

(v) *Drying test.* The basic purpose of the drying test is to differentiate between cohesive material with fissures, unfissured cohesive material, and granular material. The procedure for the drying test involves drying a sample of soil that is approximately one inch thick (2.54 cm) and six inches (15.24 cm) in diameter until it is thoroughly dry.

(A) If the sample develops cracks as it dries, significant fissures are indicated.

(B) Samples that dry without cracking are to be broken by hand. If considerable force is necessary to break a sample, the soil has significant cohesive material content. The soil can be classified as a unfissured cohesive material and the unconfined compressive strength should be determined.

(C) If a sample breaks easily by hand, it is either a fissured cohesive material or a

granular material. To distinguish between the two, pulverize the dried clumps of the sample by hand or by stepping on them. If the clumps do not pulverize easily, the material is cohesive with fissures. If they pulverize easily into very small fragments, the material is granular.

Appendix B to Subpart P

Sloping and Benching

(a) *Scope and application.* This appendix contains specifications for sloping and benching when used as methods of protecting employees working in excavations from cave-ins. The requirements of this appendix apply when the design of sloping and benching protective systems is to be performed in accordance with the requirements set forth in § 1926.852(b)(2).

(b) Definitions.

Actual slope means the slope to which an excavation face is excavated.

Distress means that the soil is in a condition where a cave-in is imminent or is likely to occur. Distress is evidenced by such phenomena as the development of fissures in the face or adjacent to an open excavation; the subsidence of the edge of an excavation; the slumping of material from the face or the bulging or heaving of material from the bottom of an excavation; the spalling of material from the face of an excavation; and raveling, i.e., small amounts of material such as pebbles or little clumps of material suddenly separating from the face of an excavation and trickling or rolling down into the excavation.

Maximum allowable slope means the steepest incline of an excavation face that is acceptable for the most favorable site conditions as protection against cave-ins, and is expressed as the ratio of horizontal distance to vertical rise (H:V).

Short term exposure means a period of time less than or equal to 24 hours that an excavation is open.

(c) *Requirements*—(1) *Soil classification.* Soil and rock deposits shall be classified in accordance with appendix A to subpart P of part 1926.

(2) *Maximum allowable slope.* The maximum allowable slope for a soil or rock deposit shall be determined from Table B-1 of this appendix.

(3) *Actual slope.* (i) The actual slope shall not be steeper than the maximum allowable slope.

(ii) The actual slope shall be less steep than the maximum allowable slope, when there are signs of distress. If that situation occurs, the slope shall be cut back to an actual slope which is at least 1/2 horizontal to one vertical (1/2H:1V) less steep than the maximum allowable slope.

(iii) When surcharge loads from stored material or equipment, operating equipment, or traffic are present, a competent person shall determine the degree to which the actual slope must be reduced below the maximum allowable slope, and shall assure that such reduction is achieved. Surcharge loads from adjacent structures shall be evaluated in accordance with § 1926.851(i).

(4) *Configurations.* Configurations of sloping and benching systems shall be in accordance with Figure B-1.

TABLE B-1
MAXIMUM ALLOWABLE SLOPES

SOIL OR ROCK TYPE	MAXIMUM ALLOWABLE SLOPES (H:V) ^[1] FOR EXCAVATIONS LESS THAN 20 FEET DEEP ^[3]
STABLE ROCK TYPE A [2] TYPE B TYPE C	VERTICAL (90°) 3/4 : 1 (53°) 1:1 (45°) 1½ : 1 (34°)

NOTES:

1. Numbers shown in parentheses next to maximum allowable slopes are angles expressed in degrees from the horizontal. Angles have been rounded off.
2. A short-term maximum allowable slope of 1/2H:1V (63°) is allowed in excavations in Type A soil that are 12 feet (3.67 m) or less in depth. Short-term maximum allowable slopes for excavations greater than 12 feet (3.67 m) in depth shall be 3/4H:1V (53°).
3. Sloping or benching for excavations greater than 20 feet deep shall be designed by a registered professional engineer.

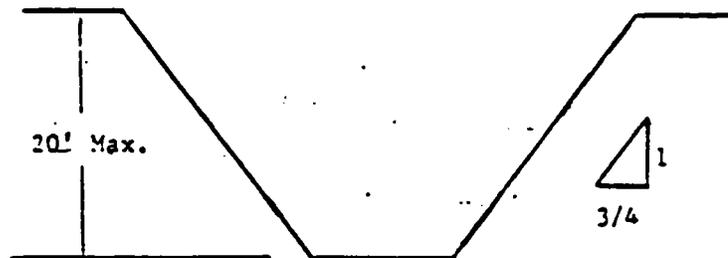
Figure B-

Slope Configurations

(All slopes stated below are in the horizontal to vertical ratio)

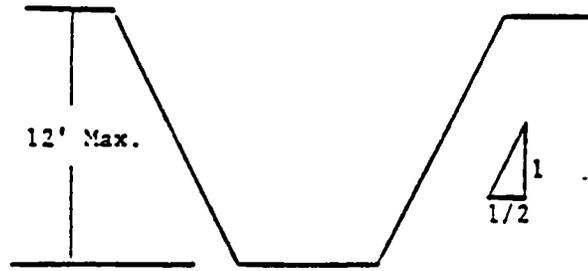
B-1.1 Excavations made in Type A soil.

1. All simple slope excavation 20 feet or less in depth shall have a maximum allowable slope of ¾:1.



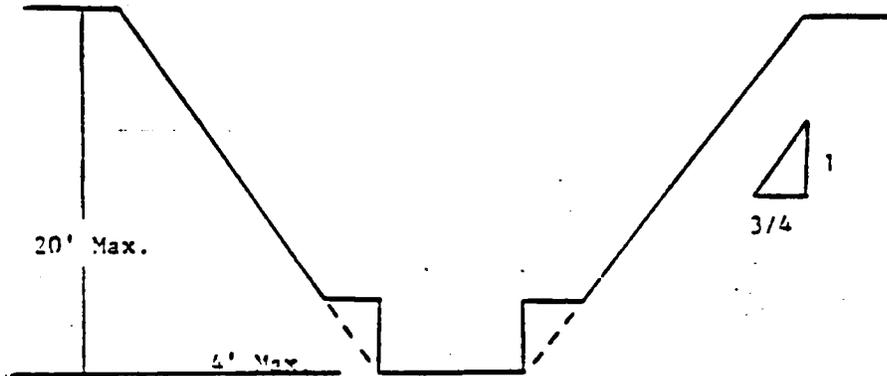
Simple Slope—General

Exception: Simple slope excavations which are open 24 hours or less (short term) and which are 12 feet or less in depth shall have a maximum allowable slope of ¾:1.

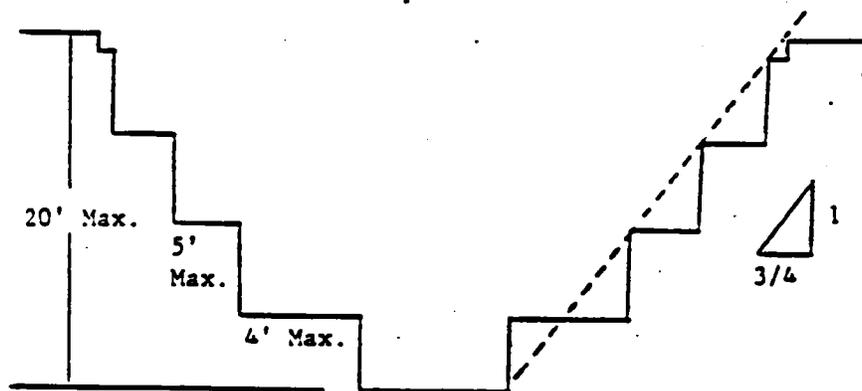


Simple Slope—Short Term

2. All benched excavations 20 feet or less in depth shall have a maximum allowable slope of $\frac{3}{4}$ to 1 and maximum bench dimensions as follows:

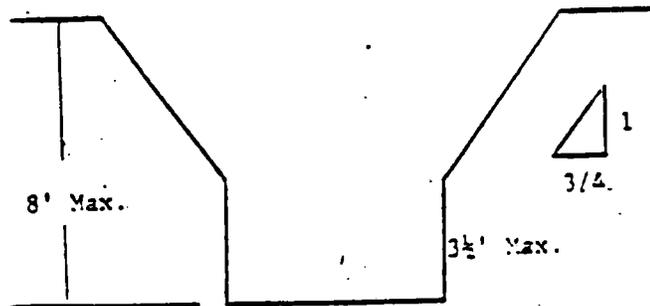


Simple Bench



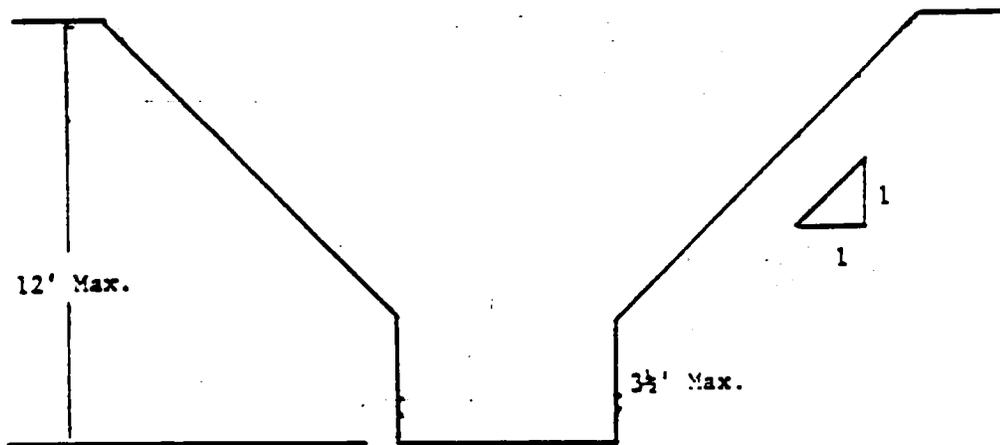
Multiple Bench

3. All excavations 8 feet or less in depth which have unsupported vertically sided lower portions shall have a maximum vertical side of $3\frac{1}{4}$ feet.



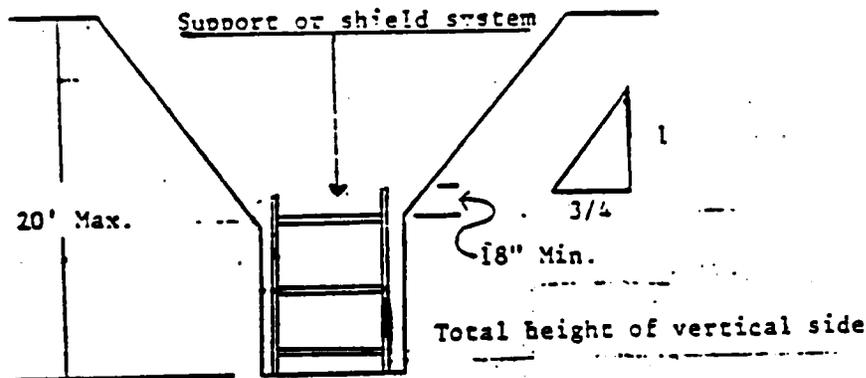
Unsupported Vertically Sided Lower Portion—Maximum 8 Feet in Depth

All excavations more than 8 feet but not more than 12 feet in depth which unsupported vertically sided lower portions shall have a maximum allowable slope of 1:1 and a maximum vertical side of 3 1/4 feet.



Unsupported Vertically Sided Lower Portion—Maximum 12 Feet in Depth

All excavations 20 feet or less in depth which have vertically sided lower portions that are supported or shielded shall have a maximum allowable slope of 3/4:1. The support or shield system must extend at least 18 inches above the top of the vertical side.

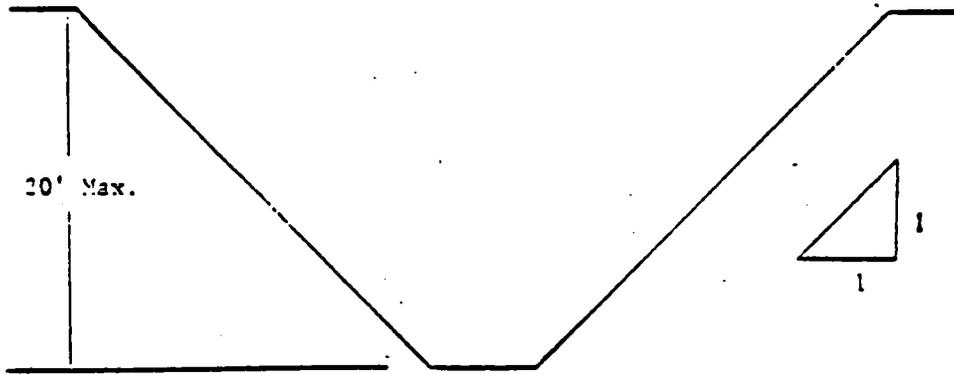


Supported or Shielded Vertically Sided Lower Portion

4. All other simple slope, compound slope, and vertically sided lower portion excavations shall be in accordance with the other options permitted under § 1926.652(b).

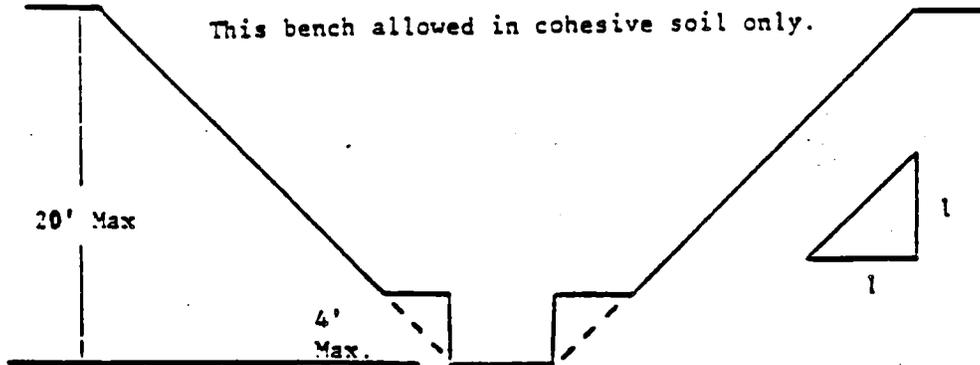
B-1.2 Excavations Made in Type B Soil

1. All simple slope excavations 20 feet or less in depth shall have a maximum allowable slope of 1:1.

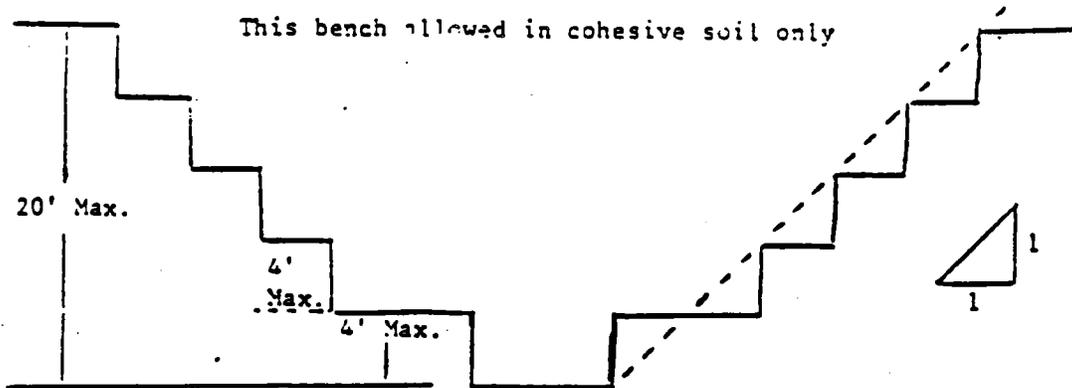


Simple Slope

2. All benched excavations 20 feet or less in depth shall have a maximum allowable slope of 1:1 and maximum bench dimensions as follows:

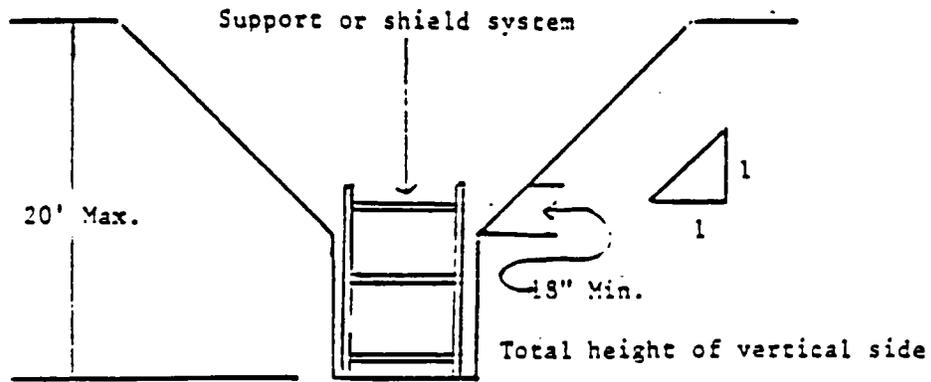


Single Bench



Multiple Bench

3. All excavations 20 feet or less in depth which have vertically sided lower portions shall be shielded or supported to a height at least 18 inches above the top of the vertical side. All such excavations shall have a maximum allowable slope of 1:1.

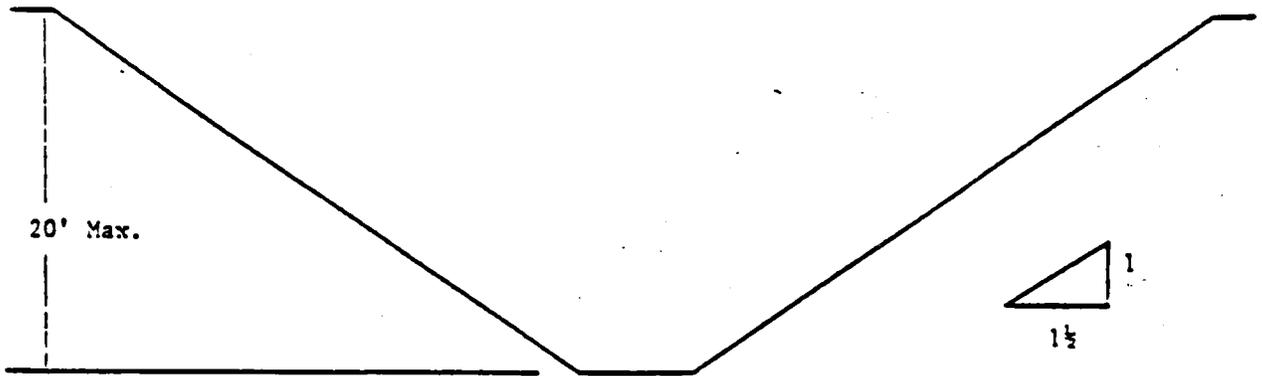


Vertically Sided Lower Portion

4. All other sloped excavations shall be in accordance with the other options permitted in § 1926.852(b).

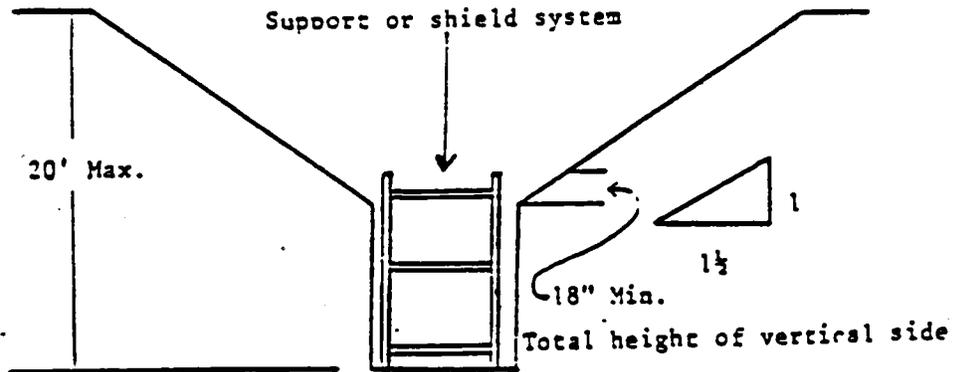
B-1.3 Excavations Made in Type C Soil

1. All simple slope excavations 20 feet or less in depth shall have a maximum allowable slope of 1½:1.



Simple Slope

2. All excavations 20 feet or less in depth which have vertically sided lower portions shall be shielded or supported to a height at least 18 inches above the top of the vertical side. All such excavations shall have a maximum allowable slope of 1½:1.

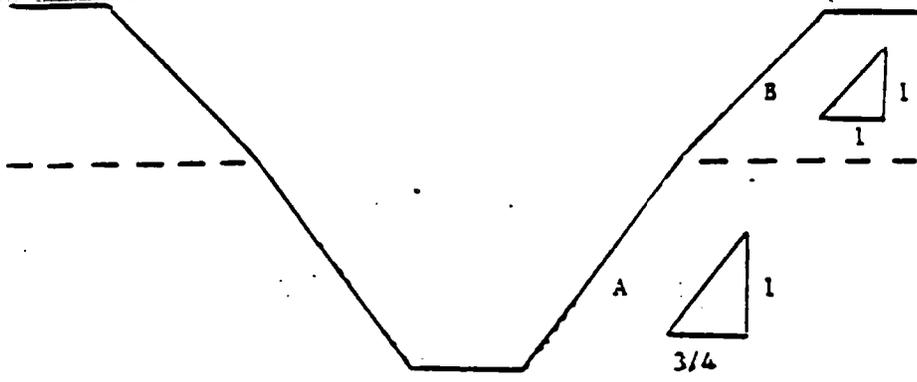


Vertical Sided Lower Portion

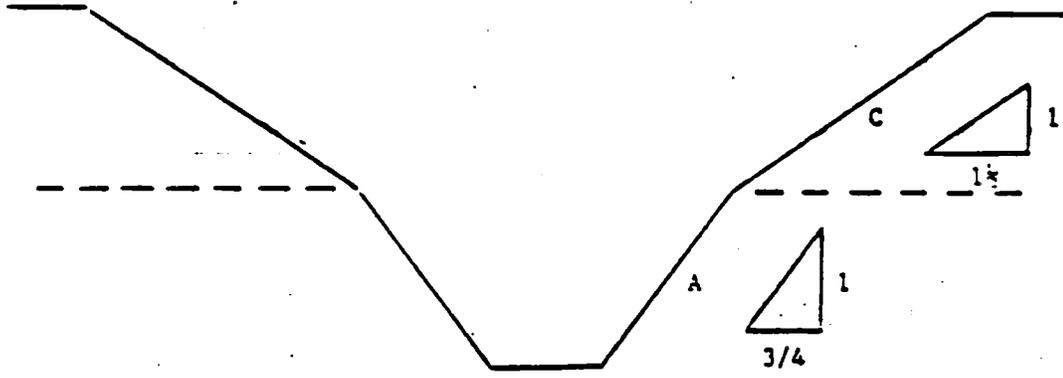
3. All other sloped excavations shall be in accordance with the other options permitted in § 1926.852(b).

B-1.4 Excavations Made in Layered Soils

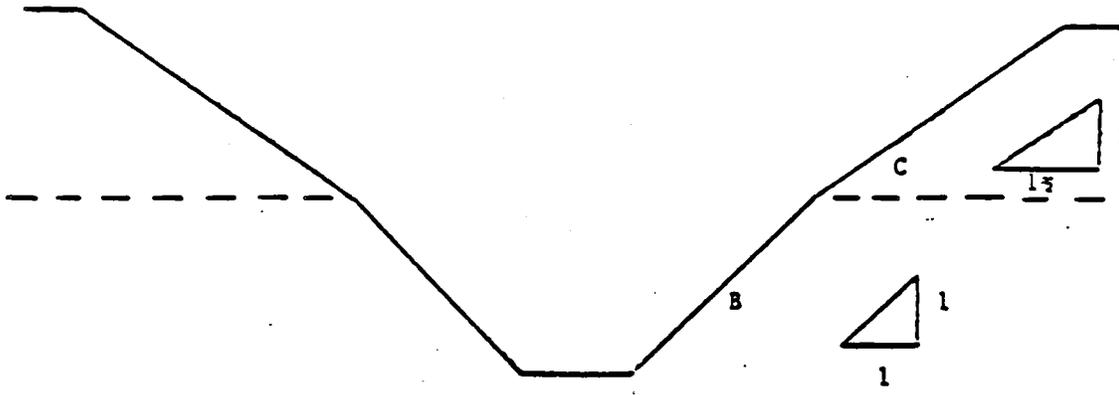
1. All excavations 20 feet or less in depth made in layered soils shall have a maximum allowable slope for each layer as set forth below.



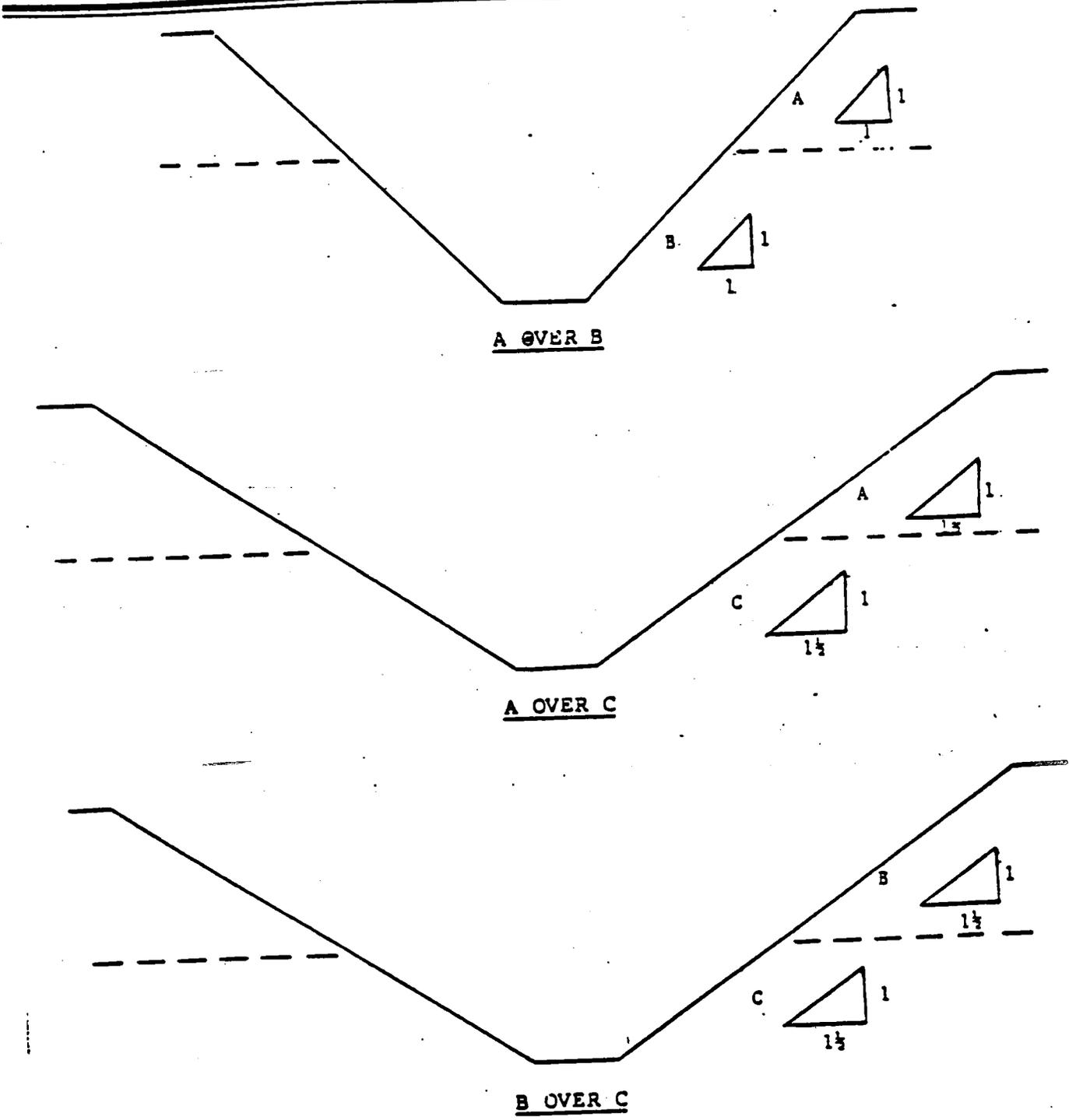
B OVER A



C OVER A



C OVER B



2. All other sloped excavations shall be in accordance with the other options permitted in § 1926.652(b).

**Appendix C to Subpart P
Timber Shoring for Trenches**

(a) *Scope.* This appendix contains information that can be used timber shoring is provided as a method of protection from cave-ins in trenches that do not exceed 20

feet (6.1 m) in depth. This appendix must be used when design of timber shoring protective systems is to be performed in accordance with § 1926.652(c)(1). Other timber shoring configurations; other systems of support such as hydraulic and pneumatic systems; and other protective systems such as sloping, benching, shielding, and freezing

systems must be designed in accordance with the requirements set forth in § 1926.652(b) and § 1926.652(c).

(b) *Soil Classification.* In order to use the data presented in this appendix, the soil type or types in which the excavation is made must first be determined using the soil

classification method set forth in appendix A of subpart P of this part.

(c) *Presentation of Information.* Information is presented in several forms as follows:

(1) Information is presented in tabular form in Tables C-1.1, C-1.2, and C-1.3, and Tables C-2.1, C-2.2 and C-2.3 following paragraph (g) of the appendix. Each table presents the minimum sizes of timber members to use in a shoring system, and each table contains data only for the particular soil type in which the excavation or portion of the excavation is made. The data are arranged to allow the user the flexibility to select from among several acceptable configurations of members based on varying the horizontal spacing of the crossbraces. Stable rock is exempt from shoring requirements and therefore, no data are presented for this condition.

(2) Information concerning the basis of the tabular data and the limitations of the data is presented in paragraph (d) of this appendix, and on the tables themselves.

(3) Information explaining the use of the tabular data is presented in paragraph (e) of this appendix.

(4) Information illustrating the use of the tabular data is presented in paragraph (f) of this appendix.

(5) Miscellaneous notations regarding Tables C-1.1 through C-1.3 and Tables C-2.1 through C-2.3 are presented in paragraph (g) of this Appendix.

(d) *Basis and limitations of the data.*—(1) *Dimensions of timber members.* (i) The sizes of the timber members listed in Tables C-1.1 through C-1.3 are taken from the National Bureau of Standards (NBS) report, "Recommended Technical Provisions for Construction Practice in Shoring and Sloping of Trenches and Excavations." In addition, where NBS did not recommend specific sizes of members, member sizes are based on an analysis of the sizes required for use by existing codes and on empirical practice.

(ii) The required dimensions of the members listed in Tables C-1.1 through C-1.3 refer to actual dimensions and not nominal dimensions of the timber. Employers wanting to use nominal size shoring are directed to Tables C-2.1 through C-2.3, or have this choice under § 1926.652(c)(3), and are referred to The Corps of Engineers, The Bureau of Reclamation or data from other acceptable sources.

(2) *Limitation of application.* (i) It is not intended that the timber shoring specification apply to every situation that may be experienced in the field. These data were developed to apply to the situations that are most commonly experienced in current trenching practice. Shoring systems for use in situations that are not covered by the data in this appendix must be designed as specified in § 1926.652(c).

(ii) When any of the following conditions are present, the members specified in the tables are not considered adequate. Either an alternate timber shoring system must be designed or another type of protective system designed in accordance with § 1926.652.

(A) When loads imposed by structures or by stored material adjacent to the trench weigh in excess of the load imposed by a two-foot soil surcharge. The term "adjacent"

as used here means the area within a horizontal distance from the edge of the trench equal to the depth of the trench.

(B) When vertical loads imposed on cross braces exceed a 240-pound gravity load distributed on a one-foot section of the center of the crossbrace.

(C) When surcharge loads are present from equipment weighing in excess of 20,000 pounds.

(D) When only the lower portion of a trench is shored and the remaining portion of the trench is sloped or benched unless: The sloped portion is sloped at an angle less steep than three horizontal to one vertical; or the members are selected from the tables for use at a depth which is determined from the top of the overall trench, and not from the toe of the sloped portion.

(e) *Use of Tables.* The members of the shoring system that are to be selected using this information are the cross braces, the uprights, and the wales, where wales are required. Minimum sizes of members are specified for use in different types of soil. There are six tables of information, two for each soil type. The soil type must first be determined in accordance with the soil classification system described in appendix A to subpart P of part 1926. Using the appropriate table, the selection of the size and spacing of the members is then made. The selection is based on the depth and width of the trench where the members are to be installed and, in most instances, the selection is also based on the horizontal spacing of the crossbraces. Instances where a choice of horizontal spacing of crossbracing is available, the horizontal spacing of the crossbraces must be chosen by the user before the size of any member can be determined. When the soil type, the width and depth of the trench, and the horizontal spacing of the crossbraces are known, the size and vertical spacing of the crossbraces, the size and vertical spacing of the wales, and the size and horizontal spacing of the uprights can be read from the appropriate table.

(f) *Examples to Illustrate the Use of Tables C-1.1 through C-1.3.*

(1) *Example 1.*

A trench dug in Type A soil is 13 feet deep and five feet wide.

From Table C-1.1, for acceptable arrangements of timber can be used.

Arrangement #1

Space 4×4 crossbraces at six feet horizontally and four feet vertically.

Wales are not required.

Space 3×8 uprights at six feet horizontally. This arrangement is commonly called "skip shoring."

Arrangement #2

Space 4×6 crossbraces at eight feet horizontally and four feet vertically.

Space 8×8 wales at four feet vertically.

Space 2×6 uprights at four feet horizontally.

Arrangement #3

Space 6×6 crossbraces at 10 feet horizontally and four feet vertically.

Space 8×10 wales at four feet vertically.

Space 2×6 uprights at five feet horizontally.

Arrangement #4

Space 6×8 crossbraces at 12 feet horizontally and four feet vertically.

Space 10×10 wales at four feet vertically.

Spaces 3×8 uprights at six feet horizontally.

(2) *Example 2.*

A trench dug in Type B soil is 13 feet deep and five feet wide. From Table C-1.2 three acceptable arrangements of members are listed.

Arrangement #1

Space 6×6 crossbraces at six feet horizontally and five feet vertically.

Space 8×8 wales at five feet vertically.

Space 2×6 uprights at two feet horizontally.

Arrangement #2

Space 6×8 crossbraces at eight feet horizontally and five feet vertically.

Space 10×10 wales at five feet vertically.

Space 2×6 uprights at two feet horizontally.

Arrangement #3

Space 8×8 crossbraces at 10 feet horizontally and five feet vertically.

Space 10×12 wales at five feet vertically.

Space 2×6 uprights at two feet vertically.

(3) *Example 3.*

A trench dug in Type C soil is 13 feet deep and five feet wide.

From Table C-1.3 two acceptable arrangements of members can be used.

Arrangement #1

Space 8×8 crossbraces at six feet horizontally and five feet vertically.

Space 10×12 wales at five feet vertically.

Position 2×6 uprights as closely together as possible.

If water must be retained use special tongue and groove uprights to form tight sheeting.

Arrangement #2

Space 8×10 crossbraces at eight feet horizontally and five feet vertically.

Space 12×12 wales at five feet vertically.

Position 2×6 uprights in a close sheeting configuration unless water pressure must be resisted. Tight sheeting must be used where water must be retained.

(4) *Example 4.*

A trench dug in Type C soil is 20 feet deep and 11 feet wide. The size and spacing of members for the section of trench that is over 15 feet in depth is determined using Table C-1.3. Only one arrangement of members is provided.

Space 8×10 crossbraces at six feet horizontally and five feet vertically.

Space 12×12 wales at five feet vertically.

Use 3×6 tight sheeting.

Use of Tables C-2.1 through C-2.3 would follow the same procedures.

(g) *Notes for all Tables.*

1. Member sizes at spacings other than indicated are to be determined as specified in § 1926.652(c), "Design of Protective Systems."

2. When conditions are saturated or submerged use **Tight Sheeting**. **Tight Sheeting** refers to the use of specially-edged timber planks (e.g., tongue and groove) at least three inches thick, steel sheet piling, or similar construction that when driven or placed in position provide a tight wall to resist the lateral pressure of water and to prevent the loss of backfill material. **Close Sheeting** refers to the placement of planks side-by-side allowing as little space as possible between them.

3. All spacing indicated is measured center to center.

4. Wales to be installed with greater dimension horizontal.

5. If the vertical distance from the center of the lowest crossbrace to the bottom of the trench exceeds two and one-half feet, uprights shall be firmly embedded or a mudsill shall be used. Where uprights are embedded, the vertical distance from the center of the lowest crossbrace to the bottom of the trench shall not exceed 36 inches. When mudsills are used, the vertical distance

shall not exceed 42 inches. Mudsills are wales that are installed at the toe of the trench side.

6. Trench jacks may be used in lieu of or in combination with timber crossbraces.

7. Placement of crossbraces. When the vertical spacing of crossbraces is four feet, place the top crossbrace no more than two feet below the top of the trench. When the vertical spacing of crossbraces is five feet, place the top crossbrace no more than 2.5 feet below the top of the trench.

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TABLE C-1.1

TIMBER TRENCH SHORING -- MINIMUM TIMBER REQUIREMENTS *

SOIL TYPE A $P_a = 25 \times H + 72$ psf (2 ft Surcharge)

DEPTH OF TRENCH (FEET)	SIZE (ACTUAL) AND SPACING OF MEMBERS **													
	HORIZ. SPACING (FEET)	CROSS BRACES					VERT. SPACING (FEET)	WALES		UPRIGHTS				
		WIDTH OF TRENCH (FEET)						SIZE (IN)	VERT. SPACING (FEET)	MAXIMUM ALLOWABLE HORIZONTAL SPACING (FEET)				
		UP TO 4	UP TO 6	UP TO 9	UP TO 12	UP TO 15				CLOSE	4	5	6	8
5 TO 10	UP TO 6	4X4	4X4	4X6	6X6	6X6	4	Not Req'd	---				2X6	
	UP TO 8	4X4	4X4	4X5	6X5	6X5	4	Not Req'd	---					2X8
10 TO 15	UP TO 10	4X6	4X6	4X6	6X6	6X6	4	8X8	4			2X6		
	UP TO 12	4X6	4X6	6X6	6X6	6X6	4	8X8	4				2X6	
10 TO 15	UP TO 6	4X4	4X4	4X6	6X6	6X6	4	Not Req'd	---				3X8	
	UP TO 8	4X6	4X6	6X6	6X6	6X6	4	8X8	4		2X6			
15 TO 20	UP TO 10	6X6	6X5	6X6	6X8	6X8	4	8X10	4			2X6		
	UP TO 12	6X6	6X6	6X6	6X8	6X8	4	10X10	4				3X8	
15 TO 20	UP TO 6	6X6	6X6	6X6	6X8	6X8	4	6X8	4	3X6				
	UP TO 8	6X6	6X6	6X6	6X8	6X8	4	8X8	4	3X6				
20 TO 25	UP TO 10	8X8	8X8	8X8	8X8	8X10	4	8X10	4	3X6				
	UP TO 12	8X8	8X8	8X8	8X8	8X10	4	10X10	4	3X6				
OVER 20	SEE NOTE 1													

* Mixed oak or equivalent with a bending strength not less than 850 psi.

** Manufactured members of equivalent strength may be substituted for wood.

TABLE C-1.2

TIMBER TRENCH SHORING -- MINIMUM TIMBER REQUIREMENTS *

SOIL TYPE B $P_u = 45 \times H + 72$ psf (2 ft. Surcharge)

DEPTH OF TRENCH (FEET)	SIZE (ACTUAL) AND SPACING OF MEMBERS**													
	HORIZ. SPACING (FEET)	CROSS BRACES					VERT. SPACING (FEET)	WALES		UPRIGHTS				
		WIDTH OF TRENCH (FEET)						SIZE (IN)	VERT. SPACING (FEET)	MAXIMUM ALLOWABLE HORIZONTAL SPACING (FEET)				
	UP TO	UP TO	UP TO	UP TO	UP TO						CLOSE	2	3	
5 TO 10	UP TO 6	4X6	4X6	6X6	6X6	6X6	5	6X8	5			2X6		
	UP TO 8	6X6	6X6	6X6	6X8	6X8	5	8X10	5			2X6		
	UP TO 10	6X6	6X6	6X6	6X8	6X8	5	10X10	5			2X6		
	See Note 1													
10 TO 15	UP TO 6	6X6	6X6	6X6	6X8	6X8	5	8X8	5		2X6			
	UP TO 8	6X8	6X8	6X8	8X8	8X8	5	10X10	5		2X6			
	UP TO 10	8X8	8X8	8X8	8X8	8X10	5	10X12	5		2X6			
	See Note 1													
15 TO 20	UP TO 6	6X8	6X8	6X8	8X8	8X8	5	8X10	5	3X6				
	UP TO 8	8X8	8X8	8X8	8X8	8X10	5	10X12	5	3X6				
	UP TO 10	8X10	8X10	8X10	8X10	10X10	5	12X12	5	3X6				
	See Note 1													
OVER 20	SEE NOTE 1													

* Mixed oak or equivalent with a bending strength not less than 850 psi.
 ** Manufactured members of equivalent strength may be substituted for wood.

TABLE C-1.3

TIMBER TRENCH SHORING -- MINIMUM TIMBER REQUIREMENTS *
 SOIL TYPE C $P_a = 80 \times H + 72$ psf (2 ft. Surcharge)

DEPTH OF TRENCH (FEET)	SIZE (ACTUAL) AND SPACING OF MEMBERS**														
	HORIZ. SPACING (FEET)	CROSS BRACES					VERT. SPACING (FEET)	SIZE (IN)	VERT. SPACING (FEET)	UPRIGHTS					
		WIDTH OF TRENCH (FEET)								MAXIMUM ALLOWABLE HORIZONTAL SPACING (FEET) (See Note 2)					
		UP TO 4	UP TO 6	UP TO 9	UP TO 12	UP TO 15				CLOSE					
5 TO 10	UP TO 6	6X8	6X8	6X8	8X8	8X8	5	8X10	5	2X6					
	UP TO 8	8X8	8X8	8X8	8X8	8X10	5	10X12	5	2X6					
	UP TO 10	8X10	8X10	8X10	8X10	10X10	5	12X12	5	2X6					
	See Note 1														
10 TO 15	UP TO 6	8X8	8X8	8X8	8X8	8X10	5	10X12	5	2X6					
	UP TO 8	8X10	8X10	8X10	8X10	10X10	5	12X12	5	2X6					
	See Note 1														
	See Note 1														
15 TO 20	UP TO 6	8X10	8X10	8X10	8X10	10X10	5	12X12	5	3X6					
	See Note 1														
	See Note 1														
	See Note 1														
OVER 20	SEE NOTE 1														

* Mixed Oak or equivalent with a bending strength not less than 850 psi.
 ** Manufactured members of equivalent strength may be substituted for wood.

TABLE C-2.1

TIMBER TRENCH SHORING -- MINIMUM TIMBER REQUIREMENTS *
 SOIL TYPE A $P_a = 25 \times H + 72$ psf (2 ft. Surcharge)

DEPTH OF TRENCH (FEET)	SIZE (S4S) AND SPACING OF MEMBERS **														
	GROSS BRACES							WALES			UPRIGHTS				
	HORIZ. SPACING (FEET)	WIDTH OF TRENCH (FEET)					VERT. SPACING (FEET)	SIZE (IN)	VERT. SPACING (FEET)	MAXIMUM ALLOWABLE HORIZONTAL SPACING (FEET)					
		UP TO 4	UP TO 6	UP TO 9	UP TO 12	UP TO 15				CLOSE	4	5	6	8	
5 TO 10	UP TO 6	4X4	4X4	4X4	4X4	4X6	4	Not Req'd	Not Req'd				4X6		
	UP TO 8	4X4	4X4	4X4	4X6	4X6	4	Not Req'd	Not Req'd					4X8	
	UP TO 10	4X6	4X6	4X6	6X6	6X6	4	8X8	4			4X6			
	UP TO 12	4X6	4X6	4X6	6X6	6X6	4	8X8	4				4X6		
10 TO 15	UP TO 6	4X4	4X4	4X4	6X6	6X6	4	Not Req'd	Not Req'd				4X10		
	UP TO 8	4X6	4X6	4X6	6X6	6X6	4	6X8	4		4X6				
	UP TO 10	6X6	6X6	6X6	6X6	6X6	4	8X8	4			4X8			
	UP TO 12	6X6	6X6	6X6	6X6	6X6	4	8X10	4		4X6		4X10		
15 TO 20	UP TO 6	6X6	6X6	6X6	6X6	6X6	4	6X8	4	3X6					
	UP TO 8	6X6	6X6	6X6	6X6	6X6	4	8X8	4	3X6	4X12				
	UP TO 10	6X6	6X6	6X6	6X6	6X8	4	8X10	4	3X6					
	UP TO 12	6X6	6X6	6X6	6X8	6X8	4	8X12	4	3X6	4X12				
OVER 20	SEE NOTE 1														

* Douglas fir or equivalent with a bending strength not less than 1500 psi.
 ** Manufactured members of equivalent strength may be substituted for wood.

TABLE C-2.2

TIMBER TRENCH SHORING -- MINIMUM TIMBER REQUIREMENTS *
 SOIL TYPE B P_a = 45' X H + 72 psf (2 ft. Surcharge)

DEPTH OF TRENCH (FEET)	SIZE (S4S) AND SPACING OF MEMBERS **													
	HORIZ. SPACING (FEET)	CROSS BRACES					VERT. SPACING (FEET)	WALES		UPRIGHTS				
		WIDTH OF TRENCH (FEET)						SIZE (IN)	VERT. SPACING (FEET)	MAXIMUM ALLOWABLE HORIZONTAL SPACING (FEET)				
		UP TO 4	UP TO 6	UP TO 9	UP TO 12	UP TO 15				CLOSE	2	3	4	6
5 TO 10	UP TO 6	4X6	4X6	4X6	6X6	6X6	5	6X8	5			3X12 4X8		4X12
	UP TO 8	4X6	4X6	6X6	6X6	6X6	5	8X8	5		3X8		4X8	
	UP TO 10	4X6	4X6	6X6	6X6	6X8	5	8X10	5			4X8		
	See Note 1													
10 TO 15	UP TO 6	6X6	6X6	6X6	6X8	6X8	5	8X8	5	3X6	4X10			
	UP TO 8	6X8	6X8	6X8	8X8	8X8	5	10X10	5	3X6	4X10			
	UP TO 10	6X8	6X8	8X8	8X8	8X8	5	10X12	5	3X6	4X10			
	See Note 1													
15 TO 20	UP TO 6	6X8	6X8	6X8	6X8	8X8	5	8X10	5	4X6				
	UP TO 8	6X8	6X8	6X8	8X8	8X8	5	10X12	5	4X6				
	UP TO 10	8X8	8X8	8X8	8X8	8X8	5	12X12	5	4X6				
	See Note 1													
OVER 20	SEE NOTE 1													

* Douglas fir or equivalent with a bending strength not less than 1500 psi.
 ** Manufactured members of equivalent strength may be substituted for wood.

TABLE C-2.1

TIMBER TRENCH SHORING -- MINIMUM TIMBER REQUIREMENTS *

SOIL TYPE C $P_a = 80 \times H + 72$ psf (2 ft. Surcharge)

DEPTH OF TRENCH (FEET)	SIZE (S4S) AND SPACING OF MEMBERS **													
	HORIZ. SPACING (FEET)	CROSS BRACES					VERT. SPACING (FEET)	WALES		UPRIGHTS				
		WIDTH OF TRENCH (FEET)						SIZE (IN)	VERT. SPACING (FEET)	MAXIMUM ALLOWABLE HORIZONTAL SPACING (FEET)				
		UP TO 4	UP TO 6	UP TO 9	UP TO 12	UP TO 15				CLOSE				
5 TO 10	UP TO 6	6X6	6X6	6X6	6X6	8X8	5	8X8	5	3X6				
	UP TO 8	6X6	6X6	6X6	8X8	8X8	5	10X10	5	3X6				
	UP TO 10	6X6	6X6	8X8	8X8	8X8	5	10X12	5	3X6				
	See Note 1													
10 TO 15	UP TO 6	6X8	6X8	6X8	8X8	8X8	5	10X10	5	4X6				
	UP TO 8	8X8	8X8	8X8	8X8	8X8	5	12X12	5	4X6				
	See Note 1													
	See Note 1													
15 TO 20	UP TO 6	8X8	8X8	8X8	8X10	8X10	5	10X12	5	4X6				
	See Note 1													
	See Note 1													
	See Note 1													
OVER 20	SEE NOTE 1													

* Douglas fir or equivalent with a bending strength not less than 1500 psi.

** Manufactured members of equivalent strength may be substituted for wood.

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Appendix D to Subpart P

Aluminum Hydraulic Shoring for Trenches

(a) *Scope.* This appendix contains information that can be used when aluminum hydraulic shoring is provided as a method of protection against cave-ins in trenches that do not exceed 20 feet (6.1m) in depth. This appendix must be used when design of the aluminum hydraulic protective system cannot be performed in accordance with § 1928.652(c)(2).

(b) *Soil Classification.* In order to use data presented in this appendix, the soil type or types in which the excavation is made must first be determined using the soil classification method set forth in appendix A of subpart P of part 1928.

(c) *Presentation of Information.* Information is presented in several forms as follows:

(1) Information is presented in tabular form in Tables D-1.1, D-1.2, D-1.3 and D-1.4. Each table presents the maximum vertical and horizontal spacings that may be used with various aluminum member sizes and various hydraulic cylinder sizes. Each table contains data only for the particular soil type in which the excavation or portion of the excavation is made. Tables D-1.1 and D-1.2 are for vertical shores in Types A and B soil. Tables D-1.3 and D-1.4 are for horizontal waler systems in Types B and C soil.

(2) Information concerning the basis of the tabular data and the limitations of the data is presented in paragraph (d) of this appendix.

(3) Information explaining the use of the tabular data is presented in paragraph (e) of this appendix.

(4) Information illustrating the use of the tabular data is presented in paragraph (f) of this appendix.

(5) Miscellaneous notations (footnotes) regarding Table D-1.1 through D-1.4 are presented in paragraph (g) of this appendix.

(6) Figures illustrating typical installations of hydraulic shoring, are included just prior to the Tables. The illustrations page is entitled "Aluminum Hydraulic Shoring: Typical Installations."

(d) Basis and Limitations of the Data.

(1) Vertical shore rails and horizontal wales are those that meet the Section Modulus requirements in the D-1 Tables. Aluminum material is 6061-T6 or material of equivalent strength and properties.

(2) Hydraulic cylinders specifications. (i) 2-inch cylinders shall be a minimum 2-inch inside diameter with a minimum safe working capacity of not less than 18,000 pounds axial compressive load at maximum extension. Maximum extension is to include full range of cylinder extensions as recommended by product manufacturer.

(ii) 3-inch cylinders shall be a minimum 3-inch inside diameter with a safe working capacity of not less than 30,000 pounds axial compressive load at extensions as recommended by product manufacturer.

(3) Limitation of application.

(i) It is not intended that the aluminum hydraulic specification apply to every situation that may be experienced in the field. These data were developed to apply to the situations that are most commonly

experienced in current trenching practice. Shoring systems for use in situations that are not covered by the data in this appendix must be otherwise designed as specified in § 1928.652(c).

(ii) When any of the following conditions are present, the members specified in the Tables are not considered adequate. In this case, an alternative aluminum hydraulic shoring system or other type of protective system must be designed in accordance with § 1928.652.

(A) When vertical loads imposed on cross braces exceed a 100 Pound gravity load distributed on a one foot section of the center of the hydraulic cylinder.

(B) When surcharge loads are present from equipment weighing in excess of 20,000 pounds.

(C) When only the lower portion or a trench is shored and the remaining portion of the trench is sloped or benched unless: The sloped portion is sloped at an angle less steep than three horizontal to one vertical; or the members are selected from the tables for use at a depth which is determined from the top of the overall trench, and not from the toe of the sloped portion.

(e) *Use of Tables D-1.1, D-1.2, D-1.3 and D-1.4.* The members of the shoring system that are to be selected using this information are the hydraulic cylinders, and either the vertical shores or the horizontal wales. When a waler system is used the vertical timber sheeting to be used is also selected from these tables. The Tables D-1.1 and D-1.2 for vertical shores are used in Type A and B soils that do not require sheeting, and Type C soils that may require sheeting, and Type C soils that always require sheeting are found in the horizontal wale Tables D-1.3 and D-1.4. The soil type must first be determined in accordance with the soil classification system described in appendix A to subpart P of part 1928. Using the appropriate table, the selection of the size and spacing of the members is made. The selection is based on the depth and width of the trench where the members are to be installed. In these tables the vertical spacing is held constant at four feet on center. The tables show the maximum horizontal spacing of cylinders allowed for each size of wale in the waler system tables, and in the vertical shore tables, the hydraulic cylinder horizontal spacing is the same as the vertical shore spacing.

*(f) Example to Illustrate the Use of the Tables:**(1) Example 1:*

A trench dug in Type A soil is 6 feet deep and 3 feet wide. From Table D-1.1: Find vertical shores and 2 inch diameter cylinders spaced 8 feet on center (o.c.) horizontally and 4 feet on center (o.c.) vertically. (See Figures 1 & 3 for typical installations.)

(2) Example 2:

A trench is dug in Type B soil that does not require sheeting, 13 feet deep and 5 feet wide. From Table D-1.2: Find vertical shores and 2 inch diameter cylinders spaced 6.5 feet o.c. horizontally and 4 feet o.c. vertically. (See Figures 1 & 3 for typical installations.)

(3) A trench is dug in Type B soil that does not require sheeting, but does experience some minor raveling of the trench face. The trench is 16 feet deep and 9 feet wide. From

Table D-1.2: Find vertical shores and 2 inch diameter cylinder (with special oversleeves as designated by footnote #2) spaced 5.5 feet o.c. horizontally and 4 feet o.c. vertically, plywood (per footnote [g])(7) to the D-1 Table) should be used behind the shores. (See Figures 2 & 3 for typical installations.)

(4) Example 4: A trench is dug in previously disturbed Type B soil, with characteristics of a Type C soil, and will require sheeting. The trench is 18 feet deep and 12 feet wide, 8 foot horizontal spacing between cylinders is desired for working space. From Table D-1.3: Find horizontal wale with a section modulus of 14.0 spaced at 4 feet o.c. vertically and 3 inch diameter cylinder spaced at 9 feet maximum o.c. horizontally. 3x12 timber sheeting is required at close spacing vertically. (See Figure 4 for typical installation.)

(5) Example 5: A trench is dug in Type C soil, 9 feet deep and 4 feet wide. Horizontal cylinder spacing in excess of 6 feet is desired for working space. From Table D-1.4: Find horizontal wale with a section modulus of 7.0 and 2 inch diameter cylinders spaced at 6.5 feet o.c. horizontally. Or, find horizontal wale with a 14.0 section modulus and 3 inch diameter cylinder spaced at 10 feet o.c. horizontally. Both wales are spaced 4 feet o.c. vertically. 3x12 timber sheeting is required at close spacing vertically. (See Figure 4 for typical installation.)

(g) Footnotes, and general notes, for Tables D-1.1, D-1.2, D-1.3, and D-1.4.

(1) For applications other than those listed in the tables, refer to § 1928.652(c)(2) for use of manufacturer's tabulated data. For trench depths in excess of 20 feet, refer to § 1928.652(c)(2) and § 1928.652(c)(3).

(2) 2 inch diameter cylinders, at this width, shall have structural steel tube (3.5x3.5x0.1875) oversleeves, or structural oversleeves of manufacturer's specification, extending the full, collapsed length.

(3) Hydraulic cylinders capacities. (i) 2 inch cylinders shall be a minimum 2-inch inside diameter with a safe working capacity of not less than 18,000 pounds axial compressive load at maximum extension. Maximum extension is to include full range of cylinder extensions as recommended by product manufacturer.

(ii) 3-inch cylinders shall be a minimum 3-inch inside diameter with a safe work capacity of not less than 30,000 pounds axial compressive load at maximum extension. Maximum extension is to include full range of cylinder extensions as recommended by product manufacturer.

(4) All spacing indicated is measured center to center.

(5) Vertical shoring rails shall have a minimum section modulus of 0.40 inch.

(6) When vertical shores are used, there must be a minimum of three shores spaced equally, horizontally, in a group.

(7) Plywood shall be 1.125 in. thick softwood or 0.75 inch. thick, 14 ply, arctic white birch (Finland form). Please note that plywood is not intended as a structural member, but only for prevention of local raveling (sloughing of the trench face) between shores.

(8) See appendix C for timber specifications.

(9) Wales are calculated for simple span conditions.

(10) See appendix D, item (d), for basis and limitations of the data.

BILLING CODE 4510-26-M

ALUMINUM HYDRAULIC SHORING TYPICAL INSTALLATIONS

FIGURE NO. 1

VERTICAL ALUMINUM
HYDRAULIC SHORING
(SPOT BRACING)

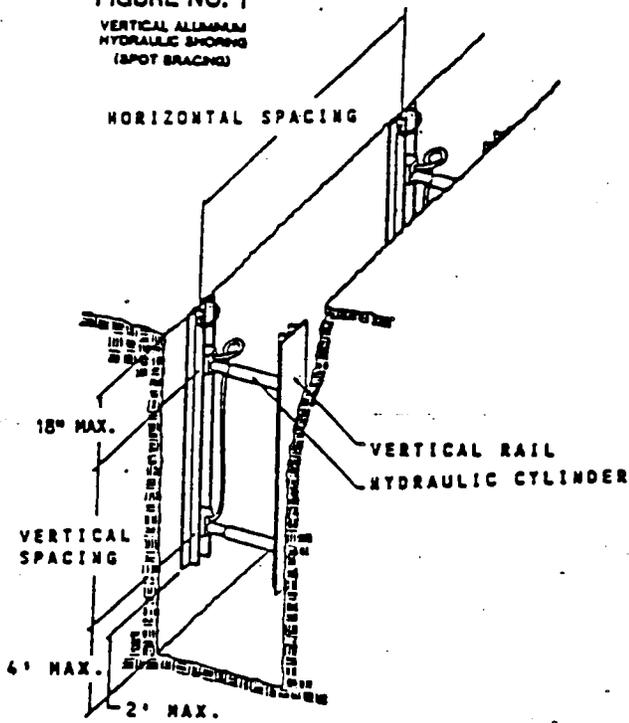


FIGURE NO. 2

VERTICAL ALUMINUM
HYDRAULIC SHORING
(WITH PLYWOOD)

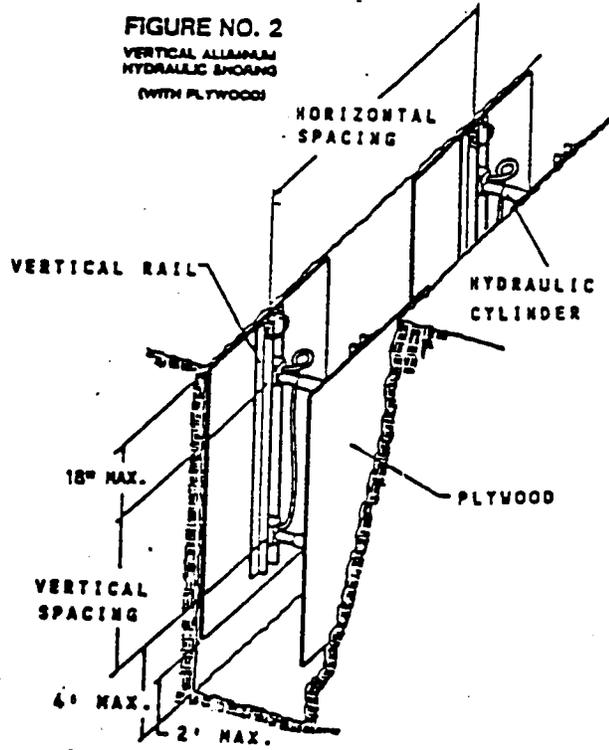


FIGURE NO. 3

VERTICAL ALUMINUM
HYDRAULIC SHORING
(STACKED)

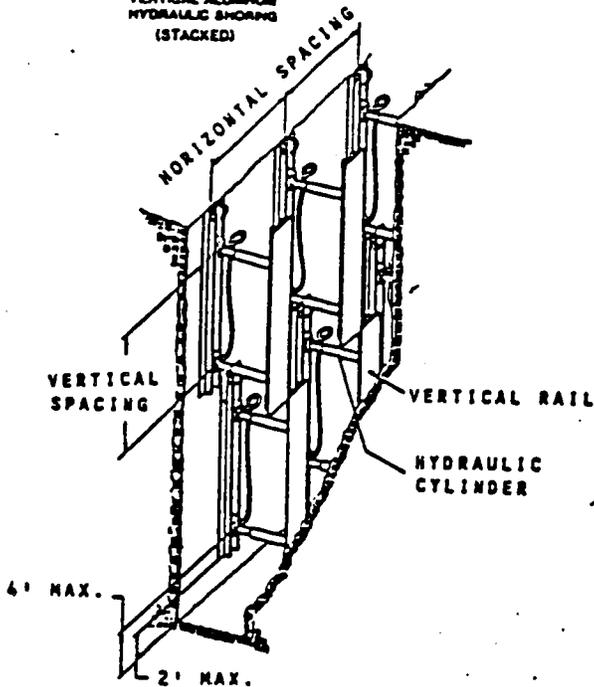
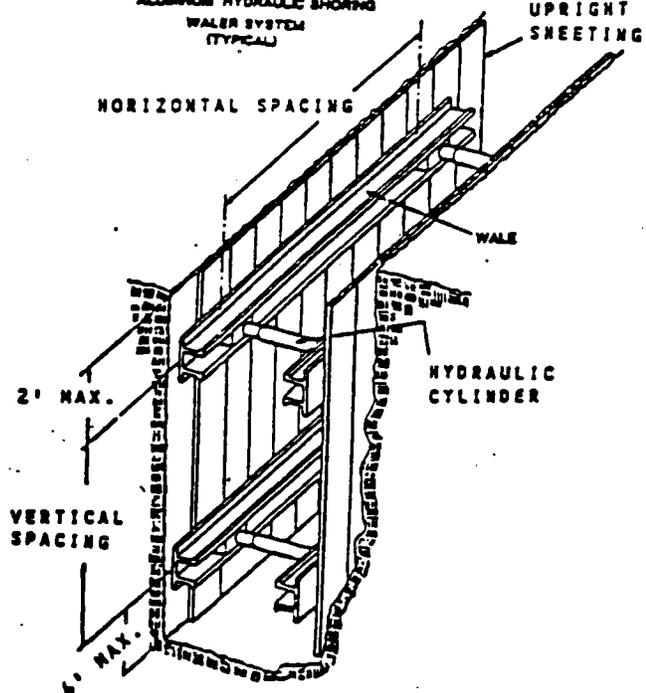


FIGURE NO. 4

ALUMINUM HYDRAULIC SHORING
WALER SYSTEM
(TYPICAL)



**TABLE D - 1.1
ALUMINUM HYDRAULIC SHORING
VERTICAL SHORES
FOR SOIL TYPE A**

DEPTH OF TRENCH (FEET)	HYDRAULIC CYLINDERS				
	MAXIMUM HORIZONTAL SPACING (FEET)	MAXIMUM VERTICAL SPACING (FEET)	WIDTH OF TRENCH (FEET)		
			UP TO 8	OVER 8 UP TO 12	OVER 12 UP TO 15
OVER 5 UP TO 10	8	4	2 INCH DIAMETER	2 INCH DIAMETER NOTE (2)	3 INCH DIAMETER
OVER 10 UP TO 15	8				
OVER 15 UP TO 20	7				
OVER 20	NOTE (1)				

Footnotes to tables, and general notes on hydraulic shoring, are found in Appendix D, Item (g)

Note (1): See Appendix D, Item (g) (1)

Note (2): See Appendix D, Item (g) (2)

**TABLE D - 1.2
ALUMINUM HYDRAULIC SHORING
VERTICAL SHORES
FOR SOIL TYPE B**

DEPTH OF TRENCH (FEET)	HYDRAULIC CYLINDERS				
	MAXIMUM HORIZONTAL SPACING (FEET)	MAXIMUM VERTICAL SPACING (FEET)	WIDTH OF TRENCH (FEET)		
			UP TO 8	OVER 8 UP TO 12	OVER 12 UP TO 15
OVER 5 UP TO 10	8	4	2 INCH DIAMETER	2 INCH DIAMETER NOTE (2)	3 INCH DIAMETER
OVER 10 UP TO 15	6.5				
OVER 15 UP TO 20	5.5				
OVER 20	NOTE (1)				

Footnotes to tables, and general notes on hydraulic shoring, are found in Appendix D, Item (g)

Note (1): See Appendix D, Item (g) (1)

Note (2): See Appendix D, Item (g) (2)

**TABLE D - 1.3
ALUMINUM HYDRAULIC SHORING
WALER SYSTEMS
FOR SOIL TYPE B**

DEPTH OF TRENCH (FEET)	WALES		HYDRAULIC CYLINDERS						TIMBER UPRIGHTS		
	VERTICAL SPACING (FEET)	SECTION MODULUS (IN ³)	WIDTH OF TRENCH (FEET)						MAX. HORIZ. SPACING (ON CENTER)		
			UP TO 8		OVER 8 UP TO 12		OVER 12 UP TO 15		SOLID SHEET	2 FT.	3 FT.
			HORIZ. SPACING	CYLINDER DIAMETER	HORIZ. SPACING	CYLINDER DIAMETER	HORIZ. SPACING	CYLINDER DIAMETER			
OVER 5 UP TO 10	4	3.5	8.0	2 IN	8.0	2 IN NOTE(2)	8.0	3 IN	—	—	3x12
		7.0	9.0	2 IN	9.0	2 IN NOTE(2)	9.0	3 IN			
		14.0	12.0	3 IN	12.0	3 IN	12.0	3 IN			
OVER 10 UP TO 15	4	3.5	6.0	2 IN	6.0	2 IN NOTE(2)	6.0	3 IN	—	3x12	—
		7.0	8.0	3 IN	8.0	3 IN	8.0	3 IN			
		14.0	10.0	3 IN	10.0	3 IN	10.0	3 IN			
OVER 15 UP TO 20	4	3.5	5.5	2 IN	5.5	2 IN NOTE(2)	5.5	3 IN	3x12	—	—
		7.0	6.0	3 IN	6.0	3 IN	6.0	3 IN			
		14.0	9.0	3 IN	9.0	3 IN	9.0	3 IN			
OVER 20	NOTE (1)										

Footnotes to tables, and general notes on hydraulic shoring, are found in Appendix D, Item (g)

Notes (1): See Appendix D, item (g) (1)

Notes (2): See Appendix D, Item (g) (2)

* Consult product manufacturer and/or qualified engineer for Section Modulus of available wales.

**TABLE D - 1.4
ALUMINUM HYDRAULIC SHORING
WALER SYSTEMS
FOR SOIL TYPE C**

DEPTH OF TRENCH (FEET)	WALES		HYDRAULIC CYLINDERS						TIMBER UPRIGHTS		
	VERTICAL SPACING (FEET)	SECTION MODULUS (IN ³)	WIDTH OF TRENCH (FEET)						MAX. HORIZ. SPACING (ON CENTER)		
			UP TO 8		OVER 8 UP TO 12		OVER 12 UP TO 15		SOLID SHEET	2 FT.	3 FT.
			HORIZ. SPACING	CYLINDER DIAMETER	HORIZ. SPACING	CYLINDER DIAMETER	HORIZ. SPACING	CYLINDER DIAMETER			
OVER 5 UP TO 10	4	3.5	6.0	2 IN	6.0	2 IN NOTE(2)	6.0	3 IN	3x12	—	—
		7.0	6.5	2 IN	6.5	2 IN NOTE(2)	6.5	3 IN			
		14.0	10.0	3 IN	10.0	3 IN	10.0	3 IN			
OVER 10 UP TO 15	4	3.5	4.0	2 IN	4.0	2 IN NOTE(2)	4.0	3 IN	3x12	—	—
		7.0	5.5	3 IN	5.5	3 IN	5.5	3 IN			
		14.0	8.0	3 IN	8.0	3 IN	8.0	3 IN			
OVER 15 UP TO 20	4	3.5	3.5	2 IN	3.5	2 IN NOTE(2)	3.5	3 IN	3x12	—	—
		7.0	5.0	3 IN	5.0	3 IN	5.0	3 IN			
		14.0	6.0	3 IN	6.0	3 IN	6.0	3 IN			
OVER 20	NOTE (1)										

Footnotes to tables, and general notes on hydraulic shoring, are found in Appendix D, Item (g)

Notes (1): See Appendix D, item (g) (1)

Notes (2): See Appendix D, item (g) (2)

* Consult product manufacturer and/or qualified engineer for Section Modulus of available wales.

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Appendix E to Subpart P—Alternatives to Timber Shoring

Figure 1. Aluminum Hydraulic Shoring

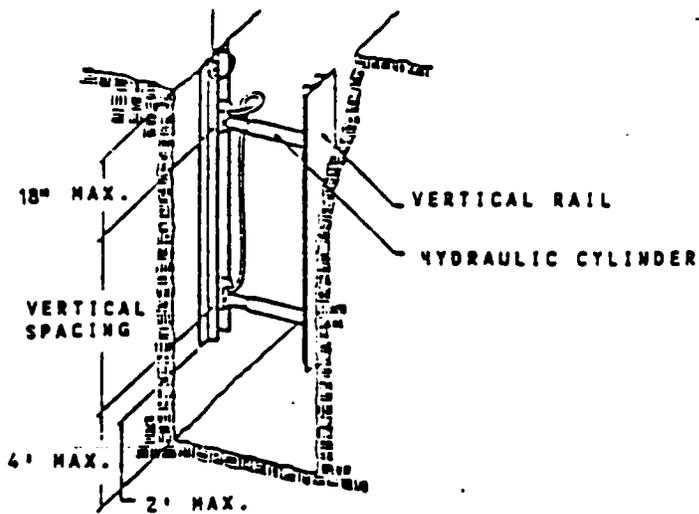
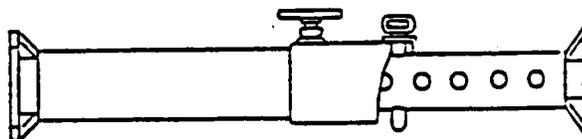
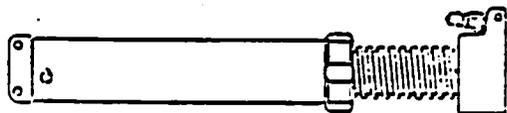


Figure 2. Pneumatic/hydraulic Shoring



BILLING CODE 4810-38-7

Figure 3. Trench Jacks (Screw Jacks)

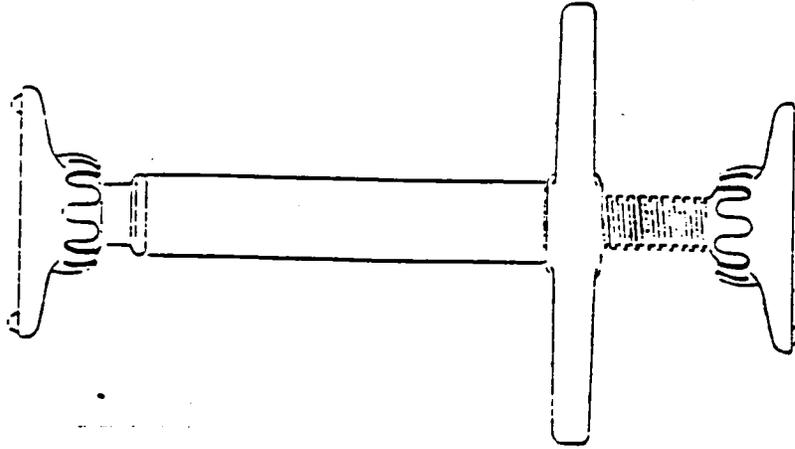
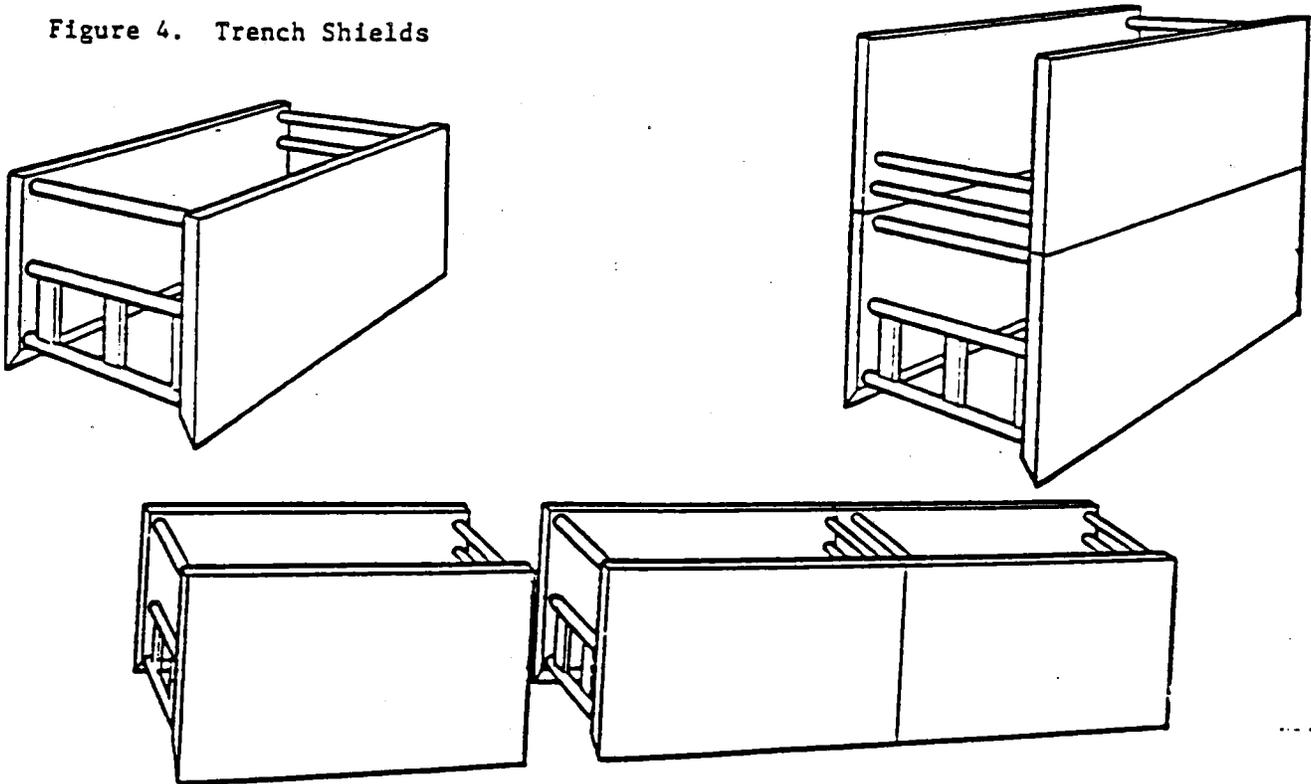


Figure 4. Trench Shields



Appendix F to Subpart P—Selection of Protective Systems

The following figures are a graphic summary of the requirements contained in subpart P for excavations 20 feet or less in depth. Protective systems for use in excavations more than 20 feet in depth must be designed by a registered professional engineer in accordance with § 1926.652 (b) and (c).

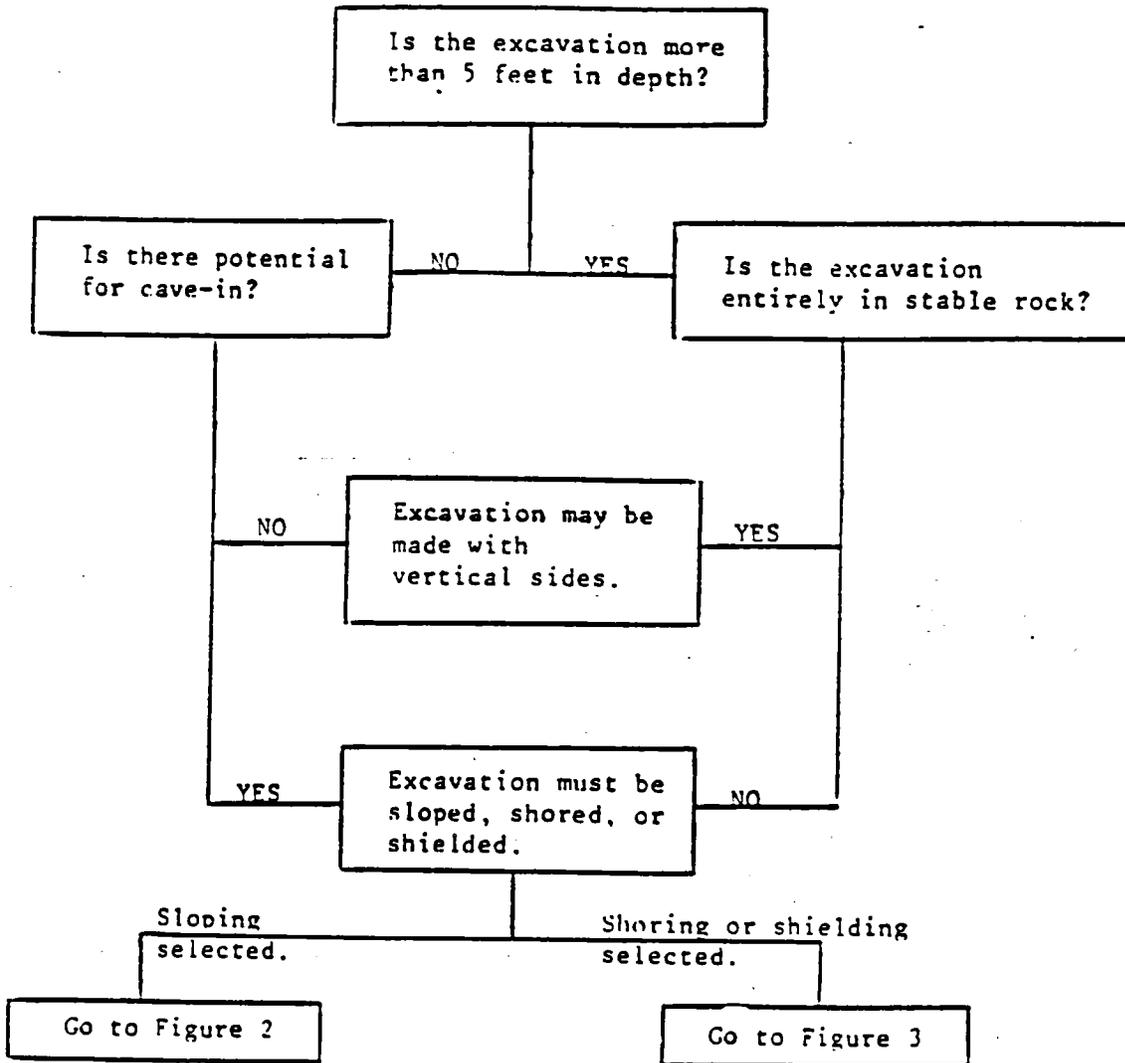


FIGURE 1 - PRELIMINARY DECISIONS

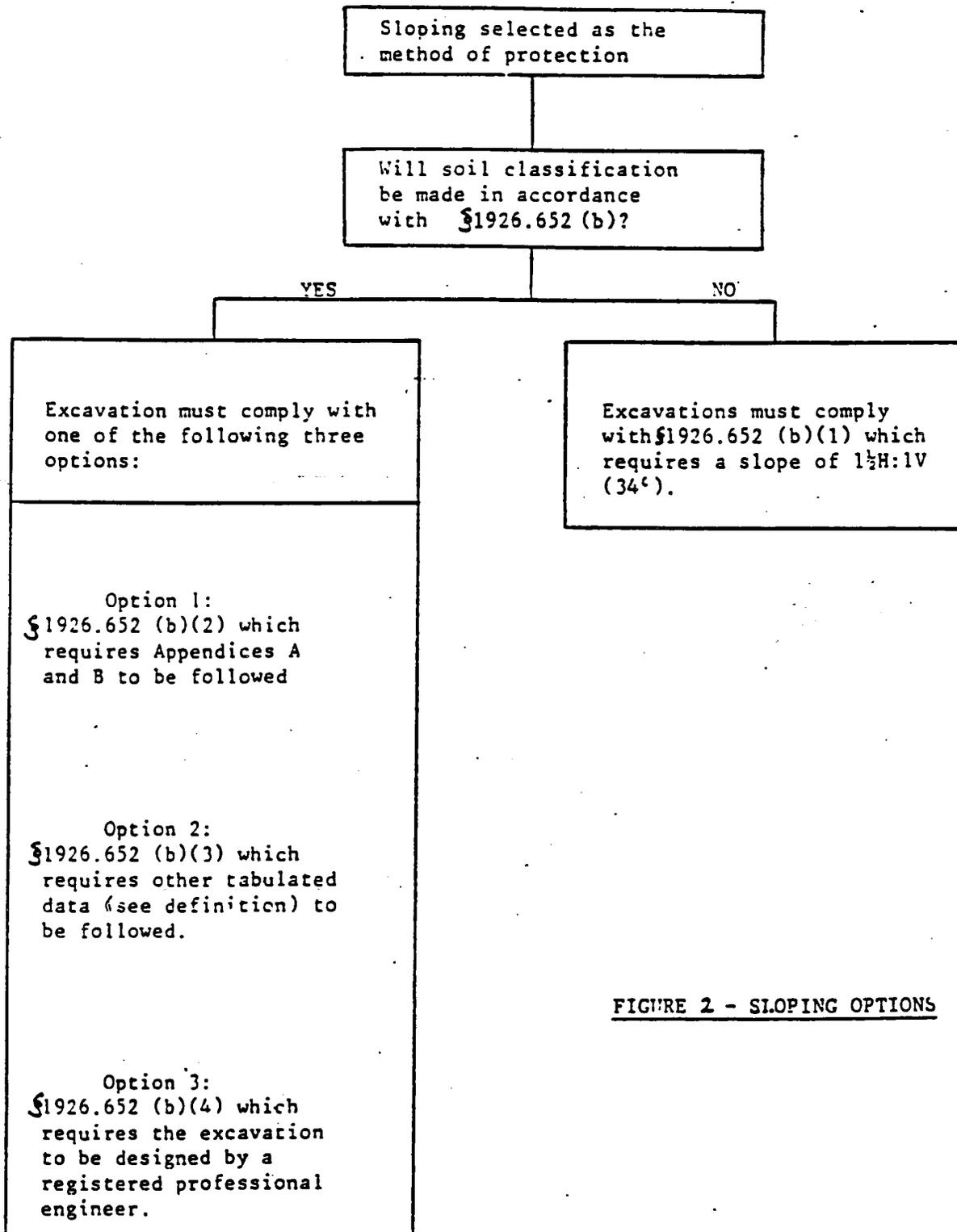


FIGURE 2 - SLOPING OPTIONS

Shoring or shielding selected as the method of protection.

Soil classification is required when shoring or shielding is used. The excavation must comply with one of the following four options:

Option 1
§1926.652 (c)(1) which requires Appendices A and C to be followed (e.g. timber shoring).

Option 2
§1926.652 (c)(2) which requires manufacturers data to be followed (e.g. hydraulic shoring, trench jacks, air shores, shields).

Option 3
§1926.652 (c)(3) which requires tabulated data (see definition) to be followed (e.g. any system as per the tabulated data).

Option 4
§1926.652 (c)(4) which requires the excavation to be designed by a registered professional engineer (e.g. any designed system).

FIGURE 3 - SHORING AND SHIELDING OPTIONS

[FR Doc. 89-25217 Filed 10-30-89; 8:45 am]

BILLING CODE 4510-29-C

APPENDIX K

TEMPERATURE EXTREMES

APPENDIX K

K.1 HEAT STRESS

Due to the increase in ambient air temperatures and the effects of protective outer wear decreasing body ventilation, there is increased 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.

K.1.1 Identification and Treatment

K.1.1.1 Heat Exhaustion.

Symptoms. Heat exhaustion usually begins with muscular weakness, dizziness, nausea, and a staggering gait. Vomiting is frequent. The bowels may move involuntarily. The victim is very pale, the skin is clammy, and he or she may perspire profusely. The pulse is weak and fast; breathing is shallow. The victim may faint unless he or she lies down. This may pass; however, sometimes it persists and, while heat exhaustion is generally not considered life threatening, death could occur.

First Aid. Immediately remove the victim to the CRZ in a shady or cool area with good air circulation. Remove all protective outer wear. Call a physician. Treat the victim for shock (i.e., have the victim lie down, raise the feet 6 to 12 inches, and maintain body temperature but loosen all clothing). If the victim is conscious, it may be helpful to give sips of water. Transport the victim to a medical facility.

K.1.1.2 Heat Stroke.

Symptoms. This is the most serious of heat casualties because the body excessively overheats. Body temperatures often are between 107 and 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 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.

First Aid. Immediately evacuate the victim to a cool and shady area in the CRZ. Remove all protective outer wear and all personal clothing. Lay the victim on his or her 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 or ice bags to the head and groin. Sponge off the bare skin with cool water or rubbing alcohol, if available, or even place the victim in a tub of cool water. The main objective is to cool without chilling. Do not give stimulants. Transport the victim to a medical facility as soon as possible.

K.1.2 Prevention of Heat Stress

One of the major causes of heat casualties is the depletion of body fluids and salts through sweating. Fluids should be maintained in the Support Zone. Salts can be replaced by either a 0.1 percent salt solution, more heavily salted foods, or commercial mixes such as Gatorade. The commercial mixes are advised for personnel on low-sodium diets.

During warm weather, a work schedule will be established that allows most work to be conducted during the morning hours, before ambient air temperature levels reach highs.

A work/rest schedule will be implemented for personnel required to wear Level B or C protection (i.e., an impervious outer garment) with sufficient time allowed for personnel to "cool down" (this may require working in shifts). Two hours is the maximum time between breaks at Level B or C, regardless of temperature. At elevated temperatures, breaks should be scheduled as follows:

<u>Ambient Temperatures</u>	<u>Maximum Time Between Cool Down Breaks</u>
Above 90°F	¼ hour
85° to 90°F	½ hour
80° to 85°F	1 hour
70° to 80°F	1½ hours

K.1.3 Heat Stress Monitoring

Monitoring of personnel wearing impervious clothing should commence when the ambient temperature reaches 70°F, with increased frequency if 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. As a screening mechanism of the body's recuperative ability to excess heat, one or more of the following techniques should be used.

1. Measure the heart rate (HR) for 30 seconds, by radial pulse, as early in the resting period as possible. At the beginning of the rest period, the HR should not exceed 110 beats per minute. If the HR is higher, the next work period should be shortened by 10 minutes (or 33 percent), with the length of the rest period staying the same. If the pulse rate is still above 110 beats per minute at the beginning of the next rest period, the following work cycle should again be shortened by 33 percent.
2. Measure oral body temperature with a clinical thermometer, as early as possible in the resting period. At the beginning of the rest period, oral temperature (OT) should not exceed 99°F. If OT exceeds 99°F, the next work period should be shortened by 10 minutes (or 33 percent), with the length of the rest period staying the same. If the OT again exceeds 99°F at the beginning of the next period, the following work cycle should be further shortened by 33 percent. OT should also be measured at the end of the rest period to ensure that it has dropped below 99°F.
3. Maintain good hygienic standards by changing clothes frequently, showering daily, and allowing clothing to dry during rest periods. Persons who notice skin problems should immediately consult medical personnel.

K.2 COLD STRESS

Cold weather may often cause problems for personnel working outside, even at temperatures above freezing. As temperatures drop below freezing, the potential for cold weather 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). These levels represent guidelines that should be used as an action level unless the HSO determines and documents otherwise. Table K-1, which shows equivalent temperatures (i.e., windchill) for a range of ambient conditions, should also be referred to.

Snow and ice increase the risks to personnel and operations through reduced visibility, increased potential for falling injuries, reduced on-site mobility, and the increased time required to access the site (or off-site support services).

In view of these factors, it is critical that the HSO establish site-specific safety and operating protocols, and that all on-site personnel be made aware of the risks.

K.2.1 Local Cold Injuries

Local cold injuries affect specific areas of the body (e.g., fingers, ears, or toes), including the more commonly recognized injuries described in the following subsections.

K.2.1.1 Chilblains.

Chilblains is a chronic condition affecting the skin and peripheral capillary circulation, resulting from prolonged exposure of the bare skin, primarily in the extremities, to temperatures at or below 60°F. The best method of preventing and treating chilblains is to cover and protect the skin, thereby avoiding prolonged exposure to the cold.

K.2.1.2 Frostbite.

Frostbite is freezing of the hands, feet, ears, and exposed parts of the face as a result of exposure to very low temperatures. Frostbite 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.

There are three stages of frostbite: incipient frost bite (frostnip), superficial frostbite, and deep frostbite. The classification depends on severity and can range from incipient frostbite (frostnip), which affects the skin; to superficial frostbite, which involves the skin and the tissues immediately beneath it; to deep frostbite, which is much more serious with damage that may affect deeper tissue and even bone.

Symptoms. Symptoms for each of the three stages of frostbite are described as follows.

- Frostnip. Skin first turns red and then later becomes pale or waxy white. There may be tingling, stinging, aching, an uncomfortable sensation of coldness or numbness, or no noticeable symptoms.
- Superficial Frostbite. The skin turns white or gray-white and is waxy in appearance. It is firm to touch (i.e., does not move easily) and the tissue beneath the

skin is soft and resilient. There is a lack of sensation in the area.

• Deep Frostbite. The tissue is pale, cold, and solid with possible blisters and swelling. The hands and feet are especially susceptible to deep frostbite.

Emergency Treatment of Frostbite. Frostnip is easily treated in the field by the application of body heat, which should be applied before the affected area becomes numb. 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. Thaw frozen spots immediately. Do not rub affected areas.

Superficial frostbite usually responds to the application of body heat, as described previously. If the skin does not respond to body heat or if it resembles the early stages of deep frostbite, follow the emergency treatments listed in the following paragraphs. DO NOT rub affected areas.

For deep frostbite, if possible, the injured person should be taken to a heated shelter to avoid further frostbite. If it can be done without the danger of further frostbite, remove all constricting items (e.g., boots, gloves, and socks) from the injured area. RAPID REWARMING WILL MINIMIZE TISSUE LOSS. If possible, warm the extremities in a carefully controlled water bath (104 to 106°F) until tips of the fingers or toes turn pink and feeling is restored. If a water bath is not available, either apply wet packs (100 to 112°F) to the person's body, or gently wrap frostbitten area in blankets or some other warm material.

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

**TABLE K-1
COOLING POWER OF WIND ON EXPOSED FLESH EXPRESSED
AS AN EQUIVALENT TEMPERATURE (UNDER CALM CONDITIONS)**

**HEALTH AND SAFETY PLAN
PART II**

ESTIMATED WIND SPEED (in mph)	ACTUAL TEMPERATURE READING (°F)											
	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
	EQUIVALENT CHILL TEMPERATURE (°F)											
calm	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
5	48	37	27	16	6	-5	-15	-26	-36	-47	-57	-68
10	40	28	16	4	-9	-24	-33	-46	-58	-70	-83	-95
15	36	22	9	-5	-18	-32	-45	-58	-72	-85	-99	-112
20	32	18	4	-10	-25	-39	-53	-67	-82	-96	-110	-121
25	30	16	0	-15	-29	-44	-59	-74	-88	-104	-118	-133
30	28	13	-2	-18	-33	-48	-63	-79	-94	-109	-125	-140
35	27	11	-4	-20	-35	-51	-67	-82	-98	-113	-129	-145
40	26	10	-6	-21	-37	-53	-69	-85	-100	-116	-132	-148
(Wind speeds greater than 40 mph have little additional effect.)	LITTLE DANGER In <hour with dry skin. Maximum danger of false sense of security.				INCREASING DANGER Danger from freezing of exposed flesh within 1 minute.				GREAT DANGER Flesh may freeze within 30 seconds.			

Trenchfoot and immersion foot may occur at any point on this chart.

Source: Developed by U.S. Army Research Institute of Environmental Medicine, Natick, Massachusetts.

DO NOT use snow to thaw frostbite. DO NOT rub, massage, or use pressure on the affected areas. Keep the frostbitten parts elevated if possible. Watch to see if CPR is necessary. Give the victim warm drinks such as tea, coffee, or soup. DO NOT GIVE ALCOHOLIC BEVERAGES. Have the victim exercise fingers or toes as soon as possible, but only after they are warmed. DO NOT allow a person with frostbitten feet to walk; walking may cause additional damage.

Medical Treatment of Frostbite.

- Frostnip. Usually does not require medical care.
- Superficial Frostbite. Blisters may require medical care.
- Deep Frostbite. EARLY MEDICAL TREATMENT IS URGENT! Transport the victim to medical care facilities at once.

Prevention of Frostbite. It is far easier to prevent or stop frostbite in earlier stages than to thaw and take care of badly frozen flesh. To protect the body against frostbite, the following precautions should be taken:

- Wear enough clothing to protect against the cold and wind.
- Wear warm gloves and boots.
- Pull a scarf or jacket flap over the lower part of the face or pull a hood tightly around the face.
- Occasionally exercise the face, fingers, and toes to keep them warm and to detect any areas that may have become numb.
- Crew members should watch each other closely, especially the face, for signs of frostbite.

K.2.1.3 Immersion Foot.

Immersion foot (formerly called trenchfoot) is a cold injury resulting from prolonged exposure to near-freezing temperatures when standing or walking on wet or swampy ground.

Symptoms. In the early stages, the feet and toes are pale, cold, numb, and stiff, and walking is difficult. If preventive action is

not taken, the feet will swell and ache; in extreme cases, this may result in irreversible damage to the tissues of the foot or leg.

Emergency Treatment of Immersion Foot. Handle feet very gently. DO NOT rub or massage. If necessary, clean feet carefully with soap and warm water, then dry, elevate, and expose to warm but not hot air.

Prevention of Immersion Foot. Because the early stages of immersion foot are not painful, crew members must be constantly on the alert and check feet often when working in cold, wet conditions. Keep feet dry by wearing waterproof footgear and changing socks frequently because perspiration, trapped inside waterproof boots or heavy footgear, can contribute to immersion foot symptoms. Avoid standing in wet areas. If feet get wet, dry them as soon as possible, warm them with your hands, then use foot powder, and change to dry socks. If you cannot change wet boots and socks, exercise your feet frequently by wiggling your toes and moving your ankles. Never wear tight boots.

K.2.2 Systemic Cold Injuries

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

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

Hypothermia often occurs between temperatures of 30 to 50°F, 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 (i.e., 65°F or lower). On land, hypothermia may take a full day or more of exposure to develop; however, if the conditions are extremely severe, death may occur within a few hours of initial symptoms.

In cold water, death may seem to be from drowning; in reality, it is usually the result of hypothermia. In water, skin and nearby

tissues chill very fast; in 10 to 15 minutes, the temperature of the heart and brain may drop. When the core (i.e., internal body) temperature reaches 90°F, unconsciousness may occur; when body temperature drops to 80°F, heart failure is possible.

K.2.2.1 Symptoms.

In the early stages of hypothermia, the body begins to lose heat faster than it can be produced, making an effort to stay warm by shivering. When the body can no longer generate enough heat to overcome heat loss and the energy reserves of the body become exhausted, 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, as shown in the following table:

SYMPTOMS OF HYPOTHERMIA	APPROXIMATE CORE TEMPERATURE
Person is conscious, alert with increased respiration. Shivering may become uncontrollable as core temperature nears 95°F.	Above 95°
Person is conscious but disoriented and apathetic. Shivering is present but diminishes as temperature drops. Below 92°F, respiratory rate gradually diminishes and pupils begin to dilate.	95° to 90°F
Person is semiconscious. Shivering is replaced by muscular rigidity. Pupils are fully dilated at about 86°F.	90° to 86°F
Unconscious; diminished respiration.	Below 86°F
Barely detectable or nondetectable respiration.	Below 80°F

K.2.2.2 Emergency Treatment of Hypothermia.

Move hypothermia victim to shelter and warmth as rapidly as possible. In very mild cases, dry clothing and shelter may be all that is needed. Gently remove all of the victim's wet clothing (so energy is not expended by warming and drying wet clothing) and replace it with a dry set. Give the person something warm to drink. DO NOT GIVE ALCOHOLIC BEVERAGES.

ALL OTHER HYPOTHERMIA CASES SHOULD BE CONSIDERED MEDICAL EMERGENCIES. PROVIDE EXTERNAL HEAT IN ANY WAY POSSIBLE! A warm bath (with the water kept between 105° 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 one of the following ALTERNATE METHODS:

- Wrap warm moist towels (or other fabric) around the victim's head, neck, sides, and groin. As the packs cool, rewarm them by adding warm water (approximately 105°F). Check the temperature of the water with your elbow or the inside of your arm; it should be warm but not hot.
- If you are at a remote outdoor location and cannot use the other method, 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 victim.

DO NOT wrap a hypothermia victim in a blanket without an auxiliary source of heat unless it is to protect against any further heat loss before treatment can begin, or you need to go for help and there is no other alternative.

Continue treatment once the victim has stabilized. Give warm liquids and nourishing food if the person is conscious. Check the person for symptoms of frostbite and if necessary, give treatment.

Handle the patient gently and do not allow him or her 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 drops below the level that will sustain life. ALCOHOL CONTRIBUTES TO AFTER-DROP.

K.2.2.3 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.

K.2.2.4 Prevention of Hypothermia.

In cold weather, never go into the field without wearing adequate clothing. Take a complete change of warm clothes and one or two extra pairs of socks (in plastic bags). Wear or carry a windproof, water-resistant outer jacket and, in rain or snow, wear adequate raingear.

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 may produce heat but it also uses up energy. Violent shivering may be an early sign of hypothermia.

Avoid accidental immersion in water. Practice boat safety and learn cold water survival techniques. If you fall into water and you are not very close to shore, remain quiet. Keep your head out of water, climb onto the boat, or hold or climb onto any other object that will support you and keep you up out of the water.

K.2.3 Safety/First Aid Equipment

In view of the causes, results, and appropriate treatment of cold weather injuries discussed previously, as a minimum, the following safety equipment should be included during cold weather operations:

- extra clothing for all personnel
- blankets and/or sleeping bag
- high-energy food and drinking water supply
- toboggan
- tow ropes

In extreme cold conditions, add the following safety items:

- electric blanket (if an electrical source is available)
- portable emergency generator (with fuel, oil, and cords)
- space heater and fuel

K.2.4 General Winter Operations

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

K.2.4.1 Preliminary Assessment.

If you will be working outdoors in cold weather, assess the local weather conditions through the news media (i.e., radio, television, and newspapers) to determine whether work should progress and/or the amount of preparation needed. Carefully consider questions such as the following:

- What are the typical wind and weather conditions for the period in which you will be working?
- 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 ensure there is adequate ventilation to prevent carbon monoxide poisoning?

K.2.4.2 Scheduling.

Wherever possible, try to schedule work during the least severe weather. Rotate crew members to keep cold exposures short and allow sufficient time for frequent warming breaks. Remember that workers in heavy clothing often need more time to complete the tasks and may become fatigued more easily. Be aware that operations may have to be discontinued if winds increase or the temperature drops.

Because winter days are short, scheduling should allow time for taking care of equipment and supplies before nightfall. Once it becomes dark, it is more difficult to gauge terrain, and temperatures are likely to drop.

K.2.4.3 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 could severely hamper the arrival or departure of emergency vehicles. If the route to off-site medical facilities is blocked by snow or ice, an otherwise minor injury could result in a major medical emergency. If conditions warrant, the following provisions should be made:

- snow removal/plowing services for site access roads
- a dependable, four-wheel-drive vehicle available to on-site personnel for transporting an injured person to an off-site medical facility
- sleeping bags, blankets, a food supply, and water kept on-site in the event a sudden storm requires personnel to remain overnight

The HSO is responsible for deciding when weather conditions make site access unsafe, thereby requiring work to stop until conditions improve.

K.2.4.4 Equipment and Supplies.

Obtain equipment and supplies that will help prevent cold stress and will help in the treatment of cold stress disorders. Required equipment includes a reliable ambient temperature thermometer, a wind gauge, and a windchill chart. If the site is potentially windy due to a lack of natural or manmade windbreaks (e.g., trees, valleys, and structures), try to provide means of shielding workers from the wind. If working at a remote location, carry extra food and water because hunger and dehydration contribute to cold stress. If possible, make provisions for hot food and beverages. Ensure that emergency communication equipment is available and operational for crew members working in the cold, at heights, or in remote locations.

Close attention must be given to the effects of cold weather on field equipment. Batteries can be severely affected by cold resulting in disabled radios, air monitoring equipment, sampling pumps, and vehicles. A supply of fresh batteries, a sufficient number of charging units, and a set of automotive jumper cables should be maintained on-site. In addition, the electronics in many field instruments such as PI, LEL, and oxygen meters, as well as the chemical reactions in detector tubes (e.g., Draeger tubes) can

also be adversely affected by the cold. The manufacturers' literature must be consulted for minimum operating temperatures.

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

APPENDIX L

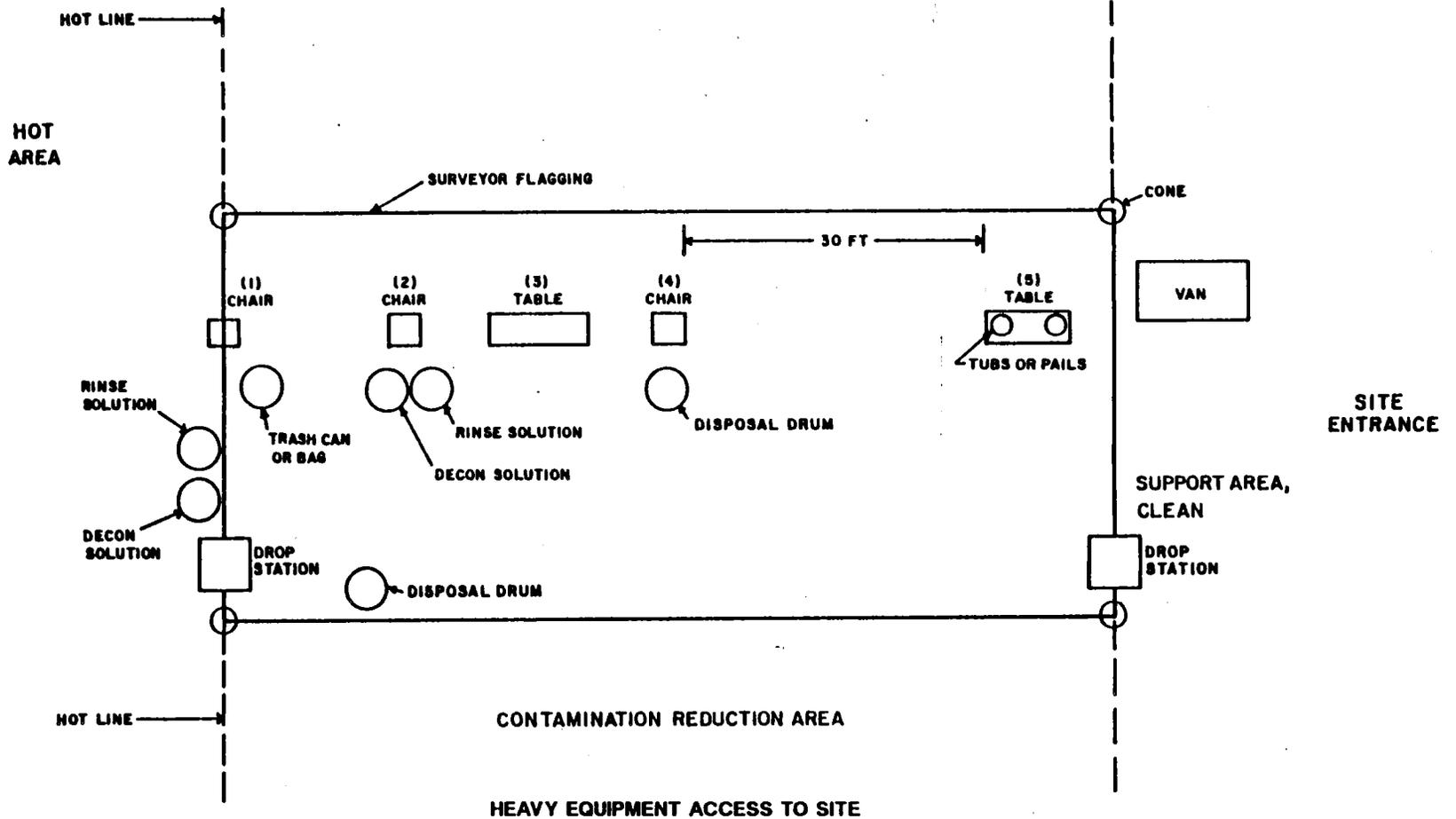
DECONTAMINATION

APPENDIX L

L.1 PERSONNEL DECONTAMINATION

Decontamination procedures are followed by all personnel leaving hazardous waste sites. Under no circumstances (except emergency evacuation) will personnel be allowed to leave the exclusion and contaminant reduction zones prior to decontamination. A typical personnel decontamination station is shown in L-1. Generalized procedures for removal of protective clothing are as follows:

1. Drop tools, monitors, samples, and trash at designated drop stations (i.e., plastic containers or drop sheets).
2. Step into the designated shuffle pit area and scuff feet to remove gross amounts of dirt from outer boots.
3. Scrub outer boots and outer gloves with decon solution or detergent and water. Rinse with water.
4. Remove tape from outer boots and remove boots; discard tape and boots in disposal container.
5. Remove tape from outer gloves and remove gloves; discard tape and gloves in disposal container.
6. If the worker has left the Exclusion Zone to change the air tank on the SCBA or the canister on the air-purifying respirator, this will be the last step in the decontamination procedure. The tank or cartridge should be exchanged, new outer gloves and boot covers donned, and the joints taped; the worker then returns to duty.
7. Remove outer garments and discard in disposal container.
8. Remove respirator and place or hang in the designated area.
9. Remove inner gloves and discard in disposal container.
10. If the site requires use of a decontamination trailer, all personnel must shower before leaving the site at the end of the work day.



TASK

- (1) WASH OUTER BOOTS - RINSE BOOTS - DISPOSE
- (2) WASH OUTER GLOVES - RINSE GLOVES - DISPOSE
- (3) SCBA TANK CHANGE OVER TABLE W/SPARE TANKS
- (4) REMOVE OUTER GARMENT - DISPOSE
- (5) REMOVE SCBA, WASH MASK IN PAILS OR TUBS
- (6) REMOVE INNER GLOVES - DISPOSE

NOT TO SCALE

**FIGURE L-1
TYPICAL PERSONNEL DECONTAMINATION STATION**

NOTE: Disposable items (i.e., Tyvek coveralls, inner gloves, and latex overboots) will be changed daily unless there is reason to change sooner. Dual respirator canisters will be changed daily, unless more frequent changes are deemed appropriate by site surveillance data or personnel assessment.

Maximum and minimum decontamination layouts for PPE Levels A through C are shown in Figures L-2 through L-5.

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

Respirators will be decontaminated daily and taken from the drop area. The masks will be disassembled, the cartridges set aside, and all other parts placed in a cleansing solution. Parts will be pre-coded (e.g., #1 on all parts of Mask #1). After an appropriate time in the solution, the parts will be removed and rinsed with tap water. Old cartridges will be discarded in the contaminated trash container for disposal. In the morning personnel will inspect and reassemble their own masks and readjust the straps for proper fit and install new cartridges.

L.2 SMALL EQUIPMENT DECONTAMINATION

Small equipment will be protected from contamination as much as possible by draping, masking, or otherwise covering the instruments with plastic (to the extent feasible), without hindering operation of the unit. For example, the PI meter can be placed in a clear plastic bag to allow for reading the scale and operating the knobs. The PI meter can be partially wrapped, keeping the sensor tip and discharge port clear.

The contaminated equipment will be taken from the drop area and the protective coverings will be removed and disposed of in 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, and then prepared with new protective coverings.

Figure L-2
Maximum Decontamination Layout
Level A Protection

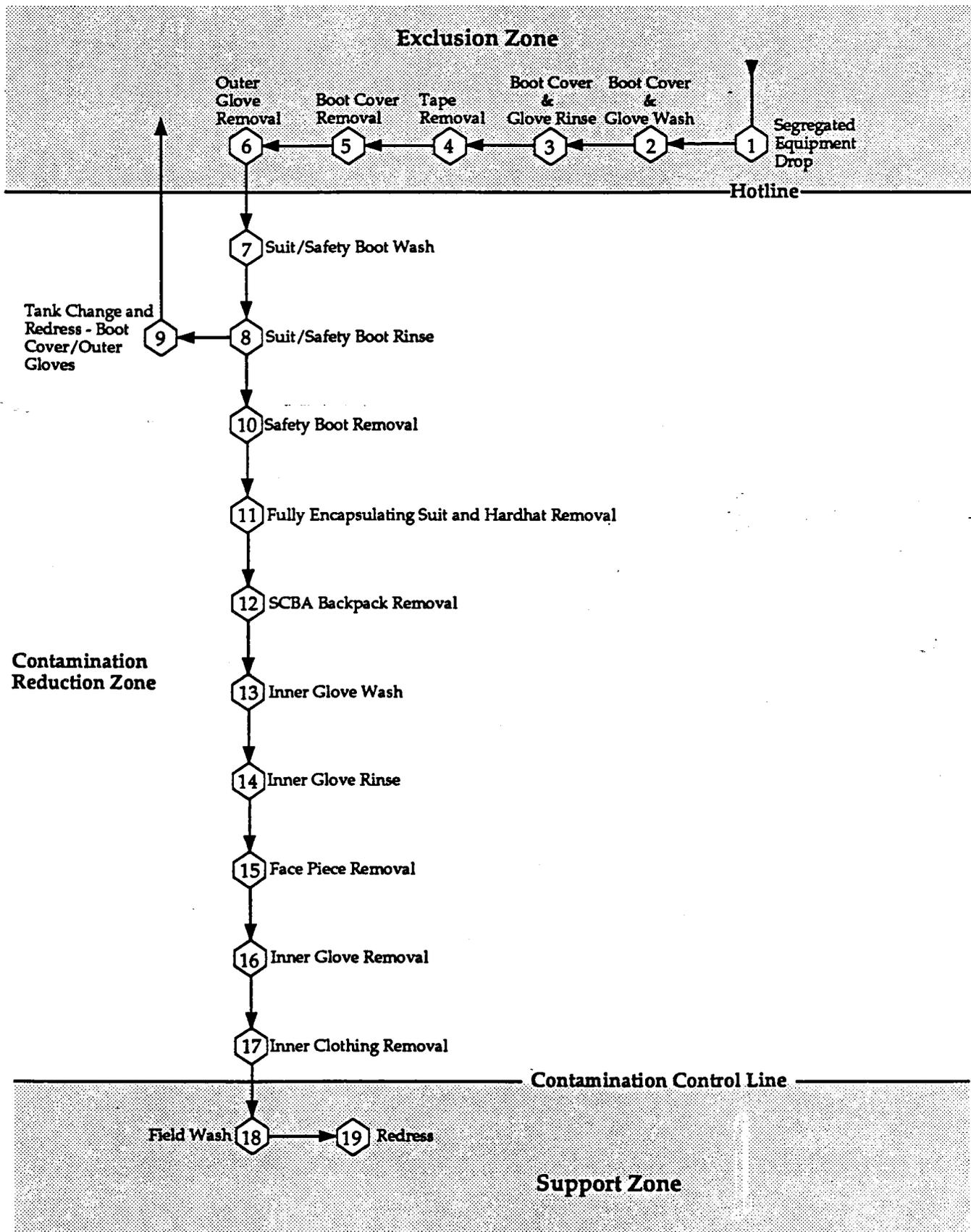


Figure L-3
Maximum Decontamination Layout
Level B Protection

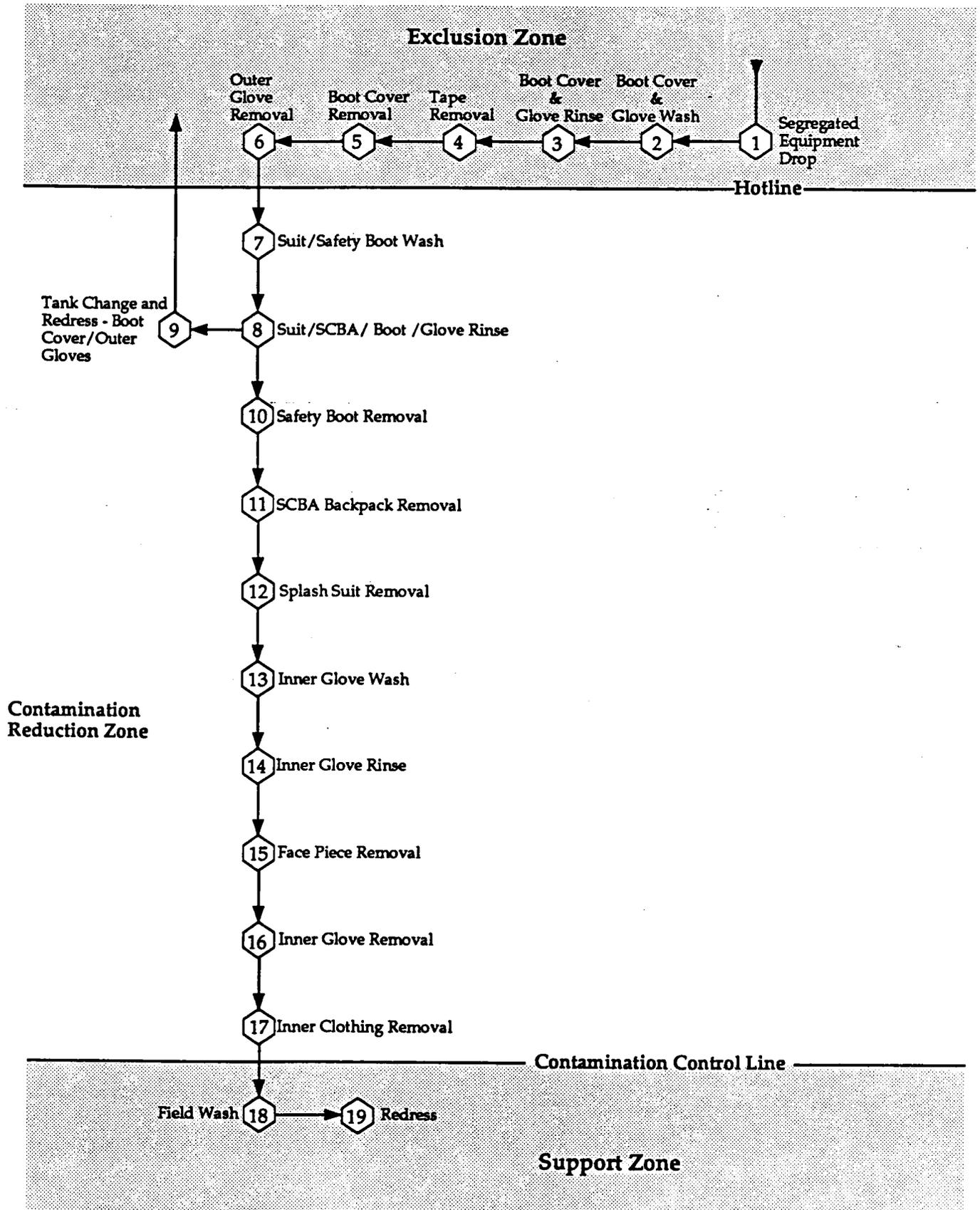


Figure L-4
Maximum Decontamination Layout
Level C Protection

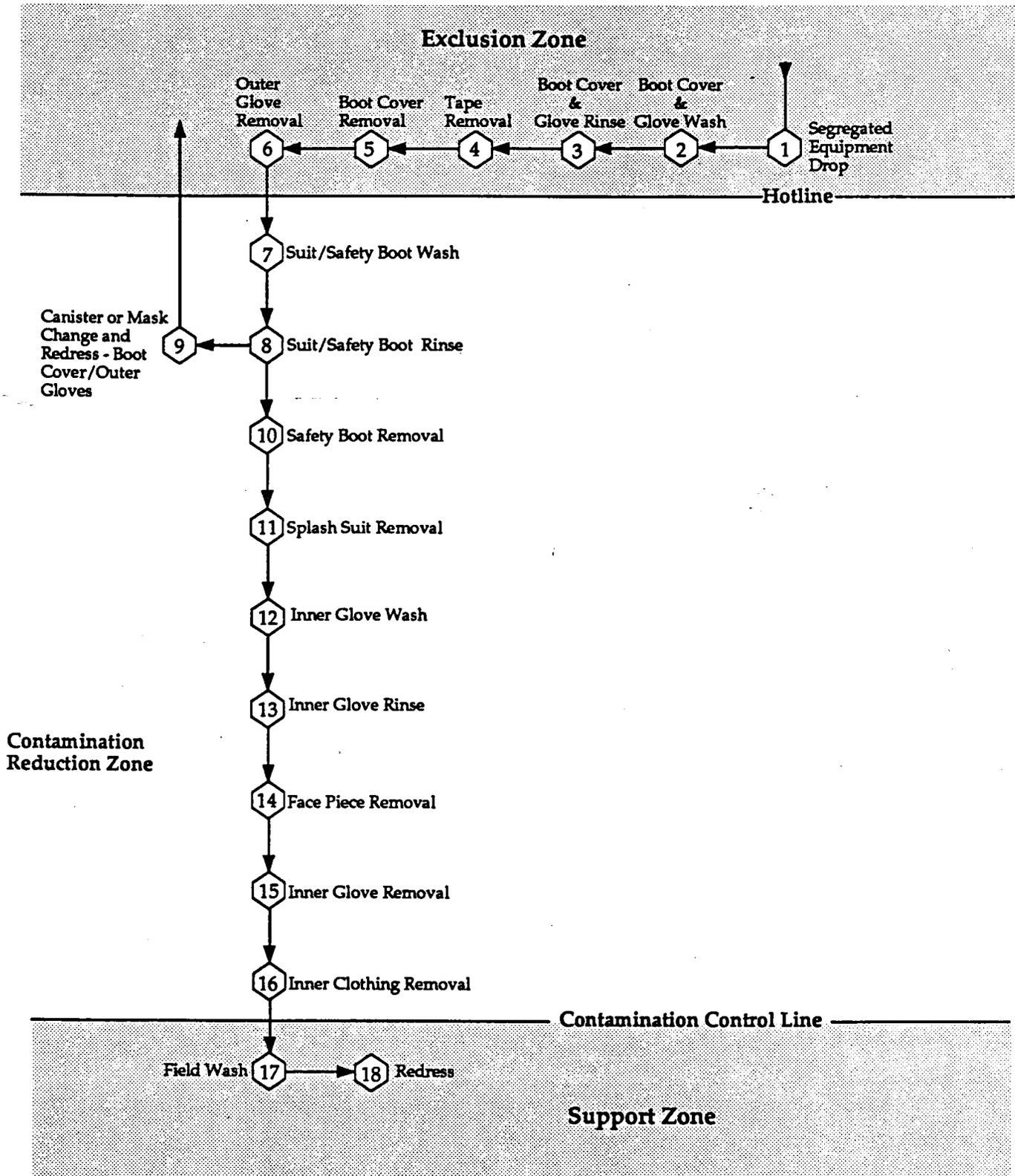
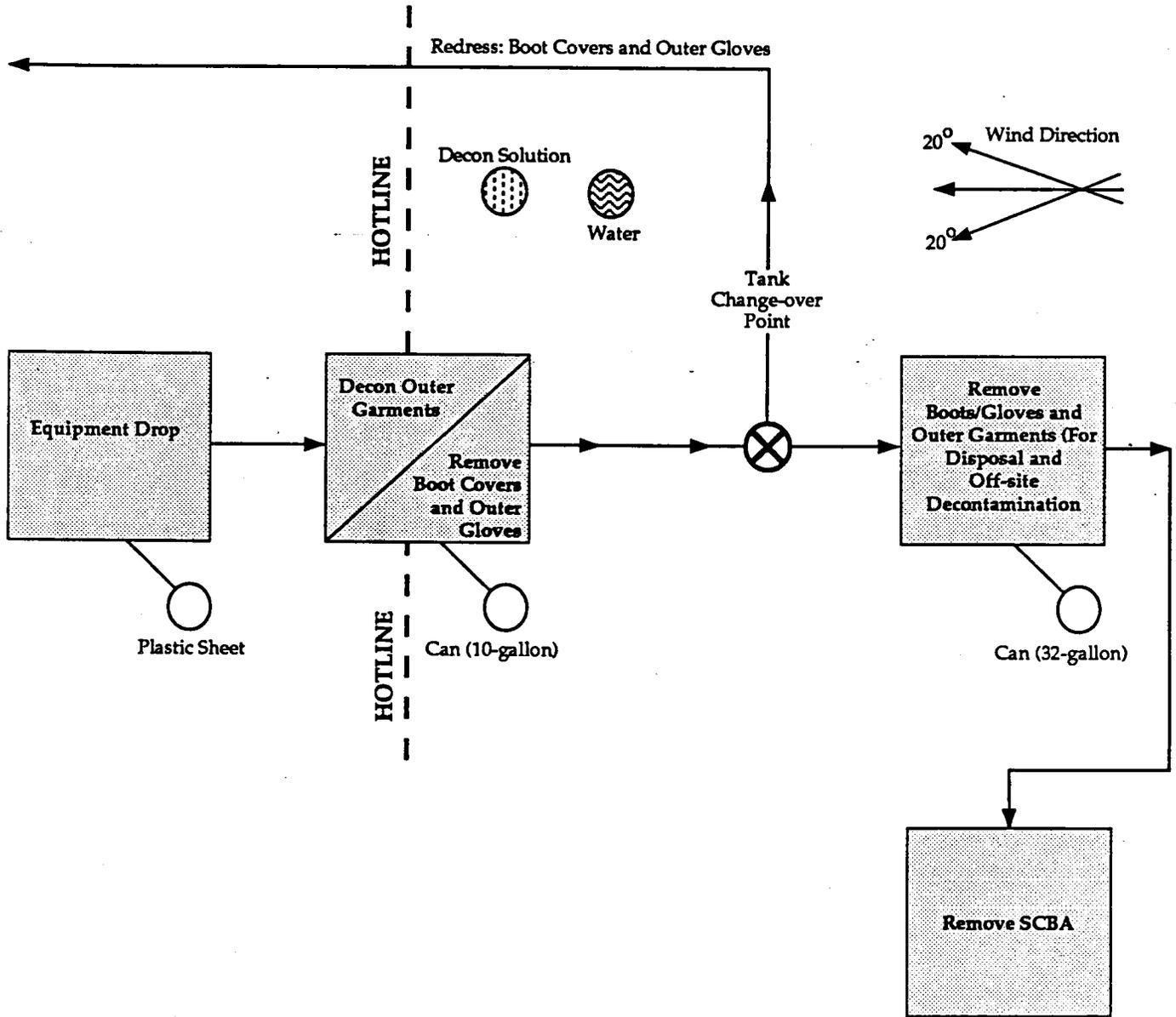


Figure L-5
 Minimum Decontamination Layout
 Levels A and B Protection



L.3 HEAVY EQUIPMENT DECONTAMINATION

It is anticipated that drilling rigs and backhoes will become contaminated during borehole and test-pitting activities. They will be cleaned with high-pressure water or steam, followed by a soap and water wash and rinse. Loose material will be removed with a brush. The person performing this activity will usually be at least at the level of protection used during the personnel and monitoring equipment decontamination.

L.4 DISPOSAL OF DECONTAMINATED MATERIALS

All protective gear, decontamination fluids (for both personnel and equipment), and other disposable materials will be disposed of at each site.

Decontamination fluids identified to be contaminated by site contaminants (i.e., Liqui-nox, used to decontaminate sampling equipment such as split spoons and groundwater sampling pumps) will be stored in DOT-approved 55-gallon drums. Contaminated disposable materials (e.g., gloves and Tyveks) will be double-bagged and stored as is, or placed in DOT-approved 55-gallon drums.

APPENDIX M

EMERGENCY PLANNING

APPENDIX M

M.1 EMERGENCY MEDICAL SERVICES

Prior to site investigation or activity on hazardous sites, nearby health facilities will be evaluated to determine their ability to provide for the needs of on-site project staff. Criteria such as emergency department physician coverage, decontamination capabilities, and available medical specialists will be evaluated.

M.1.1 On-site First Aid

An industrial first-aid kit will be provided at the work site; contents of the kit will be checked weekly and restocked as necessary. Other equipment may include oxygen, backboard and straps, splints, and a cervical collar.

At least one person qualified to perform first aid will be present on-site at all times during work activity. This person will have earned a certificate in first-aid training from the American Red Cross or will have received equivalent training. Designated first aides will receive regular review training from the American Red Cross or the equivalent.

An eye-wash station will be provided at the work site, as well as flushing water for decontamination of boots, gloves, clothing, and tools.

M.1.2 Transportation to Emergency Treatment

A vehicle will be available at all times to transport personnel to the hospital (in the event an ambulance is unnecessary or unavailable). Under no circumstances will injured persons transport themselves to a medical facility for emergency treatment.

M.2 CONTINGENCY PLANNING

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

All on-site personnel will be familiarized with both the primary and secondary route to the nearest hospital Figure 8-1, as well as the location of the nearest working telephone or radio communication device. A list of emergency telephone numbers will be posted in the trailer.

The local hospital and emergency response team will be advised in advance of the work to be performed. The hospital will also be briefed on the availability of personnel health data and technical support through Environmental Medicine Resources, Inc.

Emergency communication will be required to ensure positive preplanned notification of emergency authorities in the event of episodes requiring initiation of contingency plans. Emergency communication will include all or parts of the following:

- Coordinate with local agencies, fire and police departments, the ambulance service, and the hospital emergency room.
- Establish two-way radio communication and a site alarm capable of warning site personnel and summoning assistance (i.e., airhorn).
- Design an emergency evacuation plan for residents of nearby homes. Although evacuation is an unlikely event, as a contingency, the HSO will be designated as on-site coordinator and will be responsible for implementing the plan. The HSO will be made aware of the total number of households within a 2,000-foot radius. The Health and Safety Plan will provide the emergency contacts required and a table will provide a list of residences and identifiable operations in the area in the event that evacuation is deemed a possibility for a particular site.
- Investigate possible routes of evacuation prior to any activity.
- If an accident occurs, a copy of an accident report form, provided in Appendix N, should be filled out by the HSO and filed with the individual's supervisor, the HSM or HSS, and Human Resources. A copy should also be retained in the project records.

M.3 POTENTIAL HAZARDS

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

M.3.1 Accidents

Accidents must be handled on a case-by-case basis. Minor cuts, bruises, muscle pulls, and the like will still allow the injured person to undergo reasonably normal decontamination procedures before 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. In these cases, arrangements will be made with the medical facility and transporter to allow them to take proper precautions. The nature and degree of surface contamination at a site is generally low enough that emergency vehicles could reach the victim on-site without undue hazard. However, if on-site access is limited, accident victims may be transported by ABB Environmental personnel trained for this response to a point accessible by an ambulance.

M.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 possible that contact or ingestion of materials may occur. For example, puncture of a buried drum of liquid during drilling operations might cause the drum contents to contact personnel. Standard first-aid procedures should be followed. The drilling rig will have a tank of water that may be useful in some circumstances, particularly to flush contaminants from any exposed skin areas. Eye-wash bottles will also be maintained at the site for emergencies. In cases of ingestion or anything other than minor contact with known substances, the local Poison Control Center and hospital should be notified and the victim taken there immediately for further treatment and observation.

M.3.3 Explosion

The drilling crew should be keenly aware of combustible gas meter readings and should withdraw at any indication of imminently hazardous conditions (i.e., greater than 20 percent LEL). The detection of such conditions will be reported to local agencies for

potential execution of the evacuation plan, if the situation is assessed to warrant such response.

M.3.4 Fire

The combustible gas meter is used to provide a warning of imminent fire hazards at borings. The greatest fire hazard at the site should be recognized as handling the fluids (e.g., methanol and acetone) used for certain decontamination procedures. No smoking or open flames are allowed on-site. Carbon dioxide fire extinguishers will be kept at the drilling rig and in the decontamination area/field office. The fire department, previously informed of site activities, will be called as needed.

M.4 EVACUATION RESPONSE LEVELS

Evacuation responses will occur at three levels: (1) withdrawal from immediate work area (100 feet or more upwind), (2) site evacuation, and (3) evacuation of surrounding area. Anticipated conditions that require these responses are described in the following subsections.

M.4.1 Withdrawal Upwind (100 Feet or More)

Withdrawing upwind (100 feet or more) will be required when (1) ambient air conditions contain greater contaminant concentrations than guidelines allow for the type of respiratory protection being worn (the work crew may return after donning greater respiratory protection and/or assessing the situation as transient and past); (2) a breach in protective clothing or minor accident occurs (the work crew may return when the tear or other malfunction is repaired and first aid or decontamination has been administered); or (3) the respirator malfunctions requiring replacement.

M.4.2 Site Evacuation

Evacuation of the site will be required when (1) ambient air conditions contain explosive and persistent levels of combustible gas or excessive levels of toxic gases; (2) a fire or major accident occurs; or (3) explosion is imminent or has occurred.

M.4.3 Surrounding Area Evacuation

The area surrounding the site will be evacuated when persistent, uncompressible toxic or explosive vapors from test pits or borings

(e.g., pressure release from punctured drum) are released, or air quality monitored at several points downwind assess danger to the surrounding area.

M.5 EVACUATION PROCEDURES

M.5.1 Withdrawal Upwind

The work crew will continually observe general wind directions while on-site. (A simple wind sock may be set up near the work site for visual determinations.) Upon observing conditions that warrant moving away from the work site, the crew will relocate upwind a distance of approximately 100 feet or farther, as indicated by the site monitoring instruments. Donning SCBA and a safety harness and line, the HSO and a member of the crew may return to the work site to determine whether the conditions noted were transient or persistent. If persistent, an alarm should be raised to notify on-site personnel of the situation and the need to leave the site or don SCBA. An attempt should be made to decrease emissions only if greater respiratory protection is donned. The HSM, HSS, and client will be notified of conditions. When access to the site is restricted and escape is thereby hindered, the crew may be instructed to evacuate the site rather than move upwind, especially if withdrawal upwind moves the crew away from escape routes.

M.5.2 Site Evacuation

After determining that site evacuation is warranted, the work crew will proceed upwind of the work site and notify the security force, HSO, and field office of site conditions. If the decontamination area is upwind and more than 500 feet from the work site, the crew will pass quickly through decontamination to remove contaminated outer suits. If the hazard is toxic gas, respirators will be retained. The crew will proceed to the field office to assess the situation, where the respirators may be removed (if instrumentation indicates an acceptable condition). As more facts are determined from the field crew, they will be relayed to the appropriate agencies. The advisability and type of further response action will be coordinated and implemented by the HSO.

M.5.3 Evacuation of Surrounding Area

When the HSO determines that conditions warrant evacuation of downwind residences and commercial operations, the local agencies will be notified and assistance requested. Designated on-site

personnel will initiate evacuation of the immediate off-site area without delay.

APPENDIX N

HEALTH AND SAFETY FORMS AND DATA SHEETS

APPENDIX N

N.1 HEALTH AND SAFETY AUDIT

Site Name: _____ Date: _____

Auditor: _____

SEND A COPY OF COMPLETED FORM TO THE HEALTH AND SAFETY MANAGER.

<u>GENERAL</u>	<u>YES</u>	<u>NO</u>	<u>COMMENTS</u>
HASP on-site?	_____	_____	_____
HASP completely signed off and approved?	_____	_____	_____
OSHA poster posted in trailer?	_____	_____	_____
Emergency telephone numbers posted in trailer?	_____	_____	_____
Emergency eyewash on-site?	_____	_____	_____
Emergency shower on-site?	_____	_____	_____
Stretcher on-site?	_____	_____	_____
First-aid kit on-site?	_____	_____	_____
Adequately stocked?	_____	_____	_____
Proper sanitation facilities?	_____	_____	_____
<u>DOCUMENTATION AND RECORDKEEPING</u>			
Only personnel listed and approved in HASP on-site?	_____	_____	_____
All personnel properly trained?	_____	_____	_____

	<u>YES</u>	<u>NO</u>	<u>COMMENTS</u>
All personnel in health monitoring program?	_____	_____	_____
Daily field records kept by the Site Manager?	_____	_____	_____
Levels of PPE recorded?	_____	_____	_____
Contaminant levels recorded?	_____	_____	_____
Site surveillance records kept by HSO?	_____	_____	_____
Calibration records maintained?	_____	_____	_____
Accident/incident forms on-site?	_____	_____	_____
Field team review sheets signed?	_____	_____	_____
Medical data sheets completed?	_____	_____	_____
Spare hospital directions available?	_____	_____	_____
Visitors logbook completed?	_____	_____	_____
MSDSs for chemicals on-site?	_____	_____	_____
HASP revisions recorded?	_____	_____	_____
First-aid kit inspected weekly?	_____	_____	_____
Are daily safety meetings held?	_____	_____	_____
Emergency procedures discussed during safety meetings?	_____	_____	_____
<u>EMERGENCY RESPONSES</u>			
Vehicle available on-site for transportation to the hospital?	_____	_____	_____
Fire extinguishers on-site?	_____	_____	_____
At least two persons trained in CPR and first-aid on-site at all times?	_____	_____	_____

	<u>YES</u>	<u>NO</u>	<u>COMMENTS</u>
All personnel know who is trained?	_____	_____	_____
<u>PERSONNEL PROTECTIVE EQUIPMENT</u>			
Proper PPE being worn as specified in the HASP?	_____	_____	_____
Level of PPE being worn:	_____	_____	_____
PPE adequate for work conditions?	_____	_____	_____
If not, give reason:	_____	_____	_____
Upgrade/downgrade to PPE level:	_____	_____	_____
Has facial hair that would interfere with fit of respirators been removed?	_____	_____	_____
If not, willing to shave if necessary?	_____	_____	_____
Fit-tested within the last year?	_____	_____	_____
If Level B, back-up/emergency person suited up (except for air)?	_____	_____	_____
HSO periodically inspects PPE and equipment?	_____	_____	_____
PPE not in use properly stored?	_____	_____	_____
<u>MONITORING EQUIPMENT</u>			
All equipment listed in HASP on-site?	_____	_____	_____
Properly calibrated?	_____	_____	_____
In good condition?	_____	_____	_____
Used properly?	_____	_____	_____
Other equipment needed?	_____	_____	_____

	<u>YES</u>	<u>NO</u>	<u>COMMENTS</u>
List:			
Monitoring equipment covered with plastic to minimize contamination?	_____	_____	_____
<u>DECONTAMINATION</u>			
Decon line set up properly?	_____	_____	_____
Proper cleaning fluid used for known or suspected contaminants?	_____	_____	_____
Proper decon procedures used?	_____	_____	_____
Decon personnel wearing proper PPE?	_____	_____	_____
Equipment decontaminated?	_____	_____	_____
Samples decontaminated?	_____	_____	_____
Disposable items changed twice a day or more often if needed?	_____	_____	_____
<u>WORK PRACTICES</u>			
Proper collection and disposal of contaminated PPE?	_____	_____	_____
Proper collection and disposal of decon fluid?	_____	_____	_____
Water available for decon?	_____	_____	_____
Buddy system used?	_____	_____	_____
Equipment kept off drums and ground?	_____	_____	_____
Kneeling or sitting on drums or ground not allowed?	_____	_____	_____
Personnel avoid standing or walking through puddles or stained soil?	_____	_____	_____

	<u>YES</u>	<u>NO</u>	<u>COMMENTS</u>
Zones established?	_____	_____	_____
If night work to be conducted, adequate illumination?	_____	_____	_____
Smoking, eating, or drinking in the Exclusion Zone or CRZ not allowed?	_____	_____	_____
To the extent feasible, contaminated materials handled remotely?	_____	_____	_____
Contact lenses not allowed on-site?	_____	_____	_____
Entry into excavations not allowed unless properly shored or sloped?	_____	_____	_____
All unusual situations on-site listed in HASP?	_____	_____	_____
If not, what?	_____	_____	_____
Action taken?	_____	_____	_____
HASP revised?	_____	_____	_____
<u>CONFINED SPACE ENTRY</u>			
All confined spaces identified?	_____	_____	_____
If not, list:	_____	_____	_____
All appropriate equipment available and in good working order?	_____	_____	_____
Equipment properly calibrated?	_____	_____	_____
Confined Space Checklists used?	_____	_____	_____
Checklists completely and correctly filled out?	_____	_____	_____

N.2 ACCIDENT REPORT FORM

Site: _____ Project No.: _____

Location: _____

Location of Accident if different from above: _____

Name and Address of Injured: _____

SSN: _____ DOB: _____ Sex: _____

Years of Service: _____ Time on Current Job: _____ Department No.: _____

Title/Classification: _____

Date of Accident: _____ Time of Accident: _____

Name of Witness: _____ Telephone No.: _____

Accident Category: Motor Vehicle Property Damage Fire
 Chemical Exposure Near Miss Other

Severity of Injury or Illness Non-disabling Disabling
 Medical Treatment Fatality

Amount of Damage: \$ _____ Property Damaged: _____

CLASSIFICATION OF INJURY

<input type="checkbox"/> Fracture	<input type="checkbox"/> Heat Burn	<input type="checkbox"/> Cold Exposure
<input type="checkbox"/> Dislocation	<input type="checkbox"/> Chemical Burn	<input type="checkbox"/> Heat Stroke
<input type="checkbox"/> Sprain	<input type="checkbox"/> Radiation Burn	<input type="checkbox"/> Faint/Dizziness
<input type="checkbox"/> Abrasion	<input type="checkbox"/> Concussion	<input type="checkbox"/> Blister
<input type="checkbox"/> Laceration	<input type="checkbox"/> Toxic-Respiratory	<input type="checkbox"/> Bruise
<input type="checkbox"/> Puncture	<input type="checkbox"/> Toxic-Ingestion	<input type="checkbox"/> Poison Ivy
<input type="checkbox"/> Bite	<input type="checkbox"/> Toxic-Dermal	<input type="checkbox"/> Headache
<input type="checkbox"/> Respiratory Allergy		
<input type="checkbox"/> Other (explain) _____		

Parts of Body Affected: _____

Degree of Disability: _____

Date Medical Care Received: _____ Emergency Service?: _____

Name and Address of Medical Facility: _____

Follow-up Exam Required?: _____ Estimated No. of Days Away from Job: _____

ACCIDENT LOCATION (use other side of sheet as needed)

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

Was weather a factor? How?

Unsafe mechanical/physical/environmental condition at time of accident (be specific):

Unsafe act by injured person and/or others contributing to the accident (be specific, must be answered):

Personal factors (improper attitude, lack of knowledge or skill, slow reaction, fatigue, inattention, horseplay):

MODIFICATIONS

Level of personal protective equipment required in site safety plan: _____

Was injured person using required equipment? _____

If not, how did actual equipment use differ from plan?

Was personal protective equipment required in site safety plan adequate for site conditions? _____

If no, what additional equipment was needed?:

What can be done to prevent a recurrence of this type of accident (i.e., modification of machine, mechanical guards, modification of work practices, training)?:

DETAILED NARRATIVE DESCRIPTION (How did accident occur and why; objects, equipment, tools used, circumstances, assigned duties; be specific):

Signature of Preparer: _____ Date: _____

Signature of Site Manager: _____ Date: _____

SEND COPIES OF COMPLETED FORM TO HUMAN RESOURCES
AND THE HEALTH AND SAFETY MANAGER OR SUPERVISOR.

N.3 HSO CHECKLIST FOR FIELD OPERATIONS

The following is a list of the minimum equipment and materials needed to fulfill the requirements for health and safety at a site. This list does not include monitoring equipment, decontamination equipment, or personal health and safety equipment (e.g., respirators, tyvcks, and boots).

Need	Posted?	Paperwork
<input type="checkbox"/>		Health and Safety Plan
<input type="checkbox"/>		Health and Safety Plan Appendix
<input type="checkbox"/>		Field Team Review Sheets
<input type="checkbox"/>		Medical Data Sheets
<input type="checkbox"/>	<input type="checkbox"/>	OSHA Job Safety & Health Protection Poster
<input type="checkbox"/>	<input type="checkbox"/>	Emergency Information Sheet
<input type="checkbox"/>	<input type="checkbox"/>	Spare Hospital Directions
<input type="checkbox"/>		Blank Accident Report Forms
<input type="checkbox"/>		Visitors Logbook
<input type="checkbox"/>		H & S Audit Form
<input type="checkbox"/>		Confined Space Entry Forms
<input type="checkbox"/>		Site-specific HASP Attachments
<input type="checkbox"/>		MSDSs for Chemicals Taken On-site (other than those in HASP Appendix)
<input type="checkbox"/>		1. <input style="width: 150px; height: 15px;" type="text"/>
<input type="checkbox"/>		2. <input style="width: 150px; height: 15px;" type="text"/>

Need	Quantity	Equipment
<input type="checkbox"/>	<input type="checkbox"/>	First Aid Kit
<input type="checkbox"/>	<input type="checkbox"/>	Emergency Eye Wash Station
<input type="checkbox"/>	<input type="checkbox"/>	Fire Extinguisher
<input type="checkbox"/>	<input type="checkbox"/>	Emergency Horn
<input type="checkbox"/>	<input type="checkbox"/>	Emergency Stretcher/Backboard

N.4 MATERIAL SAFETY DATA SHEETS

Acetone
Alconox
Benzene
Benz(a)anthracene
Benzo(a)Pyrene
Benzo(ghi)Perylene
n-Butyl Acetate
Cadmium Oxide
4-Chloro-m-Cresol
Chlorobenzene
Chloroform
Chromic Anhydride
Chrysene
Dibenz(a,h)Anthracene
o-Dichlorobenzene
1,1-Dichloroethane
2-Dibenzofuranamine
Di-sec-Octyl Phthalate
Ethyl Acetate
Ethylbenzene
Ethylene Dibromide
Flouranthene
Gasoline: Automotive
Gasoline: Avaition
Gasoline: Straight Run
Kerosene
Lead Chloride
Liqui-Nox
Mercury
Methyl Chloride
Methyl Ethyl Ketone
Methyl Isobutyl Ketone
Mineral Spirits
Nickel Chloride
Oils: Diesel
Oils: Miscellaneous: Lubricating
Oils: Miscellaneous: Penetrating
Petroleum Naphtha
Phenanthrene
Phenol
Pyrene
Indeno (1,2,3-cd) Pyrene
Tetrachloroethane
Tetraethyl Lead

Toluene
Trichloroethane
Trisodium Phosphate
Vinylidene Chloride
m-Xylene
o-Xylene
p-Xylene
Zinc Chloride

ACETONE

ACT

<p>Common Synonyms Dimethyl ketone Propanone 2-Propanone</p>	<p>Watery liquid Colorless Sweet odor</p>	<p>Floats and mixes with water. Flammable, irritating vapor is produced.</p>
<p>Stay upwind and use water spray to "knock down" vapor. Shut off ignition sources and call fire department. Keep people away. Stop discharge if possible. Isolate and remove discharged material. Avoid contact with liquid and vapor. Notify local health and pollution control agencies.</p>		
<p style="text-align: center;">Fire</p>	<p>FLAMMABLE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemical, alcohol foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.</p>	
<p style="text-align: center;">Exposure</p>	<p>VAPOR Irritating to eyes, nose and throat. If inhaled, may cause difficult breathing or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.</p> <p>LIQUID Irritating to eyes. Not irritating to skin. IF IN EYES: hold eyelids open and flush with plenty of water.</p>	
<p style="text-align: center;">Water Pollution</p>	<p>Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and pollution control officials. Notify operators of nearby water intakes.</p>	
<p style="text-align: center;">1. RESPONSE TO DISCHARGE (See Response Methods Handbook) Issue warning-high flammability Disperse and flush</p>	<p style="text-align: center;">2. LABEL</p> <p>2.1 Category: Flammable liquid 2.2 Class: 3</p>	
<p style="text-align: center;">3. CHEMICAL DESIGNATIONS</p> <p>3.1 CG Competibility Class: Ketone 3.2 Formula: C₃H₆CO 3.3 HM/UN Designation: 3 1/1090 3.4 DOT ID No.: 1090 3.5 CAS Registry No.: 67-64-1</p>	<p style="text-align: center;">4. OBSERVABLE CHARACTERISTICS</p> <p>4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Sweetish, pleasant, resembling that of mint or fruit, pungent, sharp, penetrating residual; ketonic, pleasant, non-residual</p>	
<p style="text-align: center;">5. HEALTH HAZARDS</p> <p>5.1 Personal Protective Equipment: Organic vapor canister or air-supplied mask; synthetic rubber gloves; chemical safety goggles or face splash shield. 5.2 Symptoms Following Exposure: INHALATION: vapor irritating to eyes and mucous membranes; acts as an anesthetic in very high concentrations. INGESTION: low order of toxicity but very irritating to mucous membranes. SKIN: prolonged excessive contact causes defatting of the skin, possibly leading to dermatitis. 5.3 Treatment of Exposure: INHALATION: if victim is overcome, remove to fresh air and call a physician; administer artificial respiration if breathing is irregular or stopped. INGESTION: if victim has swallowed large amounts and is conscious and not having convulsions, induce vomiting and get medical help promptly; no specific antidote known. SKIN: wash well with water. EYES: flush with water immediately for at least 15 min. Consult a physician. 5.4 Threshold Limit Value: 750 ppm 5.5 Short Term Inhalation Limits: 1000 ppm for 30 min. 5.6 Toxicity by Ingestion: Grade 1; LD₅₀ = 5 to 15 g/kg (dog) 5.7 Late Toxicity: Not pertinent 5.8 Vapor (Gas) Irritant Characteristics: If present in high concentrations, vapors cause moderate irritation of the eyes or respiratory system. Effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: No appreciable hazard. Practically harmless to the skin because it is very volatile and evaporates quickly from the skin. 5.10 Odor Threshold: 100 ppm 5.11 IDLN Value: 20000 ppm</p>		

<p style="text-align: center;">6. FIRE HAZARDS</p> <p>6.1 Flash Point: 4°F O.C.; 0°F C.C. 6.2 Flammable Limits in Air: 2.6%-12.8% 6.3 Fire Extinguishing Agents: Alcohol foam, dry chemical, carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water in straight hose stream will scatter and spread fire and should not be used. 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: 869°F 6.8 Electrical Hazard: Class I, Group D 6.9 Burning Rate: 3.9 mm/min. 6.10 Adiabatic Flame Temperature: Data not available 6.11 Stoichiometric Air to Fuel Ratio: Data not available 6.12 Flame Temperature: Data not available</p> <p style="text-align: center;">7. CHEMICAL REACTIVITY</p> <p>7.1 Reactivity With Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent 7.7 Molar Ratio (Reactant to Product): Data not available 7.8 Reactivity Group: 18</p> <p style="text-align: center;">8. WATER POLLUTION</p> <p>8.1 Aquatic Toxicity: 14,250 ppm/24 hr/sunfish/killed/tap water 13,000 ppm/48 hr/mosquito fish/TL₅₀/turbid water 8.2 Waterfowl Toxicity: Not pertinent 8.3 Biological Oxygen Demand (BOD): (Theor) 122%, 5 days 8.4 Food Chain Concentration Potential: None noted</p> <p style="text-align: center;">9. SHIPPING INFORMATION</p> <p>9.1 Grades of Purity: Technical: 99.5% plus 0.5% water Reagent: 99.5% plus 0.5% water 9.2 Storage Temperature: Ambient 9.3 Inert Atmosphere: No requirement 9.4 Venting: Open (flame arrester) or pressure-vacuum</p>	<p style="text-align: center;">10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook) A-P-Q-R-S</p> <p style="text-align: center;">11. HAZARD CLASSIFICATIONS</p> <p>11.1 Code of Federal Regulations: Flammable liquid 11.2 NAS Hazard Rating for Bulk Water Transportation:</p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Category</th> <th style="text-align: left;">Rating</th> </tr> </thead> <tbody> <tr> <td>Fire</td> <td>3</td> </tr> <tr> <td>Health</td> <td></td> </tr> <tr> <td>Vapor Irritant</td> <td>1</td> </tr> <tr> <td>Liquid or Solid Irritant</td> <td>0</td> </tr> <tr> <td>Poisons</td> <td>0</td> </tr> <tr> <td>Water Pollution</td> <td></td> </tr> <tr> <td>Human Toxicity</td> <td>1</td> </tr> <tr> <td>Aquatic Toxicity</td> <td>1</td> </tr> <tr> <td>Aesthetic Effect</td> <td>1</td> </tr> <tr> <td>Reactivity</td> <td></td> </tr> <tr> <td>Other Chemicals</td> <td>1</td> </tr> <tr> <td>Water</td> <td>2</td> </tr> <tr> <td>Self Reaction</td> <td>0</td> </tr> </tbody> </table> <p>11.3 NFPA Hazard Classification:</p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Category</th> <th style="text-align: left;">Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td> <td>1</td> </tr> <tr> <td>Flammability (Red)</td> <td>3</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td>0</td> </tr> </tbody> </table> <p style="text-align: center;">12. PHYSICAL AND CHEMICAL PROPERTIES</p> <p>12.1 Physical State at 15°C and 1 atm: Liquid 12.2 Molecular Weight: 58.06 12.3 Boiling Point at 1 atm: 133°F = 56.1°C = 329.3°K 12.4 Freezing Point: -138°F = -94.7°C = 178.5°K 12.5 Critical Temperature: 455°F = 235°C = 508°K 12.6 Critical Pressure: 682 psia = 46.4 atm = 4.70 MN/m² 12.7 Specific Gravity: 0.791 at 20°C (liquid) 12.8 Liquid Surface Tension: Not pertinent 12.9 Liquid Water Interfacial Tension: Not pertinent 12.10 Vapor (Gas) Specific Gravity: 2.0 12.11 Ratio of Specific Heats of Vapor (Gas): 1.127 12.12 Latent Heat of Vaporization: 220 Btu/lb = 122 cal/g = 5.11 x 10⁴ J/kg 12.13 Heat of Combustion: -12,250 Btu/lb = -6808 cal/g = -285.0 x 10⁴ J/kg 12.14 Heat of Decomposition: Not pertinent 12.15 Heat of Solution: Not pertinent 12.16 Heat of Polymerization: Not pertinent 12.17 Heat of Fusion: 23.42 cal/g 12.18 Limiting Value: Data not available 12.19 Reid Vapor Pressure: 7.25 psia</p> <p style="text-align: center;">NOTES</p>	Category	Rating	Fire	3	Health		Vapor Irritant	1	Liquid or Solid Irritant	0	Poisons	0	Water Pollution		Human Toxicity	1	Aquatic Toxicity	1	Aesthetic Effect	1	Reactivity		Other Chemicals	1	Water	2	Self Reaction	0	Category	Classification	Health Hazard (Blue)	1	Flammability (Red)	3	Reactivity (Yellow)	0
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MATERIAL SAFETY DATA SHEET
 MAY BE USED TO COMPLY WITH
 OSHA'S HAZARD COMMUNICATION STANDARD,
 29 CFR 1910.1200. STANDARD MUST BE
 CONSULTED FOR SPECIFIC REQUIREMENTS.

U.S. DEPARTMENT OF LABOR
 OCCUPATIONAL SAFETY AND HEALTH
 ADMINISTRATION
 (NON-MANDATORY FORM)
 FORM APPROVED OMB NO. 1218-0072

IDENTITY (AS USED ON LABEL AND LIST)

ALCONOX 21835-032, 21835-054, 21835-065, 21835-087, 21835-123, WLS19650-A
 LS19650-B

SECTION I

MANUFACTURER'S NAME:

ALCONOX, INC.
 ADDRESS:
 215 PARK AVENUE SOUTH
 NEW YORK, NEW YORK 10003

EMERGENCY TELEPHONE NUMBER:

(212)-473-1300

TELEPHONE NUMBER FOR INFORMATION:

(212)-473-1300

DATE PREPARED:

FEB. 1, 1991

SECTION II - HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

THERE ARE NO INGREDIENTS IN ALCONOX WHICH APPEARED ON THE OSHA STANDARD
 29 CFR 1910 SUBPART Z.

SECTION III - PHYSICAL/CHEMICAL CHARACTERISTICS

BILING POINT:	N.A.	SPECIFIC GRAVITY (H2O=1):	N.A.
VAPOR PRESSURE (MMHG):	N.A.	MELTING POINT:	N.A.
VAPOR DENSITY (AIR=1):	N.A.	EVAPORATION RATE:	N.A.
		(BUTYL ACETATE=1)	

SOLUBILITY IN WATER: APPRECIABLE (GREATER THAN 10 PERCENT)
 APPEARANCE AND ODOR: WHITE POWDER INTERSPERED WITH CREAM COLORED FLAKES-
 ODORLESS

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (METHOD USED): NONE

FLAMMABLE LIMITS:

LEL: N/A UEL: N/A

EXTINGUISHING MEDIA:

WATER, CO2, DRY CHEMICAL, FOAM, SAND/EARTH

SPECIAL FIRE FIGHTING PROCEDURES:

FOR FIRES INVOLVING THIS MATERIAL DO NOT ENTER WITHOUT PROTECTIVE
 EQUIPMENT AND SELF CONTAINED BREATHING APPARATUS.

UNUSUAL FIRE AND EXPLOSION HAZARDS: NONE

SECTION V - REACTIVITY DATA

STABILITY: STABLE CONDITIONS TO AVOID: NONE
 INCOMPATIBILITY (MATERIALS TO AVOID): AVOID STRONG ACIDS
 HAZARDOUS DECOMPOSITION OR BYPRODUCTS: MAY RELEASE CO2 GAS ON BURNING

HAZARDOUS POLYMERIZATION WILL NOT OCCUR

CONDITIONS TO AVOID: NONE

SECTION VI - HEALTH HAZARD DATA

ROUTES OF ENTRY: INHALATION-YES SKIN-NO INGESTION-YES

HEALTH HAZARDS (ACUTE AND CHRONIC):

INHALATION OF POWDER MAY PROVE LOCALLY IRRITATING TO MUCOUS MEMBRANES.

INGESTION MAY CAUSE DISCOMFORT AND/OR DIARRHEA.

MUTAGENICITY: NTP: NO IARC MONOGRAPHS: NO OSHA REGULATED: NO

SIGNS AND SYMPTOMS OF EXPOSURE:

EXPOSURE MAY IRRITATE MUCOUS MEMBRANES. MAY CAUSE SNEEZING.

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE:

RESPIRATORY CONDITIONS MAY BE AGGRAVATED BY POWDER.

EMERGENCY AND FIRST AID PROCEDURES:

EYES-FLUSH WITH PLENTY OF WATER FOR 15 MINUTES SKIN-FLUSH WITH PLENTY OF WATER
 INGESTION-DRINK LARGE QUANTITIES OF WATER, GET MEDICAL ATTENTION FOR DISCOMFORT

SECTION VII - PRECAUTIONS FOR SAFE HANDLING AND USE

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED:

MATERIAL FOAMS PROFUSELY. SHOVEL AND RECOVER AS MUCH AS POSSIBLE. RINSE REMAINDER TO SEWER. MATERIAL IS COMPLETELY BIODEGRADABLE.

WASTE DISPOSAL METHOD:

SMALL QUANTITIES MAY BE DISPOSED OF IN SEWER. LARGE QUANTITIES SHOULD BE DISPOSED OF ACCORDING TO LOCAL REQUIREMENTS FOR NON-HAZARDOUS DETERGENT.

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING:

STORE IN A DRY AREA TO PREVENT CAKING.

OTHER PRECAUTIONS:

NO SPECIAL REQUIREMENTS OTHER THAN THE GOOD INDUSTRIAL HYGIENE AND SAFETY PRACTICES EMPLOYED WITH ANY INDUSTRIAL CHEMICAL.

SECTION VIII - CONTROL MEASURES

RESPIRATORY PROTECTION (SPECIFY TYPE):

DUST MASK

VENTILATION: LOCAL EXHAUST: NORMAL
MECHANICAL (GENERAL): N.A.
PROTECTIVE GLOVES: USEFUL-NOT REQUIRED
OTHER PROTECTIVE CLOTHING OR EQUIPMENT:
NOT REQUIRED
WORK/HYGIENIC PRACTICES:
NO SPECIAL PRACTICES REQUIRED

SPECIAL: N.A.
OTHER: N.A.
EYE PROTECTION: USEFUL-NOT REQUIRED

BENZENE

BNZ

<p>Common Synonyms</p> <p>Benzol Benzole</p>		<p>Watery liquid</p> <p>Colorless</p> <p>Gasoline-like odor</p>
<p>Floats on water. Flammable, irritating vapor is produced. Freezing point is 42°F.</p>		
<p>Avoid contact with liquid and vapor. Keep people away. Wear goggles and self-contained breathing apparatus. Shut off ignition sources and call fire department. Stop discharge if possible. Stay upwind and use water spray to "knock down" vapor. Isolate and remove discharged material. Notify local health and pollution control agencies.</p>		
<p>Fire</p>	<p>FLAMMABLE. - Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemical, foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.</p>	
<p>Exposure</p>	<p>CALL FOR MEDICAL AID.</p> <p>VAPOR Irritating to eyes, nose and throat. If inhaled, will cause headache, difficult breathing, or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.</p> <p>LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.</p>	
<p>Water Pollution</p>	<p>HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.</p>	
<p>1. RESPONSE TO DISCHARGE (See Response Methods Handbook) Issue warning-high flammability Restrict access</p>		<p>2. LABEL</p> <p>2.1 Category: Flammable liquid 2.2 Class: 3</p>
<p>3. CHEMICAL DESIGNATIONS</p> <p>3.1 CG Compatibility Class: Aromatic Hydrocarbon 3.2 Formula: C₆H₆ 3.3 IMO/UN Designation: 3.2/1114 3.4 DOT ID No.: 1114 3.5 CAS Registry No.: 71-43-2</p>		<p>4. OBSERVABLE CHARACTERISTICS</p> <p>4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Aromatic; rather pleasant aromatic odor; characteristic odor</p>
<p>5. HEALTH HAZARDS</p> <p>5.1 Personal Protective Equipment: Hydrocarbon vapor canister, supplied air or a hose mask; hydrocarbon-insoluble rubber or plastic gloves; chemical goggles or face splash shield; hydrocarbon-insoluble apron such as neoprene.</p> <p>5.2 Symptoms Following Exposure: Dizziness, excitation, pallor, followed by flushing, weakness, headache, breathlessness, chest constriction. Coma and possible death.</p> <p>5.3 Treatment of Exposure: SKIN: flush with water followed by soap and water; remove contaminated clothing and wash skin. EYES: flush with plenty of water until irritation subsides. INHALATION: remove from exposure immediately. Call a physician. IF breathing is irregular or stopped, start resuscitation, administer oxygen.</p> <p>5.4 Threshold Limit Value: 10 ppm</p> <p>5.5 Short Term Inhalation Limits: 75 ppm for 30 min.</p> <p>5.6 Toxicity by Ingestion: Grade 3; LD₅₀ = 50 to 500 mg/kg</p> <p>5.7 Late Toxicity: Leukemia</p> <p>5.8 Vapor (Gas) Irritant Characteristics: If present in high concentrations, vapors may cause irritation of eyes or respiratory system. The effect is temporary.</p> <p>5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smearing and reddening of the skin.</p> <p>5.10 Odor Threshold: 4.66 ppm</p> <p>5.11 IDLH Value: 2,000 ppm</p>		

<p>6. FIRE HAZARDS</p> <p>6.1 Flash Point: 12°F C.C.</p> <p>6.2 Flammable Limits in Air: 1.3%-7.9%</p> <p>6.3 Fire Extinguishing Agents: Dry chemical, foam, or carbon dioxide</p> <p>6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective</p> <p>6.5 Special Hazards of Combustion Products: Not pertinent</p> <p>6.6 Behavior in Fire: Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back</p> <p>6.7 Ignition Temperature: 1097°F</p> <p>6.8 Electrical Hazard: Class I, Group D</p> <p>6.9 Burning Rate: 6.0 mm/min.</p> <p>6.10 Adiabatic Flame Temperature: Data not available</p> <p>6.11 Stoichiometric Air to Fuel Ratio: Data not available</p> <p>6.12 Flame Temperature: Data not available</p>	<p>10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook) A-T-U-V-W</p>																																				
<p>7. CHEMICAL REACTIVITY</p> <p>7.1 Reactivity With Water: No reaction</p> <p>7.2 Reactivity with Common Materials: No reaction</p> <p>7.3 Stability During Transport: Stable</p> <p>7.4 Neutralizing Agents for Acids and Caustics: Not pertinent</p> <p>7.5 Polymerization: Not pertinent</p> <p>7.6 Inhibitor of Polymerization: Not pertinent</p> <p>7.7 Molar Ratio (Reactant to Product): Data not available</p> <p>7.8 Reactivity Group: 32</p>	<p>11. HAZARD CLASSIFICATIONS</p> <p>11.1 Code of Federal Regulations: Flammable liquid</p> <p>11.2 NAS Hazard Rating for Bulk Water Transportation:</p> <table border="1"> <thead> <tr> <th>Category</th> <th>Rating</th> </tr> </thead> <tbody> <tr> <td>Fire</td> <td>3</td> </tr> <tr> <td>Health</td> <td></td> </tr> <tr> <td>Vapor Irritant</td> <td>1</td> </tr> <tr> <td>Liquid or Solid Irritant</td> <td>1</td> </tr> <tr> <td>Poisons</td> <td>3</td> </tr> <tr> <td>Water Pollution</td> <td></td> </tr> <tr> <td>Human Toxicity</td> <td>3</td> </tr> <tr> <td>Aquatic Toxicity</td> <td>1</td> </tr> <tr> <td>Aesthetic Effect</td> <td>3</td> </tr> <tr> <td>Reactivity</td> <td></td> </tr> <tr> <td>Other Chemicals</td> <td>2</td> </tr> <tr> <td>Water</td> <td>1</td> </tr> <tr> <td>Self Reaction</td> <td>0</td> </tr> </tbody> </table> <p>11.3 NFPA Hazard Classification:</p> <table border="1"> <thead> <tr> <th>Category</th> <th>Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td> <td>2</td> </tr> <tr> <td>Flammability (Red)</td> <td>3</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td>0</td> </tr> </tbody> </table>	Category	Rating	Fire	3	Health		Vapor Irritant	1	Liquid or Solid Irritant	1	Poisons	3	Water Pollution		Human Toxicity	3	Aquatic Toxicity	1	Aesthetic Effect	3	Reactivity		Other Chemicals	2	Water	1	Self Reaction	0	Category	Classification	Health Hazard (Blue)	2	Flammability (Red)	3	Reactivity (Yellow)	0
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Flammability (Red)	3																																				
Reactivity (Yellow)	0																																				
<p>8. WATER POLLUTION</p> <p>8.1 Aquatic Toxicity: 5 ppm/6 hr/minnow/lethal/distilled water 20 ppm/24 hr/sunfish/TL₅₀/tap water</p> <p>8.2 Waterfowl Toxicity: Data not available</p> <p>8.3 Biological Oxygen Demand (BOD): 1.2 lb/lb, 10 days</p> <p>8.4 Food Chain Concentration Potential: None</p>	<p>12. PHYSICAL AND CHEMICAL PROPERTIES</p> <p>12.1 Physical State at 15°C and 1 atm: Liquid</p> <p>12.2 Molecular Weight: 78.11</p> <p>12.3 Boiling Point at 1 atm: 176°F = 80.1°C = 353.3°K</p> <p>12.4 Freezing Point: 42.0°F = 5.5°C = 278.7°K</p> <p>12.5 Critical Temperature: 552.0°F = 288.9°C = 562.1°K</p> <p>12.6 Critical Pressure: 710 psia = 48.3 atm = 4.89 MN/m²</p> <p>12.7 Specific Gravity: 0.879 at 20°C (liquid)</p> <p>12.8 Liquid Surface Tension: 28.9 dynes/cm = 0.0289 N/m at 20°C</p> <p>12.9 Liquid Water Interfacial Tension: 35.0 dynes/cm = 0.035 N/m at 20°C</p> <p>12.10 Vapor (Gas) Specific Gravity: 2.7</p> <p>12.11 Ratio of Specific Heats of Vapor (Gas): 1.061</p> <p>12.12 Latent Heat of Vaporization: 169 Btu/lb = 94.1 cal/g = 3.94 X 10⁴ J/kg</p> <p>12.13 Heat of Combustion: -17,460 Btu/lb = -9698 cal/g = -406.0 X 10³ J/kg</p> <p>12.14 Heat of Decomposition: Not pertinent</p> <p>12.15 Heat of Solution: Not pertinent</p> <p>12.16 Heat of Polymerization: Not pertinent</p> <p>12.25 Heat of Fusion: 30.45 cal/g</p> <p>12.26 Limiting Value: Data not available</p> <p>12.27 Reid Vapor Pressure: 3.22 psia</p>																																				
<p>9. SHIPPING INFORMATION</p> <p>9.1 Grades of Purity: Industrial pure 99+ % Thiophene-free 99+ % Nitration 99+ % Industrial 90% 85+ % Reagent 99+ %</p> <p>9.2 Storage Temperature: Open</p> <p>9.3 Inert Atmosphere: No requirement</p> <p>9.4 Venting: Pressure-vacuum</p>	<p>NOTES</p>																																				

BBC250 CAS: 56-55-3 HR: 3
BENZ(a)ANTHRACENE

mf: C₁₈H₁₂ mw: 228.30

PROP: Colorless leaflets or plates. Bp: 400°, mp: 160°.

SYNS: BA * BENZANTHRACENE * 1,2-BENZANTHRACENE * 1,2-BENZ(a)ANTHRACENE * 1,2-BENZANTHRAZEN (GERMAN) * BENZANTHRENE * 1,2-BENZANTHIRENE * BENZOANTHRACENE * 1,2-BENZOANTHRACENE * BENZO(a)ANTHRACENE * BENZO(a)PHENANTHIRENE * BENZO(b)PHENANTHIRENE * 2,3-BENZOPHENANTHIRENE * 2,3-BENZPHENANTHIRENE * NAPHTHANTHRACENE * RCRA WASTE NUMBER U018 * TETRAPHENE

CONSENSUS REPORTS: IARC Cancer Review: GROUP 2A IMEMDT 7,56,87. Animal Sufficient Evidence IMEMDT 32,135,83; IMEMDT 3,45,73. NTP Fourth Annual Report On Carcinogens, 1984. EPA Genetic Toxicology Program. Reported in EPA TSCA Inventory.

SAFETY PROFILE: Confirmed carcinogen with experimental carcinogenic, neoplastigenic, tumorigenic data by skin contact and other routes. Poison by intravenous route. Human mutation data reported. It is found in oils, waxes, smoke, food, drugs. When heated to decomposition it emits acrid smoke and irritating fumes.

BCS750 CAS: 50-32-8 HR: 3
BENZO(a)PYRENE

mf: C₂₀H₁₂ mw: 252.32

PROP: Yellow crystals. Mp: 179°, bp: 312°
(@ 10 mm. Insol in water; sol in benzene, toluene, and xylene.

SYNS: BENZO(a,e)CHRYSENE * 3,4-BENZOPYRENE
(ITALIAN) * 3,4-BENZOPYRENE * 6,7-BENZOPYRENE * 3,4-BENZOPYREN (GERMAN) * BENZO(a)PYRENE * 3,4-BENZOPYRENE * 3,4-BENZOPYRENE

CONSENSUS REPORTS: IARC Cancer Review: GROUP 2A IMEMDT 7,56,87; Animal Sufficient Evidence IMEMDT 32,211,83; IMEMDT 3,91,73. Reported in EPA TSCA Inventory.

OSHA PEL: TWA 0.2 mg/m³

SAFETY PROFILE: Suspected carcinogen with experimental carcinogenic, neoplastigenic, and tumorigenic data. A poison via subcutaneous, intraperitoneal and intrarenal routes. Experimental teratogenic and reproductive effects. Human mutation data reported. A common air contaminant of water, food, and smoke. When heated to decomposition it emits acrid smoke and fumes.

BENZO[ghi]PERYLENE

SYNONYMS: 1,12-Benzoperylene; 1,12-Benzperylene; B(ghi)P.

CHEMICAL DESIGNATIONS: CAS: 191-24-2; DOT: none assigned; mf: $C_{22}H_{12}$; fw: 276.34; RTECS: DI 6200500.

PROPERTIES: Solid. Mp: 276.8°, bp: > 500°, pK_a : > 15, K_{11} : 1.4×10^{-7} atm·m³/mol @ 25° (calcd), IP: 7.24 eV, log K_{ow} : 6.89 (calcd), log K_{ow} : 7.10, S_v : sol in most solvents, S_w : 0.26 µg/L @ 25°, vp: 1.01×10^{-10} mm @ 25°.

EXPOSURE LIMITS: No individual standards have been set, however, as a constituent in coal tar pitch volatiles, the following exposure limits have been established: NIOSH REL: 10-h TWA 0.1 mg/m³ (cyclohexane-extractable fraction); OSHA PEL: TWA 0.2 mg/m³ (benzene-soluble fraction); ACGIH TLV: TWA 0.2 mg/m³ (benzene solubles).

USE: Research chemical. Derived from industrial and experimental coal gasification operations where the maximum concn detected in coal tar streams was 2.7 mg/m³.

n-BUTYL ACETATE

BCN

<p>Common Synonyms Acetic acid, n-butyl ester Butyl acetate Butyl ethanoate</p>	<p>Watery liquid Colorless Pleasant fruity odor</p> <p>Floats on water. Flammable irritating vapor is produced.</p>
<p>Stop discharge if possible. Keep people away. Shut off ignition sources and call fire department. Avoid contact with liquid and vapor. Stay upwind and use water spray to "knock down" vapor. Isolate and remove discharged material. Notify local health and pollution control agencies.</p>	
Fire	<p>FLAMMABLE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemical, foam or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.</p>
Exposure	<p>CALL FOR MEDICAL AID.</p> <p>VAPOR Irritating to eyes, nose and throat. If inhaled, will cause nausea, dizziness, headache or difficult breathing. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.</p> <p>LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.</p>
Water Pollution	<p>Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and pollution control officials. Notify operators of nearby water intakes.</p>
<p>1. RESPONSE TO DISCHARGE (See Response Methods Handbook) Issue warning-flammability Mechanical containment</p>	<p>2. LABEL 2.1 Category: Flammable liquid 2.2 Class: 3</p>
<p>3. CHEMICAL DESIGNATIONS 3.1 CG Competibility Class: Ester 3.2 Formula: CH₃COO(CH₂)₃CH₃ 3.3 IMO/UN Designation: 3.2/1123 3.4 DOT ID No.: 1123 3.5 CAS Registry No.: 123-86-4</p>	<p>4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Characteristic, agreeable fruity (in low conc.), disagreeable (in higher conc.), nonresidual</p>
<p>5. HEALTH HAZARDS 5.1 Personal Protective Equipment: All-purpose canister mask, chemical safety goggles, rubber gloves. 5.2 Symptoms Following Exposure: SKIN: prolonged or frequently repeated exposures may lead to drying. INHALATION: headaches, dizziness, nausea, irritation of respiratory passages and eyes. 5.3 Treatment of Exposure: EYES: in case of contact, flush with water for at least 15 min. INHALATION: remove from exposure immediately. Call a physician. If breathing is irregular or stopped, start resuscitation, administer oxygen. INGESTION: induce vomiting and call a physician. 5.4 Threshold Limit Value: 150 ppm 5.5 Short Term Inhalation Limits: 300 ppm for 30 min. 5.6 Toxicity by Ingestion: Grade 2, LD₅₀ = 0.5 to 5 g/kg 5.7 Late Toxicity: None 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin. 5.10 Odor Threshold: 10 ppm 5.11 IDLH Value: 10,000 ppm</p>	

<p>6. FIRE HAZARDS 6.1 Flash Point: 99°F O.C.; 75°F C.C. 6.2 Flammable Limits in Air: 1.7%-7.6% 6.3 Fire Extinguishing Agents: Foam, dry chemical, carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water in straight hose stream will scatter and spread fire and should not be used. 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: 760°F 6.8 Electrical Hazard: Class I, Group D 6.9 Burning Rate: 4.4 mm/min. 6.10 Adiabatic Flame Temperature: Data not available 6.11 Stoichiometric Air to Fuel Ratio: Data not available 6.12 Flame Temperature: Data not available</p>	<p>10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook) A-T-U</p>
<p>7. CHEMICAL REACTIVITY 7.1 Reactivity With Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent 7.7 Molar Ratio (Reactant to Product): Data not available 7.8 Reactivity Group: 34</p>	<p>11. HAZARD CLASSIFICATIONS 11.1 Code of Federal Regulations: Flammable liquid 11.2 NIOSH Hazard Rating for Bulk Water Transportation: Category Rating Fire 3 Health: Vapor Irritant 1 Liquid or Solid Irritant 1 Poisons 2 Water Pollution: Human Toxicity 2 Aquatic Toxicity 0 Anesthetic Effect 2 Reactivity: Other Chemicals 2 Water 1 Self Reaction 0 11.3 NFPA Hazard Classification: Category Classification Health Hazard (Blue) 1 Flammability (Red) 3 Reactivity (Yellow) 0</p>
<p>8. WATER POLLUTION 8.1 Aquatic Toxicity: 44 ppm/48 hr/daphnia/TL₅₀/fresh water 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): 0.15 to 0.5 lb/lb, 5 days (theor.) 52%, 5 days 8.4 Food Chain Concentration Potential: None</p>	<p>12. PHYSICAL AND CHEMICAL PROPERTIES 12.1 Physical State at 18°C and 1 atm: Liquid 12.2 Molecular Weight: 116.16 12.3 Boiling Point at 1 atm: 259°F = 126°C = 399°K 12.4 Freezing Point: -100°F = -73.5°C = 199.7°K 12.5 Critical Temperature: 582.6°F = 305.9°C = 579.1°K 12.6 Critical Pressure: 455 psia = 31 atm = 3.1 MN/m² 12.7 Specific Gravity: 0.875 at 20°C (liquid) 12.8 Liquid Surface Tension: 14.5 dynes/cm = 0.0145 N/m at 25°C 12.9 Liquid Water Intertfacial Tension: (est.) 57 dynes/cm = 0.057 N/m at 22°C 12.10 Vapor (Gas) Specific Gravity: Not pertinent 12.11 Ratio of Specific Heats of Vapor (Gas): 1.058 12.12 Latent Heat of Vaporization: 133 Btu/lb = 73.9 cal/g = 3.09 X 10⁴ J/kg 12.13 Heat of Combustion: -13,130 Btu/lb = -7294 cal/g = -305.4 X 10⁴ J/kg 12.14 Heat of Decomposition: Not pertinent 12.15 Heat of Solution: Not pertinent 12.16 Heat of Polymerization: Not pertinent 12.26 Heat of Fusion: Data not available 12.26 Limiting Value: Data not available 12.27 Reid Vapor Pressure: 0.5 psia</p>
<p>9. SHIPPING INFORMATION 9.1 Grades of Purity: Urethane: 99.5%; pure: 98%; commercial: 90-92% 9.2 Storage Temperature: Ambient 9.3 Inert Atmosphere: No requirement 9.4 Venting: Open (flame arrester)</p>	
<p>NOTES</p>	

CADMIUM OXIDE

COX

<p>Common Synonyms Cadmium fume</p>	<p>Solid Yellow-brown Odorless</p> <p>Sinks in water.</p>
<p>AVOID CONTACT WITH SOLID AND DUST. KEEP PEOPLE AWAY. Wear a dust respirator. Stop discharge if possible. Isolate and remove discharged material. Notify local health and pollution control agencies.</p>	
Fire	<p>Not flammable. POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus.</p>
Exposure	<p>CALL FOR MEDICAL AID.</p> <p>DUST POISONOUS IF INHALED. If inhaled will cause coughing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.</p> <p>SOLID Irritating to skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS do nothing except keep victim warm.</p>
Water Pollution	<p>Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes.</p> <p>Notify local health and wildlife officials. Notify operators of nearby water intakes.</p>
<p>1. RESPONSE TO DISCHARGE (See Response Methods Handbook) Should be removed. Chemical and physical treatment.</p>	<p>2. LABEL</p> <p>2.1 Category: None 2.2 Class: Not pertinent</p>
<p>3. CHEMICAL DESIGNATIONS</p> <p>3.1 CG Competibility Class: Not listed 3.2 Formula: CdO 3.3 IMO/UN Designation: Not listed 3.4 DOT ID No.: 2570 3.5 CAS Registry No.: 1306-19-0</p>	<p>4. OBSERVABLE CHARACTERISTICS</p> <p>4.1 Physical State (as shipped): Solid 4.2 Color: Yellow-brown to brown 4.3 Odor: None</p>
<p style="text-align: center;">5. HEALTH HAZARDS</p> <p>5.1 Personal Protective Equipment: Bu. Mines approved respirator; goggles; rubber gloves 5.2 Symptoms Following Exposure: A single exposure to cadmium oxide fumes can cause severe or fatal lung irritation; chronic poisoning is characterized by lung injury (emphysema) and kidney dysfunction. Ingestion produces severe toxic effects; both kidney and liver injuries may occur. Contact with eyes causes irritation. 5.3 Treatment of Exposure: INHALATION: If there has been known exposure to dense cadmium oxide fume or if cough, chest tightness, or respiratory distress occur after possible exposure, place patient at bed rest and call a physician. INGESTION: induce vomiting; stop irritation by giving milk or egg whites at frequent intervals; perform gastric lavage; seek medical attention. EYES: flush with water for at least 15 min. 5.4 Threshold Limit Value: 0.05 mg/m³ as Cd 5.5 Short Term Inhalation Limits: 0.1 mg/m³, 30 min. 5.6 Toxicity by Ingestion: Grade 3; oral rat LD₅₀ = 72 mg/kg 5.7 Late Toxicity: Delayed liver, lung, and kidney damage has followed respiratory exposures to cadmium salts in industry. 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Odorless 5.11 IDLH Value: 40 mg/m³ as Cd</p>	

<p style="text-align: center;">6. FIRE HAZARDS</p> <p>6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Toxic cadmium oxide fume may form in fire. 6.6 Behavior in Fire: Data not available 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Data not available 6.10 Adiabatic Flame Temperature: Data not available 6.11 Stoichiometric Air to Fuel Ratio: Data not available 6.12 Flame Temperature: Data not available</p>	<p style="text-align: center;">10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook)</p> <p style="text-align: center;">II</p>
<p style="text-align: center;">7. CHEMICAL REACTIVITY</p> <p>7.1 Reactivity With Water: No reaction 7.2 Reactivity with Common Materials: Data not available 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent 7.7 Molar Ratio (Reactant to Product): Data not available 7.8 Reactivity Group: Data not available</p>	<p style="text-align: center;">11. HAZARD CLASSIFICATIONS</p> <p>11.1 Code of Federal Regulations: Not listed 11.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 11.3 NFPA Hazard Classification: Not listed</p>
<p style="text-align: center;">8. WATER POLLUTION</p> <p>8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): None 8.4 Food Chain Concentration Potential: Concentrated by shellfish</p>	<p style="text-align: center;">12. PHYSICAL AND CHEMICAL PROPERTIES</p> <p>12.1 Physical State at 15°C and 1 atm: Solid 12.2 Molecular Weight: 126.4 12.3 Boiling Point at 1 atm: Not pertinent (decomposes) 12.4 Freezing Point: Not pertinent 12.5 Critical Temperature: Not pertinent 12.6 Critical Pressure: Not pertinent 12.7 Specific Gravity: 6.95 at 20°C (solid) 12.8 Liquid Surface Tension: Not pertinent 12.9 Liquid Water Intersurface Tension: Not pertinent 12.10 Vapor (Gas) Specific Gravity: Not pertinent 12.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 12.12 Latent Heat of Vaporization: Not pertinent 12.13 Heat of Combustion: Not pertinent 12.14 Heat of Decomposition: Not pertinent 12.15 Heat of Solution: Not pertinent 12.16 Heat of Polymerization: Not pertinent 12.26 Heat of Fusion: Data not available 12.26 Limiting Value: Data not available 12.27 Reid Vapor Pressure: Data not available</p>
<p style="text-align: center;">9. SHIPPING INFORMATION</p> <p>9.1 Grades of Purity: Reagent; technical 9.2 Storage Temperature: Ambient 9.3 Inert Atmosphere: No requirement 9.4 Venting: Open</p>	
<p style="text-align: center;">NOTES</p>	

CFE250 CAS: 59-50-7 HR: J
4-CHLORO-m-CRESOL
mf: C₇H₇ClO mw: 142.59

PROP: Odorless crystals (when pure). Somewhat sol in water, very sol in organic solvents. Mp: 66°, bp: 235°.

SYNS: APTAL * BAKTOL * BAKTOLAN
* CANDASEPTIC * p-CHLOR-m-CRESOL * CHLOROCRESOL * p-CHLOROCRESOL * p-CHLORO-m-CRESOL * 6-CHLORO-m-CRESOL * 2-CHLORO-HYDROXYTOLUENE * 6-CHLORO-3-HYDROXYTOLUENE * 4-CHLORO-3-METHYLPHENOL * 3-METHYL-4-CHLOROPHENOL * OTTAFACT * PARMETOL * PAROL * PCMC * PREVENTOL CMK * RASCHIT * RASEN-ANICON * RCRA WASTE NUMBER U039

CONSENSUS REPORTS: Reported in EPA TSCA Inventory. Chlorophenol compounds are on the Community Right-To-Know List.

SAFETY PROFILE: Poison by intraperitoneal and subcutaneous routes. Moderately toxic by ingestion. An allergen. Incompatible with sodium hydroxide. When heated to decomposition it emits toxic fumes of Cl⁻ and phosgene.

CHLOROBENZENE

CRB

Common Synonyms Monochlorobenzene Phenyl chloride Benzene chloride MCB		Watery liquid Colorless Sweet, almond odor Sinks in water. Flammable vapor is produced.
Avoid contact with liquid and vapor. Keep people away. Stop discharge if possible. Call fire department. Stay upwind and use water spray to "knock down" vapor. Isolate and remove discharged material. Notify local health and pollution control agencies.		
Fire	FLAMMABLE Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemical, foam, or carbon dioxide.	
Exposure	CALL FOR MEDICAL AID VAPOR If inhaled, will cause coughing or dizziness. Not irritating to eyes, nose and throat. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open, and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.	
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.	
1. RESPONSE TO DISCHARGE (See Response Methods Handbook) Should be removed. Chemical and physical treatment.		2. LABEL 2.1 Category: Flammable liquid 2.2 Class: 3
3. CHEMICAL DESIGNATIONS 3.1 CG Compatibility Class: Halogenated hydrocarbon 3.2 Formula: C ₆ H ₅ Cl 3.3 IMO/UN Designation: 3.3/1134 3.4 DOT ID No.: 1134 3.5 CAS Registry No.: 108-90-7		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Mild amine odor, sweet, almond-like, aromatic
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Organic vapor-acid gas respirator where appropriate; neoprene or vinyl gloves; chemical safety spectacles, plus face shield where appropriate; rubber footwear; apron or impervious clothing for splash protection; hard hat. 5.2 Symptoms Following Exposure: Irritating to skin, eyes and mucous membranes. Repeated exposure of skin may cause dermatitis due to defatting action. Chronic inhalation of vapors or mist may result in damage to lungs, liver, and kidneys. Acute vapor exposures can cause symptoms ranging from coughing to transient anesthesia and central nervous system depression. 5.3 Treatment of Exposure: Get medical attention for all eye exposures and any serious over-exposures. Treat the symptoms. INHALATION: remove to clean air; administer oxygen as needed. INGESTION: dilute by drinking water; if vomiting occurs, administer more water. Administer saline laxative. EYES: flush thoroughly with water. SKIN: remove contaminated clothing, wash exposed area with soap and water. 5.4 Threshold Limit Value: 75 ppm 5.5 Short Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 2; LD ₅₀ = 0.5 to 5 g/kg (rat, rabbit) 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Vapors are nonirritating to the eyes and throat. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin. 5.10 Odor Threshold: 0.21 ppm 5.11 IDLH Value: 2,400 ppm		

6. FIRE HAZARDS 6.1 Flash Point: 84°F C.C.; 97°F O.C. 6.2 Flammable Limits in Air: 1.3%-7.1% 6.3 Fire Extinguishing Agents: Carbon dioxide, dry chemical, foam or water spray 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Burning in open flame can form toxic phosgene and hydrogen chloride gases. 6.6 Behavior in Fire: Heavy vapor can travel a considerable distance to a source of ignition and flash back. 6.7 Ignition Temperature: 1164°F 6.8 Electrical Hazard: Data not available 6.9 Burning Rate: (est.) 4.6 mm/min. 6.10 Adiabatic Flame Temperature: Data not available (Continued)	10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook) A-T-X 11. HAZARD CLASSIFICATIONS 11.1 Code of Federal Regulations: Flammable liquid 11.2 NAS Hazard Rating for Bulk Water Transportation: <table border="1"> <thead> <tr> <th>Category</th> <th>Rating</th> </tr> </thead> <tbody> <tr> <td>Fire</td> <td>3</td> </tr> <tr> <td>Health</td> <td></td> </tr> <tr> <td>Vapor Irritant</td> <td>0</td> </tr> <tr> <td>Liquid or Solid Irritant</td> <td>1</td> </tr> <tr> <td>Poisons</td> <td>2</td> </tr> <tr> <td>Water Pollution</td> <td></td> </tr> <tr> <td>Human Toxicity</td> <td>1</td> </tr> <tr> <td>Aquatic Toxicity</td> <td>3</td> </tr> <tr> <td>Aesthetic Effect</td> <td>2</td> </tr> <tr> <td>Reactivity</td> <td></td> </tr> <tr> <td>Other Chemicals</td> <td>1</td> </tr> <tr> <td>Water</td> <td>0</td> </tr> <tr> <td>Serif Reaction</td> <td>0</td> </tr> </tbody> </table> 11.3 NFPA Hazard Classification: <table border="1"> <thead> <tr> <th>Category</th> <th>Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td> <td>2</td> </tr> <tr> <td>Flammability (Red)</td> <td>3</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td>0</td> </tr> </tbody> </table>	Category	Rating	Fire	3	Health		Vapor Irritant	0	Liquid or Solid Irritant	1	Poisons	2	Water Pollution		Human Toxicity	1	Aquatic Toxicity	3	Aesthetic Effect	2	Reactivity		Other Chemicals	1	Water	0	Serif Reaction	0	Category	Classification	Health Hazard (Blue)	2	Flammability (Red)	3	Reactivity (Yellow)	0
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Flammability (Red)	3																																				
Reactivity (Yellow)	0																																				
7. CHEMICAL REACTIVITY 7.1 Reactivity With Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent 7.7 Molar Ratio (Reactant to Product): Data not available 7.8 Reactivity Group: 36	12. PHYSICAL AND CHEMICAL PROPERTIES 12.1 Physical State at 15°C and 1 atm: Liquid 12.2 Molecular Weight: 112.56 12.3 Boiling Point at 1 atm: 270°F = 132°C = 405°K 12.4 Freezing Point: -50.1°F = -45.6°C = 227.6°K 12.5 Critical Temperature: 678°F = 359°C = 632°K 12.6 Critical Pressure: 656 psia = 44.6 atm = 4.52 MN/m ² 12.7 Specific Gravity: 1.11 at 20°C (liquid) 12.8 Liquid Surface Tension: 33 dynes/cm = 0.033 N/m at 25°C 12.9 Liquid Water Interfacial Tension: 37.41 dynes/cm = 0.03741 N/m at 20°C 12.10 Vapor (Gas) Specific Gravity: Not pertinent 12.11 Ratio of Specific Heats of Vapor (Gas): 1.094 12.12 Latent Heat of Vaporization: 135 Btu/lb = 75 cal/g = 3 140 X 10 ³ J/kg 12.13 Heat of Combustion: (est.) 12,000 Btu/lb = 6700 cal/g = 280 X 10 ³ J/kg 12.14 Heat of Decomposition: Not pertinent 12.15 Heat of Solution: Not pertinent 12.16 Heat of Polymerization: Not pertinent 12.26 Heat of Fusion: 20.40 cal/g 12.26 Limiting Value: Data not available 12.27 Reid Vapor Pressure: 0.5 psia																																				
8. WATER POLLUTION 8.1 Aquatic Toxicity: 20 ppm/96 hr/bluegill/TL ₅₀ /fresh water 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): 0.3 lb/lb, 5 days 8.4 Food Chain Concentration Potential: Data not available	9. SHIPPING INFORMATION 9.1 Grades of Purity: 99.5%, technical 9.2 Storage Temperature: Ambient 9.3 Inert Atmosphere: No requirement 9.4 Venting: Pressure-vacuum																																				
6. FIRE HAZARDS (Continued) 6.11 Stoichiometric Air to Fuel Ratio: Data not available 6.12 Flame Temperature: Data not available																																					

CHLOROFORM

CRF

<p>Common Synonyms Trichloromethane</p>	<p>Water liquid Colorless Sweet odor</p> <p>Sinks in water. Irritating vapor is produced.</p>
<p>Avoid contact with liquid and vapor. Stay upwind. Wear goggles and self-contained breathing apparatus. Stop discharge if possible. Keep people away. Notify local health and pollution control agencies.</p>	
<p>Fire</p>	<p>Not flammable. POISONOUS AND IRRITATING GASES ARE PRODUCED WHEN HEATED. Wear goggles and self-contained breathing apparatus.</p>
<p>Exposure</p>	<p>CALL FOR MEDICAL AID.</p> <p>VAPOR Irritating to eyes, nose and throat. If inhaled, will cause headache, nausea, dizziness, or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.</p> <p>LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS AND HAVING CONVULSIONS, do nothing except keep victim warm.</p>
<p>Water Pollution</p>	<p>Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and pollution control officials. Notify operators of nearby water intakes.</p>
<p>1. RESPONSE TO DISCHARGE (See Response Methods Handbook) Issue warning-air contaminant Restrict access Should be removed</p>	<p>2. LABEL 2.1 Category: None 2.2 Class: Not pertinent</p>
<p>3. CHEMICAL DESIGNATIONS 3.1 CG Compatibility Class: Halogenated hydrocarbon 3.2 Formula: CHCl₃ 3.3 IMO/UN Designation: 9.0/1800 3.4 DOT ID No.: 1800 3.5 CAS Registry No.: 67-66-3</p>	<p>4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Pleasant, sweet, ethereal</p>
<p>5. HEALTH HAZARDS</p> <p>5.1 Personal Protective Equipment: Chemical goggles, 50 ppm to 2%; suitable full-face gas mask. Above 2%, suitable self-contained system. 5.2 Symptoms Following Exposure: Headache, nausea, dizziness, drunkenness, narcosis. 5.3 Treatment of Exposure: INHALATION: If ill effects develop, get victim to fresh air, keep him warm and quiet, and get medical attention. If breathing stops, start artificial respiration. INGESTION: induce vomiting and get medical attention. No known antidote; treat symptoms. EYES: flush with plenty of water for at least 15 minutes and get medical attention. SKIN: wash with soap and water, remove contaminated clothing and free of chemical. 5.4 Threshold Limit Value: 10 ppm 5.5 Short Term Inhalation Limit: 50 ppm for 10 min. 5.6 Toxicity by Ingestion: Grade 2; LD₅₀ = 0.5 to 5 g/kg 5.7 Late Toxicity: None 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin. 5.10 Odor Threshold: 205-307 ppm 5.11 IDLH Value: 1,000 ppm</p>	

<p>6. FIRE HAZARDS</p> <p>6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Poisonous and irritating gases are produced when heated. 6.6 Behavior in Fire: Decomposes, producing toxic gases 6.7 Ignition Temperature: Not flammable 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not flammable 6.10 Adiabatic Flame Temperature: Data not available 6.11 Stoichiometric Air to Fuel Ratio: Data not available 6.12 Flame Temperature: Data not available</p>	<p>10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook) A-X</p>
<p>7. CHEMICAL REACTIVITY</p> <p>7.1 Reactivity With Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Bases: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent 7.7 Molar Ratio (Reactant to Product): Data not available 7.8 Reactivity Group: 36</p>	<p>11. HAZARD CLASSIFICATIONS</p> <p>11.1 Code of Federal Regulations: ORM-A 11.2 NAS Hazard Rating for Bulk Water Transportation: Category Rating Fire 1 Health 2 Vapor Irritant 1 Liquid or Solid Irritant 2 Poisons 2 Water Pollution Human Toxicity 1 Aquatic Toxicity 2 Aesthetic Effect 2 Reactivity Other Chemicals 1 Water 0 Self Reaction 0 11.3 MFPA Hazard Classification: Category Classification Health Hazard (Blue) 2 Flammability (Red) 0 Reactivity (Yellow) 0</p>
<p>8. WATER POLLUTION</p> <p>8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): None 8.4 Food Chain Concentration Potential: None</p>	<p>12. PHYSICAL AND CHEMICAL PROPERTIES</p> <p>12.1 Physical State at 15°C and 1 atm: Liquid 12.2 Molecular Weight: 119.39 12.3 Boiling Point at 1 atm: 142°F = 61.2°C = 334.4°K 12.4 Freezing Point: -82.3°F = -63.5°C = 209.7°K 12.5 Critical Temperature: 508°F = 263.2°C = 536.4°K 12.6 Critical Pressure: 790 psia = 54 atm = 5.5 MN/m² 12.7 Specific Gravity: 1.49 at 20°C (liquid) 12.8 Liquid Surface Tension: 27.1 dynes/cm = 0.0271 N/m at 20°C 12.9 Liquid Water Interfacial Tension: 32.8 dynes/cm = 0.0328 N/m at 20°C 12.10 Vapor (Gas) Specific Gravity: 4.1 12.11 Ratio of Specific Heats of Vapor (Gas): 1.146 12.12 Latent Heat of Vaporization: 106.7 Btu/lb = 56.3 cal/g = 2.483 x 10⁴ J/kg 12.13 Heat of Combustion: Not pertinent 12.14 Heat of Decomposition: Not pertinent 12.15 Heat of Solution: Not pertinent 12.16 Heat of Polymerization: Not pertinent 12.26 Heat of Fusion: 17.62 cal/g 12.28 Limiting Value: Data not available 12.27 Reid Vapor Pressure: 6.59 psia</p>
<p>9. SHIPPING INFORMATION</p> <p>9.1 Grades of Purity: Technical, USP 9.2 Storage Temperature: Ambient 9.3 Inert Atmosphere: No requirement 9.4 Venting: Open</p>	
<p>NOTES</p>	

CHROMIC ANHYDRIDE

CMA

<p>Common Synonyms Chromic oxide Chromium trioxide Chromic acid</p>	<p>Solid flakes or powder Sinks and mixes with water.</p>	<p>Dark red</p>	<p>Odorless</p>
<p>Avoid contact with solid and dust. Keep people away. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Stay upwind and use water spray to "knock down" dust. Isolate and remove discharged material. Notify local health and pollution control agencies.</p>			
Fire	<p>Not flammable. May cause fire on contact with combustibles. Containers may explode when heated in a fire. Extinguish with water. Cool exposed containers with water.</p>		
Exposure	<p>CALL FOR MEDICAL AID. SOLID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES: hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.</p>		
Water Pollution	<p>HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.</p>		
1. RESPONSE TO DISCHARGE <small>(See Response Methods Handbook)</small>	<p>Issue warning-water contaminant Denoise and flush</p>		
2. LABEL	<p>2.1 Category: Oxidizer 2.2 Class: 5</p>		
3. CHEMICAL DESIGNATIONS	<p>3.1 CG Compatibility Class: Not listed 3.2 Formula: CrO₃ 3.3 IMO/UN Designation: 5.1/1463 3.4 DOT ID No.: 1463 3.5 CAS Registry No.: 1333-82-0</p>		
4. OBSERVABLE CHARACTERISTICS	<p>4.1 Physical State (as shipped): Solid 4.2 Color: Dark red 4.3 Odor: None</p>		
5. HEALTH HAZARDS			
<p>5.1 Personal Protective Equipment: Goggles and respirator. (Special chromic acid filters are available for respirators to prevent inhalation of dust or mist.) 5.2 Symptoms Following Exposure: Very irritating to eyes and respiratory tract. Ingestion causes severe gastrointestinal symptoms. Contact with eyes or skin causes burns; prolonged contact produces dermatitis ("chrome sores"). 5.3 Treatment of Exposure: INGESTION: call a physician; do NOT induce vomiting. SKIN OR EYES: wash eyes thoroughly for at least 15 min.; flush contacted skin areas with water; remove contaminated clothing and wash before reuse. 5.4 Threshold Limit Value: 0.05 mg/m³ 5.5 Short Term Inhalation Limits: Not pertinent 5.6 Toxicity by Ingestion: Grade 3; LD₅₀ = 50 to 500 mg/kg 5.7 Lethal Toxicity: Lung cancer 5.8 Vapor (Gas) Irritant Characteristics: Not pertinent 5.9 Liquid or Solid Irritant Characteristics: Severe skin irritant. Causes second- and third-degree burns on short contact; very injurious to the eyes. 5.10 Odor Threshold: Not pertinent 5.11 IDLH Value: 30 mg/m³</p>			

<p>6. FIRE HAZARDS</p> <p>6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Water 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Containers may explode 6.7 Ignition Temperature: May ignite organic materials on contact. 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not flammable 6.10 Adiabatic Flame Temperature: Data not available 6.11 Stoichiometric Air to Fuel Ratio: Data not available 6.12 Flame Temperature: Data not available</p>	<p>10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook) SS</p>								
<p>7. CHEMICAL REACTIVITY</p> <p>7.1 Reactivity With Water: No reaction 7.2 Reactivity with Common Materials: May react with organic materials rapidly enough to generate sufficient heat to cause ignition. Prolonged contact, particularly on wood floors, may produce a fire hazard. 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Flood with water, rinse with sodium bicarbonate solution. 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent 7.7 Molar Ratio (Reactant to Product): Data not available 7.8 Reactivity Group: Data not available</p>	<p>11. HAZARD CLASSIFICATIONS</p> <p>11.1 Code of Federal Regulations: Oxidizer 11.2 NAB Hazard Rating for Bulk Water Transportation: Not listed 11.3 NFPA Hazard Classification:</p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Category</th> <th style="text-align: left;">Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td> <td>3</td> </tr> <tr> <td>Flammability (Red)</td> <td>0</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td>1</td> </tr> </tbody> </table> <p style="text-align: right;">oxy</p>	Category	Classification	Health Hazard (Blue)	3	Flammability (Red)	0	Reactivity (Yellow)	1
Category	Classification								
Health Hazard (Blue)	3								
Flammability (Red)	0								
Reactivity (Yellow)	1								
<p>8. WATER POLLUTION</p> <p>8.1 Aquatic Toxicity: 0.01 ppm/48 hr/daphnia/TL₅₀ 52 ppm/96 hr/goldfish/died 8.2 Waterway Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): None 8.4 Food Chain Concentration Potential: None</p>	<p>12. PHYSICAL AND CHEMICAL PROPERTIES</p> <p>12.1 Physical State at 15°C and 1 atm: Solid 12.2 Molecular Weight: 100.01 12.3 Boiling Point at 1 atm: Not pertinent 12.4 Freezing Point: Not pertinent 12.5 Critical Temperature: Not pertinent 12.6 Critical Pressure: Not pertinent 12.7 Specific Gravity: 2.70 at 20°C (solid) 12.8 Liquid Surface Tension: Not pertinent 12.9 Liquid Water Interfacial Tension: Not pertinent 12.10 Vapor (Gas) Specific Gravity: Not pertinent 12.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 12.12 Latent Heat of Vaporization: Not pertinent 12.13 Heat of Combustion: Not pertinent 12.14 Heat of Decomposition: Not pertinent 12.15 Heat of Solution: Not pertinent 12.16 Heat of Polymerization: Not pertinent 12.25 Heat of Fusion: 37.7 cal/g 12.26 Limiting Value: Data not available 12.27 Reid Vapor Pressure: Data not available</p>								
<p>9. SHIPPING INFORMATION</p> <p>9.1 Grades of Purity: Technical, technical flake: 99.75% 9.2 Storage Temperature: Data not available 9.3 Inert Atmosphere: Data not available 9.4 Venting: Data not available</p>	<p style="text-align: center;">NOTES</p>								

CML810 CAS: 218-01-9 HR: 3

CHRYSENE

mf: C₁₈H₁₂ mw: 228.30

PROP: Occurs in coal tar. Is formed during distillation of coal, in very small amount during distillation or pyrolysis of many fats and oils. Orthorhombic bipyramidal plates from benzene. D: 1.274, mp: 254°. Sublimes easily in vacuum, bp: 448°. Sltly sol in alc, ether, carbon bisulfide, and glacial acetic acid; moderately sol in boiling benzene; insol in water. Chrysene is generally only sltly sol in cold organic solvents, but fairly sol in these solvents when hot, including glacial acetic acid.

SYNS: 1,2-BENZOPHENANTHRENE * BENZO(a)PHENANTHRENE * 1,2-BENZOPHENANTHRENE * BENZO(a)PHENANTHRENE * 1,2,5,6-DIBENZONAPHTHALENE * RCRA WASTE NUMBER U050

CONSENSUS REPORTS: IARC Cancer Review: GROUP 1 IMEMDT 7,56,87; Animal Limited Evidence IMEMDT 32,247,83; Animal Sufficient Evidence IMEMDT 3,159,73. EPA Genetic Toxicology Program. Reported in EPA TSCA Inventory.

OSHA PEL: 0.2 mg/m³

ACGIH TLV: Suspected Human Carcinogen

DFG MAK: Animal Carcinogen, Suspected Human Carcinogen.

NIOSH REL: (Chrysene) To be controlled as a carcinogen.

SAFETY PROFILE: Confirmed carcinogen with experimental carcinogenic, neoplastigenic, and tumorigenic data by skin contact. Human mutation data reported. When heated to decomposition it emits acrid smoke and fumes.

DCT400 CAS: 53-70-3 HR: 3
DIBENZ(a,h)ANTHRACENE
mf: C₂₂H₁₄ mw: 278.36

SYNS: 1,2:5,6-DIBENZANTHRACENE * DBA
* DB(a,h)A * 1,2,5,6-DBA * 1,2,5,6-DIBENZAN-
THRACEN (DUFCH) * 1,2:5,6-DIBENZANTHRACENE
* 1,2:5,6-DIBENZOANTHRACENE * DIBEN-
ZO(a,h)ANTHRACENE * 1,2:5,6-DIBENZOANTHRA-
CENE * RCRA WASTE NUMBER U063

CONSENSUS REPORTS: IARC Cancer Re-
view: GROUP 2A IMEMDT 7,56,87; Animal
Sufficient Evidence IMEMDT 32,299,83;
IMEMDT 3,178,73. NTP Fourth Annual Report
On Carcinogens, 1984. EPA Genetic Toxicol-
ogy Program. Reported in EPA TSCA Inven-
tory.

SAFETY PROFILE: Confirmed carcinogen with
experimental carcinogenic, tumorigenic, and
neoplastigenic data. Poison by intravenous
route. Human mutation data reported. When
heated to decomposition it emits acrid smoke
and irritating fumes.

o-DICHLOROBENZENE

DBO

<p>Common Synonyms</p> <p>1, 2-Dichlorobenzene Orthodichlorobenzene Dowtherm E</p>	<p>Liquid</p> <p>Colorless</p> <p>Pleasant odor</p> <p>Sinks in water.</p>		
<p>Avoid contact with liquid. Wear goggles and self-contained breathing apparatus. Stop discharge if possible. Call fire department. Isolate and remove discharged material. Notify local health and pollution control agencies.</p>			
Fire	<p>Combustible</p> <p>POISONOUS GASES ARE PRODUCED IN FIRE.</p> <p>Wear goggles and self-contained breathing apparatus. Extinguish with water, dry chemical, foam, or carbon dioxide. Cool exposed containers with water.</p>		
Exposure	<p style="text-align: center;">CALL FOR MEDICAL AID</p> <p>LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES: hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.</p>		
Water Pollution	<p>Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and pollution control officials. Notify operators of nearby water intakes.</p>		
<p>1. RESPONSE TO DISCHARGE (See Response Methods Handbook)</p> <p>Issue warning-water contaminant Should be removed Chemical and physical treatment</p>	<p>2. LABEL</p> <p>2.1 Category: None 2.2 Class: Not pertinent</p>		
<p>3. CHEMICAL DESIGNATIONS</p> <p>3.1 CD Compatibility Class: Halogenated hydrocarbon 3.2 Formula: $C_6H_4Cl_2$ 3.3 IMO/UN Designation: 6.1/1501 3.4 DOT ID No.: 1501 3.5 CAS Registry No.: 95-50-1</p>	<p>4. OBSERVABLE CHARACTERISTICS</p> <p>4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Aromatic; characteristic</p>		
5. HEALTH HAZARDS			
<p>5.1 Personal Protective Equipment: Organic vapor-acid gas respirator; neoprene or vinyl gloves; chemical safety spectacles, face shield, rubber footwear, apron, protective clothing.</p> <p>5.2 Symptoms Following Exposure: Chronic inhalation of mist or vapors may result in damage to lungs, liver, and kidneys. Acute vapor exposure can cause symptoms ranging from coughing to central nervous system depression and transient anesthesia. Irritating to skin, eyes, and mucous membranes. May cause dermatitis.</p> <p>5.3 Treatment of Exposure: INHALATION: remove victim to fresh air, keep him quiet and warm, and call a physician promptly. INGESTION: no known antidote; treat symptomatically, induce vomiting and get medical attention promptly. EYES AND SKIN: flush with plenty of water; get medical attention for eyes; remove contaminated clothing and wash before reuse.</p> <p>5.4 Threshold Limit Value: 50 ppm</p> <p>5.5 Short Term Inhalation Limits: 50 ppm for 15 min.</p> <p>5.6 Toxicity by Ingestion: Grade 2; $LD_{50} = 0.5$ to 5 g/kg</p> <p>5.7 Late Toxicity: Causes kidney and liver damage in rats. Effects unknown in humans.</p> <p>5.8 Vapor (Gas) Irritant Characteristics: Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.</p> <p>5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.</p> <p>5.10 Odor Threshold: 4.0 ppm; 50 ppm</p> <p>5.11 IDLH Value: 1,700 ppm</p>			

6. FIRE HAZARDS

6.1 Flash Point: 165°F O.C.; 155°F C.C.

6.2 Flammable Limits in Air: 2.2%-9.2%

6.3 Fire Extinguishing Agents: Water, foam, dry chemical, or carbon dioxide

6.4 Fire Extinguishing Agents Not to be Used: Not pertinent

6.5 Special Hazards of Combustion
Products: Irritating vapors including hydrogen chloride gas, chlorocarbons, chlorine

6.6 Behavior in Fire: Not pertinent

6.7 Ignition Temperature: 1186°F

6.8 Electrical Hazard: Not pertinent

6.9 Burning Rate: 1.3 mm/min.

6.10 Adiabatic Flame Temperature:
Data not available

6.11 Stoichiometric Air to Fuel Ratio:
Data not available

6.12 Flame Temperature: Data not available

7. CHEMICAL REACTIVITY

7.1 Reactivity With Water: No reaction

7.2 Reactivity with Common Materials: No reaction

7.3 Stability During Transport: Stable

7.4 Neutralizing Agents for Acids and Caustics: Not pertinent

7.5 Polymerization: Not pertinent

7.6 Inhibitor of Polymerization:
Not pertinent

7.7 Molar Ratio (Reactant to Product): Data not available

7.8 Reactivity Group: 36

8. WATER POLLUTION

8.1 Aquatic Toxicity:
13 ppm//marine plankton/no growth/
salt water
*Time period not specified.

8.2 Waterfowl Toxicity: Data not available

8.3 Biological Oxygen Demand (BOD):
<0.1% (theor.), 1/8 day

8.4 Food Chain Concentration Potential:
Data not available

9. SHIPPING INFORMATION

9.1 Grades of Purity: Technical: 99.5% min. dichlorobenzene (ortho-ortho + para/meta: 80 min.) Technical: 85% orthodichlorobenzene, 14.0% paradichlorobenzene Technical: 80% ortho, 17% para, 2% meta Pure: not less than 99.5% ortho, not more than 0.5% para

9.2 Storage Temperature: Data not available

9.3 Inert Atmosphere: Data not available

9.4 Venting: Data not available

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

11. HAZARD CLASSIFICATIONS

11.1 Code of Federal Regulations:
ORM-A

11.2 NAS Hazard Rating for Bulk Water Transportation:

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

11.3 NFPA Hazard Classification:

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

12. PHYSICAL AND CHEMICAL PROPERTIES

12.1 Physical State at 15°C and 1 atm:
Liquid

12.2 Molecular Weight: 147.01

12.3 Boiling Point at 1 atm:
356.9°F = 180.5°C = 453.7°K

12.4 Freezing Point:
0.3°F = 17.6°C = 255.6°K

12.5 Critical Temperature: Not pertinent

12.6 Critical Pressure: Not pertinent

12.7 Specific Gravity:
1.306 at 20°C (liquid)

12.8 Liquid Surface Tension:
37 dynes/cm = 0.007 N/m at 20°C

12.9 Liquid Water Intercalation Tension:
(est.) 40 dynes/cm = 0.04 N/m at 20°C

12.10 Vapor (Gas) Specific Gravity:
Not pertinent

12.11 Ratio of Specific Heats of Vapor (Gas):
1.080

12.12 Latent Heat of Vaporization:
115 Btu/lb = 63.9 cal/g =
2.86 X 10⁴ J/kg

12.13 Heat of Combustion: -7969 Btu/lb
= -4427 cal/g = -185.4 X 10⁴ J/kg

12.14 Heat of Decomposition: Not pertinent

12.15 Heat of Solution: Not pertinent

12.16 Heat of Solvation: Not pertinent

12.17 Heat of Polymerization: Not pertinent

12.18 Heat of Fusion: 21.02 cal/g

12.19 Limiting Value: Data not available

12.20 Reid Vapor Pressure: 0.06 psia

NOTES

1,1-DICHLOROETHANE

DCH

Common Synonyms Ethylene chloride Ethyldene dichloride Chlorinated hydrochloric ether		Oily liquid Sinks and mixes with water.	Colorless	Chloroform like etheral
Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Stop discharge if possible. Keep people away. Shut off ignition sources and call fire department. Avoid contact with liquid. Isolate and remove discharged material. Notify local health and pollution control agencies.				
Fire	Flammable POISONOUS GAS MAY BE PRODUCED IN FIRE OR WHEN HEATED. Containers may explode in fire. Wear goggles and self-contained breathing apparatus. Extinguish with alcohol foam, carbon dioxide, or dry chemical. Water may be ineffective on fire.			
Exposure	CALL FOR MEDICAL AID. LIQUID If swallowed may cause nausea, vomiting and faintness. Irritating to skin and eyes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS have victim drink water or milk and induce vomiting.			
Water Pollution	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.			
1. RESPONSE TO DISCHARGE (See Response Methods Handbook) Issue warning-high flammability. Restrict access. Chemical and physical treatment.		2. LABEL 2.1 Category: None 2.2 Class: Not pertinent		
3. CHEMICAL DESIGNATIONS 3.1 CG Compatibility Class: Halogenated hydrocarbon 3.2 Formula: C ₂ H ₂ Cl ₂ 3.3 IMO/UN Designation: Not listed 3.4 DOT ID No.: 2362 3.5 CAS Registry No.: 75-34-3		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Oily liquid 4.2 Color: Colorless 4.3 Odor: Chloroform		
5. HEALTH HAZARDS				
5.1 Personal Protective Equipment: In areas of poor ventilation or high concentration, a self-contained breathing apparatus with full face mask should be worn. Chemical workers goggles, rubber gloves, and protective clothing should be worn. 5.2 Symptoms Following Exposure: INHALATION: Irritation of respiratory tract. Salivation, sneezing, coughing, dizziness, nausea, and vomiting. EYES: Irritation, lacrimation, and reddening of conjunctiva. SKIN: Irritation. Prolonged or repeated skin contact can produce a slight burn. INGESTION: Ingestion incidental to industrial handling is not considered to be a problem. Swallowing of substantial amounts could cause nausea, vomiting, faintness, drowsiness, cyanosis, and circulatory failure. 5.3 Treatment of Exposure: Call a doctor. INHALATION: Remove from contaminated area; keep warm and quiet. If breathing has stopped, give artificial respiration. Administer oxygen. EYES: Flush with large amounts of water or weak bicarbonate of soda solution. SKIN: Dilute with large amounts of water. Remove contaminated clothing. INGESTION: Attempt to empty stomach; dilute by administering fluids (tap water, soapy water, salt water, or milk). 5.4 Threshold Limit Value: 200 ppm. 5.5 Short Term Inhalation Limits: 250 ppm. 5.6 Toxicity by Ingestion: Grade 2; LD ₅₀ = 0.5 to 5 g/kg (rat). 5.7 Late Toxicity: Chronic exposure may cause liver damage and dermatitis. Animal experimentation has shown this compound to be slightly embryo-toxic and to retard fetal development. 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin. 5.10 Odor Threshold: Data not available 5.11 IDLH Value: 4,000 ppm				

6. FIRE HAZARDS		10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook) A-P-Q-R-S									
6.1 Flash Point: 57°F O.C. = 22°F C.C. 6.2 Flammable Limits in Air: 5.6% to 11.4% 6.3 Fire Extinguishing Agents: Alcohol foam, water, foam, CO ₂ , dry chemical, carbon tetrachloride 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective 6.5 Special Hazards of Combustion Products: When heated to decomposition emits highly toxic fumes to phosgene. 6.6 Behavior in Fire: Explosion hazard 6.7 Ignition Temperature: 856°F 6.8 Electrical Hazard: Data not available 6.9 Burning Rate: Data not available 6.10 Adiabatic Flame Temperature: Data not available 6.11 Stoichiometric Air to Fuel Ratio: Data not available 6.12 Flame Temperature: Data not available		11. HAZARD CLASSIFICATIONS 11.1 Code of Federal Regulations: Not listed 11.2 HAS Hazard Rating for Bulk Water Transportation: Not listed 11.3 NFPA Hazard Classification: <table border="0"> <tr> <td>Category</td> <td>Classification</td> </tr> <tr> <td>Health Hazard (Blue)</td> <td>2</td> </tr> <tr> <td>Flammability (Red)</td> <td>3</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td>0</td> </tr> </table>		Category	Classification	Health Hazard (Blue)	2	Flammability (Red)	3	Reactivity (Yellow)	0
Category	Classification										
Health Hazard (Blue)	2										
Flammability (Red)	3										
Reactivity (Yellow)	0										
7. CHEMICAL REACTIVITY		12. PHYSICAL AND CHEMICAL PROPERTIES									
7.1 Reactivity With Water: No reaction 7.2 Reactivity with Common Materials: Data not available 7.3 Stability During Transport: Data not available 7.4 Neutralizing Agents for Acids and Caustics: Data not available 7.5 Polymerization: Data not available 7.6 Inhibitor of Polymerization: labile Data not available 7.7 Molar Ratio (Reactant to Product): Data not available 7.8 Reactivity Group: 36		12.1 Physical State at 15°C and 1 atm: Liquid 12.2 Molecular Weight: 98.97 12.3 Boiling Point at 1 atm: 135.14°F = 57.3°C = 330.5°K 12.4 Freezing Point: -143.32°F = -87.4°C = 175.75°K 12.5 Critical Temperature: 502.7°F = 261.5°C = 534.65°K 12.6 Critical Pressure: 734.8 psia = 50 atm = 5,065 MN/m ² 12.7 Specific Gravity: 1.174 at 20°C 12.8 Liquid Surface Tension: 24.75 dynes/cm = 0.02475 N/m at 20°C 12.9 Liquid Water Interfacial Tension: Data not available 12.10 Vapor (Gas) Specific Gravity: 3.42 12.11 Ratio of Specific Heats of Vapor (Gas): 1.136 at 20°C (68°F) 12.12 Latent Heat of Vaporization: 131.6 Btu/lb = 73.1 cal/g = 3.06 X 10 ⁴ J/kg 12.13 Heat of Combustion: -4,774 Btu/lb = -2,652 cal/g = -111 X 10 ⁴ J/kg 12.14 Heat of Decomposition: Data not available 12.15 Heat of Solution: Data not available 12.16 Heat of Polymerization: Data not available 12.25 Heat of Fusion: Data not available 12.26 Limiting Value: Data not available 12.27 Reid Vapor Pressure: 7.35 psia									
8. WATER POLLUTION		9. SHIPPING INFORMATION									
8.1 Aquatic Toxicity: TL ₅₀ (Marine pinperch) 250 to 275 mg/l 24-hour TL ₅₀ Brine shrimp: 320 mg/l 24-hour TL ₅₀ Pinperch: 180 mg/l 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Percent, 0.05 g/g for 10 days Percent, 0.002 g/g for 5 days 8.4 Food Chain Concentration Potential: Data not available		9.1 Grades of Purity: Data not available 9.2 Storage Temperature: Cool 9.3 Inert Atmosphere: Data not available 9.4 Venting: Data not available									
NOTES											

DDB600 CAS: 3693-22-9 HR: 3
2-DIBENZOFURANAMINE
mf: C₁₂H₉NO mw: 183.22

SYNS: 2-ADO * 3-AMINODIBENZOFURAN
† 2-AMINODIPHENYLENE OXIDE

SAFETY PROFILE: Questionable carcinogen with experimental carcinogenic and tumorigenic data. Mutation data reported. When heated to decomposition it emits toxic fumes of NO_x.

DVL700 CAS: 117-81-7 HR: 3
DI-sec-OCTYL PHTHALATE
mf: C₂₄H₃₈O₄ mw: 390.62

SYNS: DEHP * BIS(2-ETHYLHEXYL)-1,2-BENZENE-DICARBOXYLATE * BIS(2-ETHYLHEXYL)PHTHALATE * BISOPLX 81 * BISOPLX DOP * COMPOUND 889 * DAP 68 * DEHP * DI(2-ETHYLHEXYL)ORTHO-PHTHALATE * DI(2-ETHYLHEXYL)PHTHALATE * DIOCTYL PHTHALATE * DOP * ETHYLHEXYL PHTHALATE * ERGOPLAST PDO * 2-ETHYLHEXYL PHTHALATE * EVIPLAST 80 * EVIPLAST 81 * FLEXIMEI * FLEXOL DOP * FLEXOL PLASTICIZER DOP * GOOD-RITE GP 264 * HATCOL DOP * HERCOFLEX 260 * KODAFLEX DOP * MOL-LAN O * NCI-C52733 * NUOPLAZ DOP * OCTOIL * OCTYL PHTHALATE * PALATINOL AH * PHTHALIC ACID DIOCTYL ESTER * PITTSBURGH PX-138 * PLATINOL AH * PLATINOL DOP * RC PLASTICIZER DOP * RCRA WASTE NUMBER U028 * REOMOL DOP * REOMOL D 79P * SICOL 150 * STAFLEX DOP * TRUFLEX DOP * VESTINOL AH * VINICIZER 80 * WFCIZER 312

CONSENSUS REPORTS: IARC Cancer Review: GROUP 2B IMEMDT 7,56,87; Human Inadequate Evidence IMEMDT 29,269,82; Animal Sufficient Evidence IMEMDT 29,269,82. NTP Fourth Annual Report On Carcinogens, 1984. NTP Carcinogenesis Bioassay (feed); Clear Evidence: mouse, rat NTPTR* NTP-TR-217,82. EPA Genetic Toxicology Program. Reported in EPA TSCA Inventory. Community Right-To-Know List.

OSHA PEL: (Transitional: TWA 5 mg/m³)
TWA 5 mg/m³; STEL 10 mg/m³

ACGIH TLV: TWA 5 mg/m³; STEL 10 mg/m³

DFG MAK: 10 mg/m³

NIOSH REL: (DEHP) Reduce to lowest feasible level

SAFETY PROFILE: Confirmed carcinogen with experimental carcinogenic and tumorigenic data. Experimental teratogen data. Poison by intravenous route. Human systemic effects by ingestion: gastrointestinal tract effects. A mild skin and eye irritant. When heated to decomposition it emits acrid smoke.

ETHYL ACETATE

ETA

<p>Common Synonyms Acetic acid, ethyl ester Acetic ester Vinegar naptha Acetic ether Ethyl ethanoate</p>		<p>Watery liquid Colorless Pleasant fruity odor</p>
<p>Floats on water. Flammable, irritating vapor is produced.</p>		
<p>Stop discharge if possible. Keep people away. Shut off ignition sources and call fire department. Stay upwind and use water spray to "knock down" vapor. Avoid contact with liquid and vapor. Isolate and remove discharged material. Notify local health and pollution control agencies.</p>		
<p>Fire</p>	<p>FLAMMABLE Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemical, alcohol foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.</p>	
<p>Exposure</p>	<p>CALL FOR MEDICAL AID VAPOR Irritating to eyes, nose and throat. If inhaled will cause headache, dizziness, nausea, or loss of consciousness. Move to fresh air. If breathing has stopped give artificial respiration. If breathing is difficult give oxygen. LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.</p>	
<p>Water Pollution</p>	<p>Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.</p>	
<p>1. RESPONSE TO DISCHARGE (See Response Methods Handbook) Issue warning-high flammability Evacuate area Disperse and flush</p>		<p>2. LABEL 2.1 Category: Flammable liquid 2.2 Class: 3</p>
<p>3. CHEMICAL DESIGNATIONS 3.1 CG Competibility Class: Ester 3.2 Formula: CH₃COOCH₂CH₃ 3.3 IMO/IUN Designation: 3.2/1173 3.4 DOT ID No.: 1173 3.5 CAS Registry No.: 141-78-6</p>		<p>4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Pleasant, fruity</p>
<p>5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Organic vapor canister or air mask; goggles or face shield. 5.2 Symptoms Following Exposure: Headache, irritation of respiratory passages and eyes, dizziness and nausea, weakness, loss of consciousness. 5.3 Treatment of Exposure: INHALATION: If victim is overcome, move him to fresh air immediately and call a physician; if breathing is irregular or stopped, start resuscitation and administer oxygen. EYES: flush with water for at least 15 min. 5.4 Threshold Limit Value: 400 ppm 5.5 Short Term Inhalation Limit: 1000 ppm for 15 min. 5.6 Toxicity by Ingestion: Grade 2; LD₅₀ = 0.5 to 5 g/kg 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin. 5.10 Odor Threshold: 1 ppm 5.11 IDLH Value: 10,000 ppm</p>		

<p>6. FIRE HAZARDS 6.1 Flash Point: 24°F C.C.; 55°F O.C. 6.2 Flammable Limits in Air: 2.2%-9.0% 6.3 Fire Extinguishing Agents: Alcohol foam, carbon dioxide or dry chemicals 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: 800°F 6.8 Electrical Hazard: Class 1, group D 6.9 Burning Rate: 3.7 mm/min. 6.10 Adiabatic Flame Temperature: Data Not Available 6.11 Stoichiometric Air to Fuel Ratio: Data Not Available 6.12 Flame Temperature: Data Not Available</p>	<p>10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook) A-P-Q</p>
<p>7. CHEMICAL REACTIVITY 7.1 Reactivity With Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent 7.7 Molar Ratio (Reactant to Product): Data Not Available 7.8 Reactivity Group: 34</p>	<p>11. HAZARD CLASSIFICATIONS 11.1 Code of Federal Regulations: Flammable liquid 11.2 NAS Hazard Rating for Bulk Water Transportation: Category Rating Fire..... 3 Health Vapor Irritant..... 1 Liquid or Solid Irritant..... 1 Poisons..... 2 Water Pollution Human Toxicity..... 1 Aquatic Toxicity..... 2 Aesthetic Effect..... 2 Reactivity Other Chemicals..... 1 Water..... 0 Self Reaction..... 0 11.3 NFPA Hazard Classification: Category Classification Health Hazard (Blue)..... 1 Flammability (Red)..... 3 Reactivity (Yellow)..... 0</p>
<p>8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): (Theor.) 66%; 5 days 8.4 Food Chain Concentration Potential: None</p>	<p>12. PHYSICAL AND CHEMICAL PROPERTIES 12.1 Physical State at 15°C and 1 atm: Liquid 12.2 Molecular Weight: 88.11 12.3 Boiling Point at 1 atm: 171°F = 77°C = 350°K 12.4 Freezing Point: -117°F = -83°C = 190°K 12.5 Critical Temperature: 482°F = 250°C = 523°K 12.6 Critical Pressure: 558 psia = 38 atm = 3.8 MN/m² 12.7 Specific Gravity: 0.902 at 20°C (liquid) 12.8 Liquid Surface Tension: 24 dynes/cm = 0.024 N/m at 20°C 12.9 Liquid Water Interfacial Tension: 6.79 dynes/cm = 0.00679 N/m at 30°C 12.10 Vapor (Gas) Specific Gravity: 3.0 12.11 Ratio of Specific Heats of Vapor (Gas): 1.080 12.12 Latent Heat of Vaporization: 158 Btu/lb = 87.6 cal/g = 3.67 X 10⁴ J/kg 12.13 Heat of Combustion: -10,110 Btu/lb = -5616 cal/g = -235.1 X 10⁴ J/kg 12.14 Heat of Decomposition: Not pertinent 12.15 Heat of Solution: Not pertinent 12.16 Heat of Polymerization: Not pertinent 12.25 Heat of Fusion: 28.43 cal/g 12.26 Limiting Value: Data Not Available 12.27 Reid Vapor Pressure: 3.27 psia</p>
<p>9. SHIPPING INFORMATION 9.1 Grades of Purity: 85-100% 9.2 Storage Temperature: Ambient 9.3 Inert Atmosphere: No requirement 9.4 Venting: Open (flame arrester) or pressure-vacuum</p>	
<p>NOTES</p>	

ETHYLBENZENE

ETB

<p>Common Synonyms Phenylethane EB</p>		<p>Liquid Colorless Sweet, gasoline-like odor</p> <p>Floats on water. Flammable, irritating vapor is produced.</p>
<p>Avoid contact with liquid and vapor. Keep people away. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Shut off ignition sources and call fire department. Stop discharge if possible. Stay upwind and use water spray to "knock down" vapor. Isolate and remove discharged material. Notify local health and pollution control agencies.</p>		
<p>Fire</p>	<p>FLAMMABLE. Flashback along vapor trail may occur. Vapor may explode if ignited. Do not use open flame, matches, or smoking materials. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Extinguish with dry chemical, foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.</p>	
<p>Exposure</p>	<p>CALL FOR MEDICAL AID</p> <p>VAPOR Irritating to eyes, nose and throat. VAPOR may cause dizziness or difficult breathing. (including gloves). If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.</p> <p>LIQUID Will burn skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.</p>	
<p>Water Pollution</p>	<p>HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.</p>	
<p>1. RESPONSE TO DISCHARGE (See Response Methods Handbook) Mechanical containment Should be removed Chemical and physical treatment</p>		<p>2. LABEL 2.1 Category: Flammable liquid 2.2 Class: 3</p>
<p>3. CHEMICAL DESIGNATIONS 3.1 CG Competibility Class: Aromatic hydrocarbon 3.2 Formula: C₈H₁₀CH₂ 3.3 IMO/UN Designation: 3.3/1175 3.4 DOT ID No.: 1175 3.5 CAS Registry No.: 100-41-4</p>		<p>4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Aromatic</p>
<p>5. HEALTH HAZARDS</p> <p>5.1 Personal Protective Equipment: Self-contained breathing apparatus; safety goggles. 5.2 Symptoms Following Exposure: Inhalation may cause irritation of nose, dizziness, depression. Moderate irritation of eyes with corneal injury possible. Irritates skin and may cause blisters. 5.3 Treatment of Exposure: INHALATION: If ill effects occur, remove victim to fresh air, keep him warm and quiet, and get medical help promptly; if breathing stops, give artificial respiration. INGESTION: induce vomiting only upon physician's approval; material in lung may cause chemical pneumonia. SKIN AND EYES: promptly flush with plenty of water (15 min. for eyes) and get medical attention; remove and wash contaminated clothing before reuse. 5.4 Threshold Limit Value: 100 ppm 5.5 Short Term Inhalation Limits: 200 ppm for 30 min. 5.6 Toxicity by Ingestion: Grade 2; LD₅₀ = 0.5 to 0.5 g/kg (rat) 5.7 Lethal Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Causes smearing of the skin and first-degree burns on short exposure; may cause secondary burns on long exposure. 5.10 Odor Threshold: 140 ppm 5.11 IDLH Value: 2,000 ppm</p>		

6. FIRE HAZARDS

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

(Continued)

7. CHEMICAL REACTIVITY

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

8. WATER POLLUTION

8.1 Aquatic Toxicity: 29 ppm/96 hr/bluegill/TL₅₀/fresh water
8.2 Waterfowl Toxicity: Data not available
8.3 Biological Oxygen Demand (BOD): 2.8% (theor.), 5 days
8.4 Food Chain Concentration Potential: None

9. SHIPPING INFORMATION

9.1 Grades of Purity: Research grade: 99.99%; pure grade: 99.5%; technical grade: 99.0%
9.2 Storage Temperature: Ambient
9.3 Inert Atmosphere: No requirement
9.4 Venting: Open (flame arrester) or pressure-vacuum

6. FIRE HAZARDS (Continued)

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

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

11. HAZARD CLASSIFICATIONS

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

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

11.3 NFPA Hazard Classification:

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

12. PHYSICAL AND CHEMICAL PROPERTIES

12.1 Physical State at 15°C and 1 atm: Liquid
12.2 Molecular Weight: 106.17
12.3 Boiling Point at 1 atm: 277.2°F = 136.2°C = 409.4°K
12.4 Freezing Point: -139°F = -95°C = 178°K
12.5 Critical Temperature: 651.0°F = 343.9°C = 617.1°K
12.6 Critical Pressure: 523 psia = 35.6 atm = 3.61 MN/m²
12.7 Specific Gravity: 0.867 at 20°C (liquid)
12.8 Liquid Surface Tension: 29.2 dynes/cm = 0.0292 N/m at 20°C
12.9 Liquid Water Interfacial Tension: 35.48 dynes/cm = 0.03548 N/m at 20°C
12.10 Vapor (Gas) Specific Gravity: Not pertinent
12.11 Ratio of Specific Heats of Vapor (Gas): 1.071
12.12 Latent Heat of Vaporization: 144 Btu/lb = 80.1 cal/g = 3.25 X 10⁴ J/kg
12.13 Heat of Combustion: -17,780 Btu/lb = -8177 cal/g = -413.5 X 10⁴ J/kg
12.14 Heat of Decomposition: Not pertinent
12.15 Heat of Solution: Not pertinent
12.16 Heat of Polymerization: Not pertinent
12.25 Heat of Fusion: Data Not Available
12.26 Limiting Value: Data Not Available
12.27 Reid Vapor Pressure: 0.4 psia

ETHYLENE DIBROMIDE

EDB

<p>Common Synonyms</p> <p>1, 2-Dibromoethane Ethylene bromide Bromoethane sym-Dibromoethane Dow-lume 40, W-10, W-15, W-40 Glycol dibromide</p>	<p>Liquid Colorless Sweet odor</p> <p>Sinks in water. Poisonous vapor is produced. Freezing point is 50°F.</p>	
<p>Stop discharge if possible. Keep people away. Avoid contact with liquid and vapor. Isolate and remove discharged material. Notify local health and pollution control agencies.</p>		
<p>Fire</p>	<p>Not flammable. POISONOUS GASES ARE PRODUCED WHEN HEATED. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Cool exposed containers with water.</p>	
<p>Exposure</p>	<p>CALL FOR MEDICAL AID.</p> <p>VAPOR POISONOUS IF INHALED. Irritating to eyes, nose and throat. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.</p> <p>LIQUID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED. Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.</p>	
<p>Water Pollution</p>	<p>HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.</p>	
<p>1. RESPONSE TO DISCHARGE (See Response Methods Handbook) Should be removed Chemical and physical treatment</p>		<p>2. LABEL</p> <p>2.1 Category: None 2.2 Class: Not pertinent</p>
<p>3. CHEMICAL DESIGNATIONS</p> <p>3.1 CG Compatibility Class: Halogenated hydrocarbon 3.2 Formula: BrCH₂CH₂Br 3.3 IMO/UN Designation: 6.1/1805 3.4 DOT ID No.: 1805 3.5 CAS Registry No.: 106-93-4</p>		<p>4. OBSERVABLE CHARACTERISTICS</p> <p>4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Mildly sweet; like chloroform</p>
<p>5. HEALTH HAZARDS</p> <p>5.1 Personal Protective Equipment: Canister type mask or self-contained air mask; neoprene gloves; chemical safety goggles. 5.2 Symptoms Following Exposure: Local inflammation, blisters and ulcers on skin; irritation in lungs and organic injury to liver and kidneys; may be absorbed through skin. 5.3 Treatment of Exposure: Remove from exposure. Remove contaminated clothing. Wash skin with soap and water. Flush eyes with plenty of water. Consult physician. 5.4 Threshold Limit Value: 2 ppm 5.5 Short Term Inhalation Limits: 50 ppm for 5 min. 5.6 Toxicity by Ingestion: Grade 3; LD₅₀ = 50 to 500 mg/kg 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin. 5.10 Odor Threshold: Data not available 5.11 IDLH Value: 400 ppm</p>		

<p>6. FIRE HAZARDS</p> <p>6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Decomposition gases are toxic and irritating. 6.6 Behavior in Fire: Decomposes into toxic irritating gases. Reacts with hot metals such as aluminum and magnesium. 6.7 Ignition Temperature: Not flammable 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not flammable 6.10 Adiabatic Flame Temperature: Data Not Available 6.11 Stoichiometric Air to Fuel Ratio: Data Not Available 6.12 Flame Temperature: Data Not Available</p> <p>7. CHEMICAL REACTIVITY</p> <p>7.1 Reactivity With Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent 7.7 Molar Ratio (Reactant to Product): Data Not Available 7.8 Reactivity Group: 36</p>

<p>8. WATER POLLUTION</p> <p>8.1 Aquatic Toxicity: 18 mg/l/48 hr/bluegill/fresh water 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Feed Chain Concentration Potential: None</p>

<p>9. SHIPPING INFORMATION</p> <p>9.1 Grades of Purity: Commercial 9.2 Storage Temperature: Ambient 9.3 Inert Atmosphere: No requirement 9.4 Venting: Pressure-vacuum</p>
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<p>10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook)</p> <p style="text-align: center;">A-X</p> <p>11. HAZARD CLASSIFICATIONS</p> <p>11.1 Code of Federal Regulations: CFR-A</p> <p>11.2 NAS Hazard Rating for Bulk Water Transportation:</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: right;">Category</td> <td style="text-align: right;">Rating</td> </tr> <tr> <td>Fire</td> <td style="text-align: right;">0</td> </tr> <tr> <td>Health</td> <td></td> </tr> <tr> <td>Vapor Irritant</td> <td style="text-align: right;">1</td> </tr> <tr> <td>Liquid or Solid Irritant</td> <td style="text-align: right;">1</td> </tr> <tr> <td>Poisons</td> <td style="text-align: right;">3</td> </tr> <tr> <td>Water Pollution</td> <td></td> </tr> <tr> <td>Human Toxicity</td> <td style="text-align: right;">3</td> </tr> <tr> <td>Aquatic Toxicity</td> <td style="text-align: right;">3</td> </tr> <tr> <td>Aesthetic Effect</td> <td style="text-align: right;">2</td> </tr> <tr> <td>Reactivity</td> <td></td> </tr> <tr> <td>Other Chemicals</td> <td style="text-align: right;">1</td> </tr> <tr> <td>Water</td> <td style="text-align: right;">0</td> </tr> <tr> <td>Self Reaction</td> <td style="text-align: right;">0</td> </tr> </table> <p>11.3 NFPA Hazard Classification:</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: right;">Category</td> <td style="text-align: right;">Classification</td> </tr> <tr> <td>Health Hazard (Blue)</td> <td style="text-align: right;">3</td> </tr> <tr> <td>Flammability (Red)</td> <td style="text-align: right;">0</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td style="text-align: right;">0</td> </tr> </table>	Category	Rating	Fire	0	Health		Vapor Irritant	1	Liquid or Solid Irritant	1	Poisons	3	Water Pollution		Human Toxicity	3	Aquatic Toxicity	3	Aesthetic Effect	2	Reactivity		Other Chemicals	1	Water	0	Self Reaction	0	Category	Classification	Health Hazard (Blue)	3	Flammability (Red)	0	Reactivity (Yellow)	0
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<p>12. PHYSICAL AND CHEMICAL PROPERTIES</p> <p>12.1 Physical State at 15°C and 1 atm: Liquid 12.2 Molecular Weight: 187.06 12.3 Boiling Point at 1 atm: 268°F = 131°C = 404°K 12.4 Freezing Point: 49.8°F = 9.8°C = 283.0°K 12.5 Critical Temperature: Not pertinent 12.6 Critical Pressure: Not pertinent 12.7 Specific Gravity: 2.180 at 20°C (Liquid) 12.8 Liquid Surface Tension: 38.75 dynes/cm = 0.03875 N/m at 20°C 12.9 Liquid Water Interfacial Tension: 36.54 dynes/cm = 0.03654 N/m at 20°C 12.10 Vapor (Gas) Specific Gravity: Not pertinent 12.11 Ratio of Specific Heats of Vapor (Gas): 1.109 12.12 Latent Heat of Vaporization: 82.1 Btu/lb = 45.6 cal/g = 1.91 X 10⁴ J/kg 12.13 Heat of Combustion: Not pertinent 12.14 Heat of Decomposition: Not pertinent 12.15 Heat of Solution: Not pertinent 12.16 Heat of Polymerization: Not pertinent 12.25 Heat of Fusion: 13.79 cal/g 12.26 Limiting Value: Data Not Available 12.27 Reid Vapor Pressure: 0.4 psia</p>
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NOTES

FDF000 CAS: 206-44-0 HR: 3
FLUORANTHENE

mf: C₁₆H₁₀ mw: 202.26

PROP: A polycyclic hydrocarbon. Colorless solid. Mp: 120°, bp: 367°, vap press: 0.01 mm @ 20°.

SYNS: 1,2-BENZACENAPHTHENE * BENZO-
(K)FLUORENE * IDRYL * 1,2-(1,8-NAPHTHALENE-
DIYL)BENZENE * 1,2-(1,8-NAPHTHYLENE)BENZENE
* RCRA WASTE NUMBER U120

CONSENSUS REPORTS: IARC Cancer Re-
view: GROUP 3 IMEMDT 7,56,87; Animal
No Evidence IMEMDT 32,355,83. Reported
in EPA TSCA Inventory. EPA Genetic Toxicol-
ogy Program.

SAFETY PROFILE: Poison by intravenous
route. Moderately toxic by ingestion and skin
contact. Questionable carcinogen with experi-
mental tumorigenic data. Human mutation data
reported. Combustible when exposed to heat
or flame. When heated to decomposition it emits
acrid smoke and irritating fumes.

GASOLINES: AUTOMOTIVE (<4.23g lead/gal)

GAT

<p>Common Synonyms Motor spirit Petrol</p>	<p>Watery liquid Floats on water. Flammable, irritating vapor is produced.</p>	<p>Colorless to pale brown or pink</p>	<p>Gasoline odor</p>
<p>Stop discharge if possible. Keep people away. Shut off ignition sources and call fire department. Stay upwind and use water spray to "knock down" vapor. Isolate and remove discharged material. Notify local health and pollution control agencies.</p>			
Fire	<p>FLAMMABLE. Flashback, along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemical, foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.</p>		
Exposure	<p>CALL FOR MEDICAL AID. VAPOR Irritating to eyes, nose and throat. If inhaled, will cause dizziness, headache, difficult breathing or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. LIQUID Irritating to skin and eyes. If swallowed, will cause nausea or vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.</p>		
Water Pollution	<p>HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.</p>		
<p>1. RESPONSE TO DISCHARGE (See Response Methods Handbook) Issue warning-high flammability Evacuate area Disperse and flush</p>		<p>2. LABEL 2.1 Category: Flammable liquid 2.2 Class: 3</p>	
<p>3. CHEMICAL DESIGNATIONS 3.1 CG Compatibility Class: Miscellaneous Hydrocarbon Mixtures 3.2 Formula: (Mixture of hydrocarbons) 3.3 IMO/UN Designation: 3.1/1203 3.4 DOT ID No.: 1203 3.5 CAS Registry No.: Data not available</p>		<p>4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless to brown 4.3 Odor: Gasoline</p>	
5. HEALTH HAZARDS			
<p>5.1 Personal Protective Equipment: Protective goggles, gloves. 5.2 Symptoms Following Exposure: Irritation of mucous membranes and stimulation followed by depression of central nervous system. Breathing of vapor may also cause dizziness, headache, and incoordination or, in more severe cases, anesthesia, coma, and respiratory arrest. If liquid enters lungs, it will cause severe irritation, coughing, gagging, pulmonary edema, and, later, signs of bronchopneumonia and pneumonitis. Swallowing may cause irregular heartbeat. 5.3 Treatment of Exposure: INHALATION: maintain respiration and administer oxygen; enforce bed rest if liquid is in lungs. INGESTION: do NOT induce vomiting; stomach should be lavaged (by doctor) if appreciable quantity is swallowed. EYES: wash with copious quantity of water. SKIN: wipe off and wash with soap and water. 5.4 Threshold Limit Value: 300 ppm 5.5 Short Term Inhalation Limits: 500 ppm for 30 min. 5.6 Toxicity by Ingestion: Grade 2; LD₅₀ = 0.5 to 5 g/kg. 5.7 Late Toxicity: None 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin. 5.10 Odor Threshold: 0.25 ppm 5.11 IDLH Value: Data not available</p>			

<p>6. FIRE HAZARDS 6.1 Flash Point: -36°F C.C. 6.2 Flammable Limits in Air: 1.4%-7.4% 6.3 Fire Extinguishing Agents: Foam, carbon dioxide, dry chemical 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective 6.5 Special Hazards of Combustion Products: None 6.6 Behavior in Fire: Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back. 6.7 Ignition Temperature: 853°F 6.8 Electrical Hazard: Class I, Group D 6.9 Burning Rate: 4 mm/min. 6.10 Adiabatic Flame Temperature: Data not available 6.11 Stoichiometric Air to Fuel Ratio: Data not available 6.12 Flame Temperature: Data not available</p>	<p>10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook) A-T-U-V-W</p>																																						
<p>7. CHEMICAL REACTIVITY 7.1 Reactivity With Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent 7.7 Molar Ratio (Reactant to Product): Data not available 7.8 Reactivity Group: 33</p>	<p>11. HAZARD CLASSIFICATIONS 11.1 Code of Federal Regulations: Flammable liquid 11.2 NAB Hazard Rating for Bulk Water Transportation:</p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Category</th> <th style="text-align: right;">Rating</th> </tr> </thead> <tbody> <tr> <td>Fire.....</td> <td style="text-align: right;">3</td> </tr> <tr> <td>Health</td> <td></td> </tr> <tr> <td>Vapor Irritant.....</td> <td style="text-align: right;">1</td> </tr> <tr> <td>Liquid or Solid Irritant.....</td> <td style="text-align: right;">1</td> </tr> <tr> <td>Poisons.....</td> <td style="text-align: right;">2</td> </tr> <tr> <td>Water Pollution</td> <td></td> </tr> <tr> <td>Human Toxicity.....</td> <td style="text-align: right;">1</td> </tr> <tr> <td>Aquatic Toxicity.....</td> <td style="text-align: right;">2</td> </tr> <tr> <td>Aesthetic Effect.....</td> <td style="text-align: right;">2</td> </tr> <tr> <td>Reactivity</td> <td></td> </tr> <tr> <td>Other Chemicals.....</td> <td style="text-align: right;">0</td> </tr> <tr> <td>Water.....</td> <td style="text-align: right;">0</td> </tr> <tr> <td>Self Reaction.....</td> <td style="text-align: right;">0</td> </tr> <tr> <td>11.3 NFPA Hazard Classification:</td> <td></td> </tr> <tr> <td style="text-align: center;">Category</td> <td style="text-align: center;">Classification</td> </tr> <tr> <td>Health Hazard (Blue).....</td> <td style="text-align: right;">1</td> </tr> <tr> <td>Flammability (Red).....</td> <td style="text-align: right;">3</td> </tr> <tr> <td>Reactivity (Yellow).....</td> <td style="text-align: right;">0</td> </tr> </tbody> </table>	Category	Rating	Fire.....	3	Health		Vapor Irritant.....	1	Liquid or Solid Irritant.....	1	Poisons.....	2	Water Pollution		Human Toxicity.....	1	Aquatic Toxicity.....	2	Aesthetic Effect.....	2	Reactivity		Other Chemicals.....	0	Water.....	0	Self Reaction.....	0	11.3 NFPA Hazard Classification:		Category	Classification	Health Hazard (Blue).....	1	Flammability (Red).....	3	Reactivity (Yellow).....	0
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<p>8. WATER POLLUTION 8.1 Aquatic Toxicity: 90 ppm/24 hr/Juvenile American shad/T₁₀₀/fresh water 91 mg/1/24 hr/Juvenile American shad/T₁₀₀/salt water 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): 8%, 5 days 8.4 Food Chain Concentration Potential: None</p>	<p>12. PHYSICAL AND CHEMICAL PROPERTIES 12.1 Physical State at 15°C and 1 atm: Liquid 12.2 Molecular Weight: Not pertinent 12.3 Boiling Point at 1 atm: 140-390°F = 60-199°C = 333-472°K 12.4 Freezing Point: Not pertinent 12.5 Critical Temperature: Not pertinent 12.6 Critical Pressure: Not pertinent 12.7 Specific Gravity: 0.7321 at 20°C (liquid) 12.8 Liquid Surface Tension: 19-23 dynes/cm = 0.019-0.023 N/m at 20°C 12.9 Liquid Water Interfacial Tension: 49-51 dynes/cm = 0.049-0.051 N/m at 20°C 12.10 Vapor (Gas) Specific Gravity: 3.4 12.11 Ratio of Specific Heats of Vapor (Gas) (est.) 1.054 12.12 Latent Heat of Vaporization: 130-150 Btu/lb = 71-81 cal/g = 3.0 - 3.4 X 10⁴ J/kg 12.13 Heat of Combustion: -18,720 Btu/lb = -10,400 cal/g = 435.1 X 10⁴ J/kg 12.14 Heat of Decomposition: Not pertinent 12.15 Heat of Solution: Not pertinent 12.16 Heat of Polymerization: Not pertinent 12.25 Heat of Fusion: Data not available 12.26 Limiting Value: Data not available 12.27 Reid Vapor Pressure: 7.4 psia</p>																																						
<p>9. SHIPPING INFORMATION 9.1 Grades of Purity: Various octane ratings; military specifications 9.2 Storage Temperature: Ambient 9.3 Inert Atmosphere: No requirement 9.4 Venting: Open (flame arrester) or pressure-vacuum</p>	<p style="text-align: center;">NOTES</p>																																						

GASOLINES: AVIATION (< 4.86g lead/gal)

GAV

Common Synonyms	Waterly liquid	Red, blue, green, brown or purple	Gasoline odor
Floats on water. Flammable, irritating vapor is produced.			
Stop discharge if possible. Keep people away. Shut off ignition sources and call fire department. Stay upwind and use water spray to "knock down" vapor. Isolate and remove discharged material. Notify local health and pollution control agencies.			
Fire	<p>FLAMMABLE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemical, foam or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.</p>		
Exposure	<p>CALL FOR MEDICAL AID</p> <p>VAPOR Irritating to eyes, nose and throat. If inhaled will cause dizziness, headache, difficult breathing or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.</p> <p>LIQUID Irritating to skin and eyes. If swallowed, will cause nausea or vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.</p>		
Water Pollution	<p>HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.</p>		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook) Issue warning-high flammability Evacuate area Disperse and flush		2. LABEL 2.1 Category: Flammable liquid 2.2 Class: 3	
3. CHEMICAL DESIGNATIONS 3.1 CQ Compatibility Class: Not listed 3.2 Formula: Not pertinent 3.3 IMO/UN Designations: 3.1/1203 3.4 DOT ID No.: 1203 3.5 CAS Registry No.: Data not available		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Red, blue, green, brown, purple 4.3 Odor: Gasoline	
5. HEALTH HAZARDS			
<p>5.1 Personal Protective Equipment: Protective goggles, gloves.</p> <p>5.2 Symptoms Following Exposure: INHALATION causes irritation of upper respiratory tract; central nervous system stimulation followed by depression of varying degrees ranging from dizziness, headache, and incoordination to anesthesia, coma, and respiratory arrest; irregular heartbeat is dangerous complication. ASPIRATION causes severe lung irritation with coughing, gagging, dyspnea, substernal distress, and rapidly developing pulmonary edema; later, signs of bronchopneumonia and pneumonia; acute onset of central nervous system excitement followed by depression. INGESTION causes irritation of mucous membranes of throat, esophagus, and stomach; stimulation followed by depression of central nervous system; irregular heartbeat.</p> <p>5.3 Treatment of Exposure: Seek medical attention. INHALATION: maintain respiration; give oxygen if needed. ASPIRATION: enforce bed rest; administer oxygen. INGESTION: do NOT induce vomiting; lavage carefully if appreciable quantity was ingested; guard against aspiration into lungs. EYES: wash with copious quantity of water. SKIN: wipe off and wash with soap and water.</p> <p>5.4 Threshold Limit Value: 300 ppm 5.5 Short Term Inhalation Limits: 500 ppm for 30 min. 5.6 Toxicity by Ingestion: Grade 2; LD₅₀ = 0.5 to 5 g/kg 5.7 Late Toxicity: None 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin. 5.10 Odor Threshold: 0.25 ppm 5.11 IDLH Value: Data not available</p>			

<p style="text-align: center;">6. FIRE HAZARDS</p> <p>6.1 Flash Point: -50°F C.C. 6.2 Flammable Limits in Air: 1.2%-7.1% 6.3 Fire Extinguishing Agents: Foam, carbon dioxide, dry chemical 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective 6.5 Special Hazards of Combustion Products: None 6.6 Behavior in Fire: Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back. 6.7 Ignition Temperature: 824°F 6.8 Electrical Hazard: Class I, group D 6.9 Burning Rate: 4 mm/min. 6.10 Adiabatic Flame Temperature: Data not available 6.11 Stoichiometric Air to Fuel Ratio: Data not available 6.12 Flame Temperature: Data not available</p> <p style="text-align: center;">7. CHEMICAL REACTIVITY</p> <p>7.1 Reactivity With Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent 7.7 Molar Ratio (Reactant to Product): Data not available 7.8 Reactivity Group: Data not available</p> <p style="text-align: center;">8. WATER POLLUTION</p> <p>8.1 Aquatic Toxicity: 90 ppm/24 hr/juvenile American shad/TL₅₀/fresh water 91 ppm/24 hr/juvenile American shad/TL₅₀/salt water 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): 8%, 5 days 8.4 Food Chain Concentration Potential: None</p> <p style="text-align: center;">9. SHIPPING INFORMATION</p> <p>9.1 Grades of Purity: Grades 90/87, 100/130, and 115/145; Specification MIL-G-5572e 9.2 Storage Temperature: Ambient 9.3 Inert Atmosphere: No requirement 9.4 Venting: Open (flame arrester) or pressure-vacuum</p>	<p style="text-align: center;">10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook) A-T-U-V-W</p> <p style="text-align: center;">11. HAZARD CLASSIFICATIONS</p> <p>11.1 Code of Federal Regulations: Flammable liquid</p> <p>11.2 NAS Hazard Rating for Bulk Water Transportation:</p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Category</th> <th style="text-align: left;">Rating</th> </tr> </thead> <tbody> <tr> <td>Fire</td> <td>3</td> </tr> <tr> <td>Health</td> <td></td> </tr> <tr> <td>Vapor Irritant</td> <td>1</td> </tr> <tr> <td>Liquid or Solid Irritant</td> <td>1</td> </tr> <tr> <td>Poisons</td> <td>2</td> </tr> <tr> <td>Water Pollution</td> <td></td> </tr> <tr> <td>Human Toxicity</td> <td>1</td> </tr> <tr> <td>Aquatic Toxicity</td> <td>2</td> </tr> <tr> <td>Aesthetic Effect</td> <td>2</td> </tr> <tr> <td>Reactivity</td> <td></td> </tr> <tr> <td>Other Chemicals</td> <td>0</td> </tr> <tr> <td>Water</td> <td>0</td> </tr> <tr> <td>Salt Reaction</td> <td>0</td> </tr> </tbody> </table> <p>11.3 NFPA Hazard Classification:</p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Category</th> <th style="text-align: left;">Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td> <td>1</td> </tr> <tr> <td>Flammability (Red)</td> <td>3</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td>0</td> </tr> </tbody> </table> <p style="text-align: center;">12. PHYSICAL AND CHEMICAL PROPERTIES</p> <p>12.1 Physical State at 15°C and 1 atm: Liquid 12.2 Molecular Weight: Not pertinent 12.3 Boiling Point at 1 atm: 160-340°F = 71-171°C = 344-444°K 12.4 Freezing Point: <76°F = <24.4°C = <297.6°K 12.5 Critical Temperature: Not pertinent 12.6 Critical Pressure: Not pertinent 12.7 Specific Gravity: 0.711 at 15°C (liquid) 12.8 Liquid Surface Tension: 19-23 dynes/cm = 0.019-0.023 N/m at 20°C 12.9 Liquid Water Interfacial Tension: 49-51 dynes/cm = 0.049-0.051 N/m at 20°C 12.10 Vapor (Gas) Specific Gravity: 3.4 12.11 Ratio of Specific Heats of Vapor (Gas): (est.) 1.054 12.12 Latent Heat of Vaporization: 130-150 Btu/lb = 71-81 cal/g = 3.0-3.4 X 10⁴ J/kg 12.13 Heat of Combustion: -18,720 Btu/lb = -10,400 cal/g = -435.4 X 10⁴ J/kg 12.14 Heat of Decomposition: Not pertinent 12.15 Heat of Solution: Not pertinent 12.16 Heat of Polymerization: Not pertinent 12.25 Heat of Fusion: Data not available 12.26 Limiting Value: Data not available 12.27 Reid Vapor Pressure: Data not available</p> <p style="text-align: center;">NOTES</p>	Category	Rating	Fire	3	Health		Vapor Irritant	1	Liquid or Solid Irritant	1	Poisons	2	Water Pollution		Human Toxicity	1	Aquatic Toxicity	2	Aesthetic Effect	2	Reactivity		Other Chemicals	0	Water	0	Salt Reaction	0	Category	Classification	Health Hazard (Blue)	1	Flammability (Red)	3	Reactivity (Yellow)	0
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GASOLINES: STRAIGHT RUN

GSR

Common Synonyms	Watery liquid	Colorless	Gasoline odor
Floats on water. Flammable, irritating vapor is produced.			
Fire	<p>FLAMMABLE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area.</p>		
Exposure	<p>VAPOR Irritating to eyes, nose and throat. If inhaled, will cause dizziness, headache, difficult breathing or loss of consciousness.</p> <p>LIQUID Irritating to skin and eyes. If swallowed, will cause nausea or vomiting.</p>		
Water Pollution	<p>HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. Fouling to shoreline. May be dangerous if it enters water intakes.</p>		
<p>1. RESPONSE TO DISCHARGE (See Response Methods Handbook) Issue warning-high flammability Evacuate area Disperse and flush</p>	<p>2. LABEL</p> <p>2.1 Category: Flammable liquid 2.2 Class: 3</p>		
<p>3. CHEMICAL DESIGNATIONS</p> <p>3.1 CG Compatibility Class: Miscellaneous Hydrocarbon Mixtures 3.2 Formula: Not pertinent 3.3 IMO/UN Designation: 3.1, 3.2/1203 3.4 DOT ID No.: 1203 3.5 CAS Registry No.: Data not available</p>	<p>4. OBSERVABLE CHARACTERISTICS</p> <p>4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Gasoline</p>		
5. HEALTH HAZARDS			
<p>5.1 Personal Protective Equipment: Protective goggles, gloves. 5.2 Symptoms Following Exposure: INHALATION causes irritation of upper respiratory tract; central nervous system stimulation followed by depression of varying degrees ranging from dizziness, headache, and incoordination to anesthesia, coma, and respiratory arrest; irregular heartbeat is dangerous complication. ASPIRATION causes severe lung irritation with coughing, gagging, dyspnea, substernal distress, and rapidly developing pulmonary edema; later, signs of bronchopneumonia and pneumonia; acute onset of central nervous system excitement followed by depression. INGESTION causes irritation of mucous membranes of throat, esophagus, and stomach; stimulation followed by depression of central nervous system; irregular heartbeat. 5.3 Treatment of Exposure: Seek medical attention. INHALATION: maintain respiration; give oxygen if needed. ASPIRATION: enforce bed rest; administer oxygen. INGESTION: do NOT induce vomiting; lavage carefully if appreciable quantity was ingested; guard against aspiration into lungs. EYES: wash with copious quantity of water. SKIN: wipe off and wash with soap and water. 5.4 Threshold Limit Value: 300 ppm 5.5 Short Term Inhalation Limits: 500 ppm for 30 min. 5.6 Toxicity by Ingestion: Grade 2; LD₅₀ = 0.5 to 5 g/kg 5.7 Late Toxicity: None 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin. 5.10 Odor Threshold: 0.25 ppm 5.11 IDLH Value: Data not available</p>			

<p>6. FIRE HAZARDS</p> <p>6.1 Flash Point: (a) <0°F C.C. (b) 0-73°F C.C. 6.2 Flammable Limits in Air: (a) 1.3%-7.1% 6.3 Fire Extinguishing Agents: Dry chemical, foam, carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective 6.5 Special Hazards of Combustion Products: None 6.6 Behavior in Fire: Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back. 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Class I, group D 6.9 Burning Rate: 4 mm/min. 6.10 Adiabatic Flame Temperature: Data not available 6.11 Stoichiometric Air to Fuel Ratio: Data not available 6.12 Flame Temperature: Data not available</p> <p>7. CHEMICAL REACTIVITY</p> <p>7.1 Reactivity With Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent 7.7 Molar Ratio (Reactant to Product): Data not available 7.8 Reactivity Group: 33</p> <p>8. WATER POLLUTION</p> <p>8.1 Aquatic Toxicity: 80 ppm/24 hr/juvenile American shad/TL₅₀/fresh water 91 ppm/24 hr/juvenile American shad/TL₅₀/salt water 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): 8%, 5 days 8.4 Food Chain Concentration Potential: None</p> <p>9. SHIPPING INFORMATION</p> <p>9.1 Grades of Purity: Composition varies with range of distillation temperatures used. 9.2 Storage Temperature: Ambient 9.3 Inert Atmosphere: No requirement 9.4 Venting: Open (flame arrester) or pressure-vacuum</p>

<p>10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook) A-T-U-V-W</p>																																				
<p>11. HAZARD CLASSIFICATIONS</p> <p>11.1 Code of Federal Regulations: Flammable liquid</p> <p>11.2 NAS Hazard Rating for Bulk Water Transportation:</p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Category</th> <th style="text-align: left;">Rating</th> </tr> </thead> <tbody> <tr> <td>Fire</td> <td>3</td> </tr> <tr> <td>Health</td> <td></td> </tr> <tr> <td>Vapor Irritant</td> <td>1</td> </tr> <tr> <td>Liquid or Solid Irritant</td> <td>1</td> </tr> <tr> <td>Poisons</td> <td>2</td> </tr> <tr> <td>Water Pollution</td> <td></td> </tr> <tr> <td>Human Toxicity</td> <td>1</td> </tr> <tr> <td>Aquatic Toxicity</td> <td>2</td> </tr> <tr> <td>Aesthetic Effect</td> <td>2</td> </tr> <tr> <td>Reactivity</td> <td></td> </tr> <tr> <td>Other Chemicals</td> <td>0</td> </tr> <tr> <td>Water</td> <td>0</td> </tr> <tr> <td>Self Reaction</td> <td>0</td> </tr> </tbody> </table> <p>11.3 MFPA Hazard Classification:</p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Category</th> <th style="text-align: left;">Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td> <td>1</td> </tr> <tr> <td>Flammability (Red)</td> <td>3</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td>0</td> </tr> </tbody> </table>	Category	Rating	Fire	3	Health		Vapor Irritant	1	Liquid or Solid Irritant	1	Poisons	2	Water Pollution		Human Toxicity	1	Aquatic Toxicity	2	Aesthetic Effect	2	Reactivity		Other Chemicals	0	Water	0	Self Reaction	0	Category	Classification	Health Hazard (Blue)	1	Flammability (Red)	3	Reactivity (Yellow)	0
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<p>12. PHYSICAL AND CHEMICAL PROPERTIES</p> <p>12.1 Physical State at 15°C and 1 atm: Liquid</p> <p>12.2 Molecular Weight: Not pertinent</p> <p>12.3 Boiling Point at 1 atm: 58-275°F = 14-135°C = 267-408°K</p> <p>12.4 Freezing Point: Not pertinent</p> <p>12.5 Critical Temperature: Not pertinent</p> <p>12.6 Critical Pressure: Not pertinent</p> <p>12.7 Specific Gravity: 0.71-0.747 at 15°C (liquid)</p> <p>12.8 Liquid Surface Tension: 19-23 dynes/cm = 0.019-0.023 N/m at 20°C</p> <p>12.9 Liquid Water Interfacial Tension: 49-51 dynes/cm = 0.049-0.051 N/m at 20°C</p> <p>12.10 Vapor (Gas) Specific Gravity: 3.4</p> <p>12.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent</p> <p>12.12 Latent Heat of Vaporization: 130-150 Btu/lb = 71-81 cal/g = 3.0-3.4 X 10⁴ J/kg</p> <p>12.13 Heat of Combustion: -18,720 Btu/lb = -10,400 cal/g = -435.4 X 10³ J/kg</p> <p>12.14 Heat of Decomposition: Not pertinent</p> <p>12.15 Heat of Solution: Not pertinent</p> <p>12.16 Heat of Polymerization: Not pertinent</p> <p>12.25 Heat of Fusion: Data not available</p> <p>12.26 Limiting Value: Data not available</p> <p>12.27 Reid Vapor Pressure: Data not available</p>																																				
NOTES																																				

KEROSENE

KRS

Common Synonyms Illuminating Oil Kerosene Range of Fuel of No. 1 Jet Fuel JP-1	Watery liquid Colorless Fuel oil odor	Floats on water.
Stop discharge if possible. Call fire department. Avoid contact with liquid. Isolate and remove discharged material. Notify local health and pollution control agencies.		
Fire	Combustible. Extinguish with dry chemical, foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.	
Exposure	CALL FOR MEDICAL AID. LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.	
Water Pollution	Dangerous to aquatic life in high concentrations. Fouling to shorelines. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.	
1. RESPONSE TO DISCHARGE (See Response Methods Handbook) Mechanical containment Should be removed Chemical and physical treatment		2. LABEL 2.1 Category: None 2.2 Class: Not pertinent
3. CHEMICAL DESIGNATIONS 3.1 CG Competibility Class: Miscellaneous Hydrocarbon Mixtures 3.2 Formula: C ₁₂ H ₂₆ + s 3.3 IMO/UN Designation: 3.3/1223 3.4 DOT ID No.: 1223 3.5 CAS Registry No.: 8006-20-6		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless to light brown 4.3 Odor: Characteristic
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Protective gloves; goggles or face shield. 5.2 Symptoms Following Exposure: Vapor causes slight irritation of eyes and nose. Liquid irritates stomach; if taken into lungs, causes coughing, distress, and rapidly developing pulmonary edema. 5.3 Treatment of Exposure: ASPIRATION: enforce bed rest; administer oxygen; call a doctor. INGESTION: do NOT induce vomiting; call a doctor. EYES: wash with plenty of water. SKIN: wipe off and wash with soap and water. 5.4 Threshold Limit Value: 200 ppm 5.5 Short Term Inhalation Limit: 2500 mg/m ³ for 60 min. 5.6 Toxicity by Ingestion: Grade 1; LD ₅₀ = 5 to 15 g/kg 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin. 5.10 Odor Threshold: 1 ppm 5.11 IDLH Value: Data not available		

6. FIRE HAZARDS 6.1 Flash Point: 100°F (min.)C.C. 6.2 Flammable Limits in Air: 0.7%-5% 6.3 Fire Extinguishing Agents: Foam, dry chemical, or carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: 444°F 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: 4 mm/min. 6.10 Adiabatic Flame Temperature: Data not available 6.11 Stoichiometric Air to Fuel Ratio: Data not available 6.12 Flame Temperature: Data not available	10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook) A-T-U																																				
7. CHEMICAL REACTIVITY 7.1 Reactivity With Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent 7.7 Molar Ratio (Reactant to Product): Data not available 7.8 Reactivity Group: 33	11. HAZARD CLASSIFICATIONS 11.1 Code of Federal Regulations: Combustible liquid 11.2 NAS Hazard Rating for Bulk Water Transportation: <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: right;">Category</td> <td style="text-align: right;">Rating</td> </tr> <tr> <td>Fire</td> <td style="text-align: right;">2</td> </tr> <tr> <td>Health</td> <td></td> </tr> <tr> <td>Vapor Irritant</td> <td style="text-align: right;">1</td> </tr> <tr> <td>Liquid or Solid Irritant</td> <td style="text-align: right;">1</td> </tr> <tr> <td>Poisons</td> <td style="text-align: right;">1</td> </tr> <tr> <td>Water Pollution</td> <td></td> </tr> <tr> <td>Human Toxicity</td> <td style="text-align: right;">1</td> </tr> <tr> <td>Aquatic Toxicity</td> <td style="text-align: right;">1</td> </tr> <tr> <td>Aesthetic Effect</td> <td style="text-align: right;">3</td> </tr> <tr> <td>Reactivity</td> <td></td> </tr> <tr> <td>Other Chemicals</td> <td style="text-align: right;">0</td> </tr> <tr> <td>Water</td> <td style="text-align: right;">0</td> </tr> <tr> <td>Solid Reaction</td> <td style="text-align: right;">0</td> </tr> </table> 11.3 NFPA Hazard Classification: <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: right;">Category</td> <td style="text-align: right;">Classification</td> </tr> <tr> <td>Health Hazard (Blue)</td> <td style="text-align: right;">0</td> </tr> <tr> <td>Flammability (Red)</td> <td style="text-align: right;">2</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td style="text-align: right;">0</td> </tr> </table>	Category	Rating	Fire	2	Health		Vapor Irritant	1	Liquid or Solid Irritant	1	Poisons	1	Water Pollution		Human Toxicity	1	Aquatic Toxicity	1	Aesthetic Effect	3	Reactivity		Other Chemicals	0	Water	0	Solid Reaction	0	Category	Classification	Health Hazard (Blue)	0	Flammability (Red)	2	Reactivity (Yellow)	0
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8. WATER POLLUTION 8.1 Aquatic Toxicity: 2990 ppm/24 hr/bluegill/TL ₅₀ /fresh water 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): 63%, 5 days 8.4 Food Chain Concentration Potential: None	12. PHYSICAL AND CHEMICAL PROPERTIES 12.1 Physical State at 15°C and 1 atm: Liquid 12.2 Molecular Weight: Not pertinent 12.3 Boiling Point at 1 atm: 392-500°F = 200-260°C = 473-533°K 12.4 Freezing Point: -50°F = -45.6°C = 227.8°K 12.5 Critical Temperature: Not pertinent 12.6 Critical Pressure: Not pertinent 12.7 Specific Gravity: 0.80 at 15°C (liquid) 12.8 Liquid Surface Tension: 23-32 dynes/cm = 0.023-0.032 N/m at 20°C 12.9 Liquid Water Interfacial Tension: 47-49 dynes/cm = 0.047-0.049 N/m at 20°C 12.10 Vapor (Gas) Specific Gravity: Not pertinent 12.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 12.12 Latent Heat of Vaporization: 110 Btu/lb = 60 cal/g = 2.5 x 10 ⁴ J/kg 12.13 Heat of Combustion: -18,540 Btu/lb = -10,300 cal/g = -431.24 x 10 ⁴ J/kg 12.14 Heat of Decomposition: Not pertinent 12.15 Heat of Solution: Not pertinent 12.16 Heat of Polymerization: Not pertinent 12.26 Heat of Fusion: Data not available 12.28 Limiting Value: Data not available 12.27 Reid Vapor Pressure: 0.1 psia																																				
9. SHIPPING INFORMATION 9.1 Grades of Purity: Light hydrocarbon distillate: 100% 9.2 Storage Temperature: Ambient 9.3 Inert Atmosphere: No requirement 9.4 Venting: Open (flame arrester)	NOTES																																				

LEAD CHLORIDE

LCL

Common Synonyms Lead dichloride Plumbous chloride Lead (II) chloride		Solid White Sinks and mixes with water.
Avoid contact with solid and dust. Keep people away. Wear goggles, self-contained breathing apparatus, rubber overclothing (including gloves). Stop discharge if possible. Isolate and remove discharged material. Notify local health and pollution control agencies.		
Fire	Not flammable. POISONOUS METAL FUMES MAY BE PRODUCED IN FIRE. Wear goggles, self-contained breathing apparatus, rubber overclothing (including gloves).	
Exposure	CALL FOR MEDICAL AID. DUST AND FUMES, POISONOUS IF INHALED. Move to fresh air. Keep victim quiet and warm. SOLID If swallowed, may cause metallic taste, abdominal pain, vomiting and diarrhea. Flush affected area with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk, have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS, do nothing except keep victim warm.	
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.	
1. RESPONSE TO DISCHARGE (See Response Methods Handbook) Issue warning - water contaminant. Restrict access. Should be removed. Chemical and physical treatment.		2. LABEL 2.1 Category: None 2.2 Class: Not pertinent
3. CHEMICAL DESIGNATIONS 3.1 CG Compatibility Class: Not listed 3.2 Formula: PbCl ₂ 3.3 IMO/UN Designation: Not listed 3.4 DOT ID No.: Data not available 3.5 CAS Registry No.: 7756-95-4		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid (crystal powder) 4.2 Color: White 4.3 Odor: Data not available
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Wear approved filter mask, rubber gloves, and safety glasses. 5.2 Symptoms Following Exposure: INHALATION: Joint and muscle pains, headache, dizziness and insomnia. Weakness, frequently of extensor muscles of hand and wrist (unilateral or bilateral). Heavy contamination - brain damage. Stupor progressing to coma - with or without convulsion, often death. Excitation, confusion, and mania less common. Cerebrospinal pressure may be increased. INGESTION: Abdominal pain, diarrhea, constipation, loss of appetite, muscular weakness, headache, blue line on gums, metallic taste, nausea, and vomiting. 5.3 Treatment of Exposure: Call a physician. INHALATION: Remove from source of exposure. Keep victim quiet and warm. EYES: Flush with plenty of water. SKIN: Wash with soap and water. INGESTION: Induce vomiting and follow with gastric lavage. Administer saline cathartic and an enema. Give antispasmodic (calcium gluconate, atropine, papaverine) for relief of colic. If pain is severe morphine sulfate may be considered. 5.4 Threshold Limit Value: 0.15 mg/m ³ as lead. 5.5 Short Term Inhalation Limits: 0.45 mg/m ³ as lead. 5.6 Toxicity by Ingestion: Guinea pig minimum lethal dose 1500 to 2000 mg/kg. 5.7 Lethal Toxicity: In man 6 mg/m ³ /day inhaled long term produces histological and pathological effects. 1.2 mg/day ingested long term produces CNS disorders. Teratogenic effects. 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available 5.11 IDLH Value: Data not available		

6. FIRE HAZARDS 6.1 Flash Point: Not pertinent 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Toxic metal fumes 6.6 Behavior in Fire: Can emit toxic metal fumes 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent 6.10 Adiabatic Flame Temperature: Data not available 6.11 Stoichiometric Air to Fuel Ratio: Data not available 6.12 Flame Temperature: Data not available	10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook) SS
7. CHEMICAL REACTIVITY 7.1 Reactivity With Water: No reaction 7.2 Reactivity with Common Materials: Data not available 7.3 Stability During Transport: Data not available 7.4 Neutralizing Agents for Acids and Caustics: Data not available 7.5 Polymerization: Data not available 7.6 Inhibitor of Polymerization: Data not available 7.7 Molar Ratio (Reactant to Product): Data not available 7.8 Reactivity Group: Data not available	11. HAZARD CLASSIFICATIONS 11.1 Code of Federal Regulations: ORM-B 11.2 NAB Hazard Rating for Bulk Water Transportation: Not listed 11.3 NFPA Hazard Classification: Not listed
8. WATER POLLUTION 8.1 Aquatic Toxicity: 5.58 ppm/96-hour/TL ₅₀ /Fathead minnow/soft water 482 ppm/96-hour/TL ₅₀ /Fathead minnow/hard water 23.8 ppm/96-hour/TL ₅₀ /Bluegill/soft water 442 ppm/96-hour/TL ₅₀ /Bluegill/hard water 31.5 ppm/96-hour/TL ₅₀ /Goldfish/soft water 20.6 ppm/96-hour/TL ₅₀ /Guppy/soft water 8.2 Waterfowl Toxicity: Data not available (Continued)	12. PHYSICAL AND CHEMICAL PROPERTIES 12.1 Physical State at 15°C and 1 atm: Solid 12.2 Molecular Weight: 278.12 12.3 Boiling Point at 1 atm: 1742°F = 950°C = 1223.2°K 12.4 Freezing Point: 933.8°F = 501°C = 774.2°K 12.5 Critical Temperature: Data not available 12.6 Critical Pressure: Data not available 12.7 Specific Gravity: 5.85 at room temperature 12.8 Liquid Surface Tension: Not pertinent 12.9 Liquid Water Interfacial Tension: Not pertinent 12.10 Vapor (Gas) Specific Gravity: 9.59 (calculated) 12.11 Ratio of Specific Heats of Vapor (Gas): Data not available 12.12 Latent Heat of Vaporization: 191.5 Btu/lb = 106.4 cal/g = 4.45 X 10 ⁴ J/kg 12.13 Heat of Combustion: Data not available 12.14 Heat of Decomposition: Data not available 12.15 Heat of Solution: Endothermic: 40.1 Btu/lb = 22.3 cal/g = 0.93 X 10 ⁴ J/kg 12.16 Heat of Polymerization: Not pertinent 12.25 Heat of Fusion: 20.3 cal/g 12.26 Limiting Value: Data not available 12.27 Reid Vapor Pressure: Data not available
9. SHIPPING INFORMATION 9.1 Grades of Purity: Data not available 9.2 Storage Temperature: Data not available 9.3 Inert Atmosphere: Data not available 9.4 Venting: Data not available	8. WATER POLLUTION (Continued) 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: Both fish and animal life can concentrate lead.

FROM: **ALCONOX Inc.**

Quality Management Laboratory Services Hospital Products Division
215 PARK AVENUE SOUTH NEW YORK, N.Y. 10003

TO: **CE Environmental**
ATTN: **Bill Thurston**
TEL: **207-773-0011**

DATE: **1/19/90**
PAGE **1** OF **1**
FROM: **Malcolm**

Material Safety Data Sheet
May be used to comply with OSHA's Hazard Communication Standard 29 CFR 1910.1200. Standard must be consulted for specific requirements.

U.S. Department of Labor
Occupational Safety and Health Administration
(This Mandatory Form)
Form Approved
OMB No. 1218-0012

IDENTIFY (As Used on Label and Tag)
LIQUI-NOX

Section I - Manufacturer's Name
ALCONOX, INC.
Address (Number, Street, City, State, and ZIP Code)
215 PARK AVENUE SOUTH
NEW YORK, NEW YORK 10003

Emergency Telephone Number
(212) 473-1300

Telephone Number for Information
(212) 473-1300

Date Prepared
JULY 1, 1987

Signature of Preparer (printed)

Section II - Hazardous Ingredients/Identity Information

There are no ingredients in LIQUI-NOX which appeared on the OSHA Standard 29 CFR 1910 SUBPART Z.

Section III - Physical/Chemical Characteristics

Pressure (psia @ 70°F)	218.0 P	Specific Gravity (40 - 60)	1.025
Density (API - 1)	NO DATA	Melting Point	N.A.
Viscosity (cP @ 70°F)	NO DATA	Boiling Point (at 1 atm)	NO DATA

Section IV - Fire and Explosion Hazard Data

Flammable Limits
LFL: **N.A.** UFL: **N.A.**

Flash Point
WATER, DRY CHEMICAL, FOAM, CO₂, SAND/EARTH

Section V - Reactivity Data

Stability
Stable

Conditions to Avoid
NONE

Incompatibility (Materials to Avoid)
NONE

Hazardous Decomposition or Byproducts
SO₂ MAY BE RELEASED ON BURNING

Hazardous Polymerization
May Occur: **NO** Conditions to Avoid: **NONE**
Will Not Occur: **NO**

Section VI - Health Hazard Data

Route of Entry: Inhalation: **NO** Skin: **YES** Ingestion: **YES**

Health Hazards (Acute and Chronic)
SKIN CONTACT MAY PROVE LOCALLY IRRITATING.
INGESTION MAY CAUSE DISCOMFORT AND/OR DIARRHEA.

Cardiotoxicity: MTT: **NO** IARC Monograph: **NO** OSHA Permitted: **NO**

Signs and Symptoms of Exposure
PROLONGED SKIN CONTACT MAY CAUSE DRYING AND/OR CHAPPING.

Medical Conditions
Generally Aggravated by Exposure: **NONE**

Emergency and First Aid Procedures
EYES-FLUSH WITH PLENTY OF WATER FOR 15 MINUTES. SKIN-FLUSH WITH WATER.
INGESTION-DRINK LARGE QUANTITIES OF WATER. GET MEDICAL ATTENTION FOR DISCOMFORT.

Section VII - Precautions for Safe Handling and Use

Material to be Taken to Clean Material to Released or Spilled
MATERIAL FOAMS PROFUSELY. RECOVER AS MUCH AS POSSIBLE WITH ABSORBENT MATERIAL AND RINSE REMAINDER TO SEWER. MATERIAL IS COMPLETELY BIODEGRADABLE.

When Disposed Material
SMALL QUANTITIES MAY BE DISPOSED OF IN SEWER. LARGE QUANTITIES SHOULD BE SOAKED UP WITH ABSORBENT MATERIAL AND DISPOSED OF ACCORDING TO LOCAL ORDINANCE.

Other Precautions
NO SPECIAL REQUIREMENTS OTHER THAN THE GOOD INDUSTRIAL HYGIENE AND SAFETY PRACTICES EMPLOYED WITH ANY INDUSTRIAL CHEMICAL.

Section VIII - Control Measures

Respiratory Protection (Specify Type)

Local Exhaust	NONE	Supplies	N.A.
Mechanical (General)	N.A.	Other	N.A.

Eye Protection
RECOMMENDED

Other Protective Clothing or Equipment
NOT REQUIRED

Hygienic Practices
NO SPECIAL PRACTICES REQUIRED.

LIQUI-NOX

MERCURY

MCR

Common Synonyms Quicksilver	Liquid Silver Odorless Sinks in water.
<p>AVOID CONTACT WITH LIQUID. Keep people away. Stop discharge if possible. Isolate and remove discharged material. Notify local health and pollution control agencies.</p>	
Fire	Not flammable.
Exposure	<p>CALL FOR MEDICAL AID LIQUID Effects of exposure may be delayed.</p>
Water Pollution	<p>HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.</p>
<p>1. RESPONSE TO DISCHARGE (See Response Methods Handbook) Should be removed Chemical and physical treatment</p>	<p>2. LABEL 2.1 Category: None</p>
<p>3. CHEMICAL DESIGNATIONS 3.1 CG Compatibility Class: Not listed 3.2 Formula: Hg 3.3 IMO/UN Designation: Not listed 3.4 DOT ID No.: 2809 3.5 CAS Registry No.: 7439-97-6</p>	<p>4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Silvery 4.3 Odor: None</p>
<p>5. HEALTH HAZARDS</p> <p>5.1 Personal Protective Equipment: Avoid contact of liquid with skin. For vapor use chemical cartridge (Hopacrite) respirator.</p> <p>5.2 Symptoms Following Exposure: No immediate symptoms. As poisoning becomes established, slight muscular tremor, loss of appetite, nausea, and diarrhea are observed. Psychic, kidney, and cardiovascular disturbances may occur.</p> <p>5.3 Treatment of Exposure: Consult a doctor.</p> <p>5.4 Threshold Limit Value: 0.05 mg/m³</p> <p>5.5 Short Term Inhalation Limits: Data not available</p> <p>5.6 Toxicity by Ingestion: No immediate toxicity</p> <p>5.7 Late Toxicity: Development of mercury poisoning</p> <p>5.8 Vapor (Gas) Irritant Characteristics: None</p> <p>5.9 Liquid or Solid Irritant Characteristics: None</p> <p>5.10 Odor Threshold: Not pertinent</p> <p>5.11 IDLH Value: 28 mg/m³</p>	

<p>6. FIRE HAZARDS</p> <p>6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not flammable 6.7 Ignition Temperature: Not flammable 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not flammable 6.10 Adiabatic Flame Temperature: Data not available 6.11 Stoichiometric Air to Fuel Ratio: Data not available 6.12 Flame Temperature: Data not available</p>	<p>10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook) A-X</p>
<p>7. CHEMICAL REACTIVITY</p> <p>7.1 Reactivity With Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent 7.7 Molar Ratio (Reactant to Product): Data not available 7.8 Reactivity Group: Data not available</p>	<p>11. HAZARD CLASSIFICATIONS</p> <p>11.1 Code of Federal Regulations: ORM-B 11.2 HAS Hazard Rating for Bulk Water Transportation: Not listed 11.3 NFPA Hazard Classification: Not listed</p>
<p>8. WATER POLLUTION</p> <p>8.1 Aquatic Toxicity: 0.5-1 ppm/48 hr/carpagus ardum/TL₅₀/fresh water 0.29 ppm/48 hr/manne fish/TL₅₀/salt water</p> <p>8.2 Waterfowl Toxicity: Data not available</p> <p>8.3 Biological Oxygen Demand (BOD): None</p> <p>8.4 Food Chain Concentration Potential: Mercury concentrates in liver and kidneys of ducks and geese to levels above FDA limit of 0.5 ppm. Muscle tissue usually well below the limit.</p>	<p>12. PHYSICAL AND CHEMICAL PROPERTIES</p> <p>12.1 Physical State at 15°C and 1 atm: Liquid 12.2 Molecular Weight: 200.59 12.3 Boiling Point at 1 atm: 675°F = 357°C = 630°K 12.4 Freezing Point: -38.0°F = -38.9°C = 234.3°K 12.5 Critical Temperature: 2664°F = 1462°C = 1735°K 12.6 Critical Pressure: 23,900 psia = 1587 atm = 160.8 MN/m² 12.7 Specific Gravity: 13.55 at 20°C (liquid) 12.8 Liquid Surface Tension: 470 dynes/cm = 0.470 N/m at 20°C 12.9 Liquid Water Intercfacial Tension: 375 dynes/cm = 0.375 N/m at 20°C 12.10 Vapor (Gas) Specific Gravity: Not pertinent 12.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 12.12 Latent Heat of Vaporization: Not pertinent 12.13 Heat of Combustion: Not pertinent 12.14 Heat of Decomposition: Not pertinent 12.15 Heat of Solution: Not pertinent 12.16 Heat of Polymerization: Not pertinent 12.26 Heat of Fusion: 2.7 cal/g 12.26 Limiting Value: Data not available 12.27 Reid Vapor Pressure: Data not available</p>
<p>9. SHIPPING INFORMATION</p> <p>9.1 Grades of Purity: Pure 9.2 Storage Temperature: Ambient 9.3 Inert Atmosphere: No requirement 9.4 Venting: Open</p>	
<p>NOTES</p>	

METHYL CHLORIDE

MTC

Common Synonyms Chloromethane Arbc		Gas Colorless Odorless or sweet odor
Floats and boils on water. Flammable, visible vapor cloud is formed.		
Avoid contact with liquid and vapor. Keep people away. Wear goggles and self-contained breathing apparatus. Stop discharge if possible. Shut off ignition sources and call fire department. Stay upwind and use water spray to "knock down" vapor. Isolate and remove discharged material. Notify local health and pollution control agencies.		
Fire	FLAMMABLE POISONOUS GASES ARE PRODUCED IN FIRE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles and self-contained breathing apparatus. Stop discharge if possible. Cool exposed containers and protect men effecting shutdown with water. Let fire burn.	
Exposure	CALL FOR MEDICAL AID VAPOR Not irritating to eyes, nose or throat. If inhaled, will cause nausea, vomiting, headache, difficult breathing, or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. LIQUID Will cause frostbite. Flush affected areas with plenty of water. DO NOT RUB AFFECTED AREAS.	
Water Pollution	Not harmful to aquatic life.	
1. RESPONSE TO DISCHARGE (See Response Methods Handbook) Issue warning-high flammability, air contaminant. Restrict access. Evacuate area.		2. LABEL 2.1 Category: Flammable gas 2.2 Class: 2
3. CHEMICAL DESIGNATIONS 3.1 CG Compatibility Class: Halogenated hydrocarbon 3.2 Formula: CH ₂ Cl 3.3 IMO/UN Designation: 2.0/1063 3.4 DOT ID No.: 1063 3.5 CAS Registry No.: 74-87-3		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquefied gas 4.2 Color: Colorless 4.3 Odor: Faint, sweet, non-irritating; faint ether-like
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Approved canister mask; leather or vinyl gloves; goggles or face shield. 5.2 Symptoms Following Exposure: Inhalation causes nausea, vomiting, weakness, headache, emotional disturbances; high concentrations cause mental confusion, eye disturbances, muscular tremors, cyanosis, convulsions. Contact of liquid with skin may cause frostbite. 5.3 Treatment of Exposure: Remove to fresh air. Call a doctor and have patient hospitalized for observation of slowly developing symptoms. 5.4 Threshold Limit Value: 50 ppm 5.5 Short Term Inhalation Limit: 100 ppm for 5 min. 5.6 Toxicity by Ingestion: Not pertinent 5.7 Late Toxicity: None 5.8 Vapor (Gas) Irritant Characteristics: Vapors are nonirritating to the eyes and throat. 5.9 Liquid or Solid Irritant Characteristics: No appreciable hazard. Practically harmless to the skin because it evaporates quickly. May cause frostbite. 5.10 Odor Threshold: Data not available 5.11 IDLM Value: 10,000 ppm		

6. FIRE HAZARDS 6.1 Flash Point: <32°F C.C. 6.2 Flammable Limits in Air: 8.1%-17.2% 6.3 Fire Extinguishing Agents: Dry chemical or carbon dioxide. Stop flow of gas. 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Toxic and irritating gases are generated in fires. 6.6 Behavior in Fire: Containers may explode 6.7 Ignition Temperature: 1170°F 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: 2.2 mm/min. 6.10 Adiabatic Flame Temperature: Data not available 6.11 Stoichiometric Air to Fuel Ratio: 4.078 (Est.) 6.12 Flame Temperature: Data not available	7. CHEMICAL REACTIVITY 7.1 Reactivity With Water: No reaction 7.2 Reactivity with Common Materials: Reacts with zinc, aluminum, magnesium, and their alloys; reaction is not violent. 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent 7.7 Molar Ratio (Reactant to Product): Data not available 7.8 Reactivity Group: 36
8. WATER POLLUTION 8.1 Aquatic Toxicity: None 8.2 Waterfowl Toxicity: None 8.3 Biological Oxygen Demand (BOD): None 8.4 Food Chain Concentration Potential: None	9. SHIPPING INFORMATION 9.1 Grades of Purity: Technical grade; "Arbc" refrigerant grade 9.2 Storage Temperature: Ambient 9.3 Inert Atmosphere: No requirement 9.4 Venting: Safety relief

10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook) A-B-C-D-E-F-G	11. HAZARD CLASSIFICATIONS 11.1 Code of Federal Regulations: Flammable gas 11.2 NAS Hazard Rating for Bulk Water Transportation: <table border="1"> <thead> <tr> <th>Category</th> <th>Rating</th> </tr> </thead> <tbody> <tr> <td>Fire</td> <td>4</td> </tr> <tr> <td>Health</td> <td>0</td> </tr> <tr> <td>Vapor Irritant</td> <td>0</td> </tr> <tr> <td>Liquid or Solid Irritant</td> <td>0</td> </tr> <tr> <td>Poisons</td> <td>2</td> </tr> <tr> <td>Water Pollution</td> <td>0</td> </tr> <tr> <td>Human Toxicity</td> <td>0</td> </tr> <tr> <td>Aquatic Toxicity</td> <td>1</td> </tr> <tr> <td>Aesthetic Effect</td> <td>0</td> </tr> <tr> <td>Reactivity</td> <td>0</td> </tr> <tr> <td>Other Chemicals</td> <td>1</td> </tr> <tr> <td>Water</td> <td>0</td> </tr> <tr> <td>Self Reaction</td> <td>0</td> </tr> </tbody> </table> 11.3 NFPA Hazard Classification: <table border="1"> <thead> <tr> <th>Category</th> <th>Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td> <td>2</td> </tr> <tr> <td>Flammability (Red)</td> <td>4</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td>0</td> </tr> </tbody> </table>	Category	Rating	Fire	4	Health	0	Vapor Irritant	0	Liquid or Solid Irritant	0	Poisons	2	Water Pollution	0	Human Toxicity	0	Aquatic Toxicity	1	Aesthetic Effect	0	Reactivity	0	Other Chemicals	1	Water	0	Self Reaction	0	Category	Classification	Health Hazard (Blue)	2	Flammability (Red)	4	Reactivity (Yellow)	0
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12. PHYSICAL AND CHEMICAL PROPERTIES 12.1 Physical State at 15°C and 1 atm: Gas 12.2 Molecular Weight: 50.49 12.3 Boiling Point at 1 atm: -11.6°F = -24.2°C = 249°K 12.4 Freezing Point: -143.9°F = 97.7°C = 175.5°K 12.5 Critical Temperature: 290.5°F = 143.6°C = 416.8°K 12.6 Critical Pressure: 969 psia = 65.9 atm = 6.68 MN/m ² 12.7 Specific Gravity: 0.997 at -24°C (liquid) 12.8 Liquid Surface Tension: 16.2 dynes/cm = 0.0162 N/m at 20°C 12.9 Liquid Water Intercapillary Tension: (est.) 50 dynes/cm = 0.05 N/m at -24°C 12.10 Vapor (Gas) Specific Gravity: 1.7 12.11 Ratio of Specific Heats of Vapor (Gas): 1.259 12.12 Latent Heat of Vaporization: 182.3 Btu/lb = 101.3 cal/g = 4.241 X 10 ⁵ J/kg 12.13 Heat of Combustion: -5290 Btu/lb = -2536 cal/g = -123.1 X 10 ⁵ J/kg 12.14 Heat of Decomposition: Not pertinent 12.15 Heat of Solution: Not pertinent 12.16 Heat of Polymerization: Not pertinent 12.25 Heat of Fusion: Data not available 12.26 Limiting Value: Data not available 12.27 Reid Vapor Pressure: 116.7 psia																																					
NOTES																																					

METHYL ETHYL KETONE

MEK

Common Synonyms MEK 2-Butanone Ethyl methyl ketone		Liquid Floats and mixes with water. Flammable, irritating vapor is produced.	Colorless Sweet odor
Stop discharge if possible. Keep people away. Shut off ignition sources and call fire department. Stay upwind and use water spray to knock down vapor. Avoid contact with liquid and vapor. Isolate and remove discharged material. Notify local health and pollution control agencies.			
Fire	FLAMMABLE Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemical, alcohol foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.		
Exposure	CALL FOR MEDICAL AID VAPOR Irritating to eyes, nose and throat. If inhaled, will cause nausea, vomiting, headache, dizziness, difficult breathing, or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. LIQUID Will burn eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with copious amounts of water. Flush EYES: hold eyes open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.		
Water Pollution	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook) Issue warning-high flammability Disperse and flush		2. LABEL 2.1 Category: Flammable liquid 2.2 Class: 3	
3. CHEMICAL DESIGNATIONS 3.1 CG Compatibility Class: Ketone 3.2 Formula: $CH_3COCH_2CH_3$ 3.3 IMO/UN Designation: 3.2/1193 3.4 DOT ID No.: 1193 3.5 CAS Registry No.: 78-93-3		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Like acetone; pleasant; pungent	
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Organic canister or air pack; plastic gloves; goggles or face shield. 5.2 Symptoms Following Exposure: Liquid causes eye burn. Vapor irritates eyes, nose, and throat; can cause headache, dizziness, nausea, weakness, and loss of consciousness. 5.3 Treatment of Exposure: INHALATION: remove victim to fresh air; if breathing is irregular or has stopped, start resuscitation and administer oxygen. EYES: wash with plenty of water for at least 15 min. and call physician. 5.4 Threshold Limit Value: 200 ppm 5.5 Short Term Inhalation Limits: 290 mg/m ³ for 60 min. 5.6 Toxicity by Ingestion: Grade 2; LD ₅₀ = 0.5 to 5 g/kg (rat) 5.7 Late Toxicity: None 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard; if spilled on clothing and allowed to remain, may cause smarting and reddening of the skin. 5.10 Odor Threshold: 10 ppm 5.11 IDLM Value: Data not available			

6. FIRE HAZARDS 6.1 Flash Point: 20°F C.C.; 22°F O.C. 6.2 Flammable Limits in Air: 1.8%-11.5% 6.3 Fire Extinguishing Agents: Alcohol foam, dry chemical, or carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: 961°F 6.8 Electrical Hazard: Class I, Group D 6.9 Burning Rate: 4.1 mm/min. 6.10 Adiabatic Flame Temperature: Data not available 6.11 Stoichiometric Air to Fuel Ratio: Data not available 6.12 Flame Temperature: Data not available	10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook) A-P-Q-R-S																				
7. CHEMICAL REACTIVITY 7.1 Reactivity With Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent 7.7 Molar Ratio (Reactant to Product): Data not available 7.8 Reactivity Group: 18	11. HAZARD CLASSIFICATIONS 11.1 Code of Federal Regulations: Flammable liquid 11.2 NAS Hazard Rating for Bulk Water Transportation: <table border="1"> <thead> <tr> <th>Category</th> <th>Rating</th> </tr> </thead> <tbody> <tr> <td>Fire</td> <td>3</td> </tr> <tr> <td>Health</td> <td>1</td> </tr> <tr> <td>Vapor Irritant</td> <td>3</td> </tr> <tr> <td>Liquid or Solid Irritant</td> <td>1</td> </tr> <tr> <td>Poisons</td> <td>2</td> </tr> </tbody> </table> Water Pollution Human Toxicity: 2 Aquatic Toxicity: 1 Aesthetic Effect: 1 Reactivity Other Chemicals: 2 Water: 0 Self Reaction: 0 11.3 NFPA Hazard Classification: <table border="1"> <thead> <tr> <th>Category</th> <th>Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td> <td>1</td> </tr> <tr> <td>Flammability (Red)</td> <td>3</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td>0</td> </tr> </tbody> </table>	Category	Rating	Fire	3	Health	1	Vapor Irritant	3	Liquid or Solid Irritant	1	Poisons	2	Category	Classification	Health Hazard (Blue)	1	Flammability (Red)	3	Reactivity (Yellow)	0
Category	Rating																				
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Category	Classification																				
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Reactivity (Yellow)	0																				
8. WATER POLLUTION 8.1 Aquatic Toxicity: 5640 mg/l/48 hr/bluegill/TL ₅₀ /fresh water 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): 214%, 5 days 8.4 Food Chain Concentration Potential: None	12. PHYSICAL AND CHEMICAL PROPERTIES 12.1 Physical State at 15°C and 1 atm: Liquid 12.2 Molecular Weight: 72.11 12.3 Boiling Point at 1 atm: 175.3°F = 79.6°C = 352.8°K 12.4 Freezing Point: -123.3°F = -86.3°C = 186.9°K 12.5 Critical Temperature: 504.5°F = 262.5°C = 535.7°K 12.6 Critical Pressure: 803 psia = 41.0 atm = 4.15 MN/m ² 12.7 Specific Gravity: 0.806 at 20°C (liquid) 12.8 Liquid Surface Tension: Not pertinent 12.9 Liquid Water Interfacial Tension: Not pertinent 12.10 Vapor (Gas) Specific Gravity: 2.5 12.11 Ratio of Specific Heats of Vapor (Gas): 1.075 12.12 Latent Heat of Vaporization: 191 Btu/lb = 106 cal/g = 4.44 X 10 ⁴ J/kg 12.13 Heat of Combustion: -13,480 Btu/lb = -7491 cal/g = -313.6 X 10 ⁴ J/kg 12.14 Heat of Decomposition: Not pertinent 12.15 Heat of Solution: (est.) -9 Btu/lb = -5 cal/g = -0.2 X 10 ⁴ J/kg 12.16 Heat of Polymerization: Not pertinent 12.25 Heat of Fusion: Data not available 12.26 Limiting Value: Data not available 12.27 Reid Vapor Pressure: 3.5 psia																				
9 SHIPPING INFORMATION 9.1 Grades of Purity: 99.5+ % 9.2 Storage Temperature: Ambient 9.3 Inert Atmosphere: No requirement 9.4 Venting: Open (flame arrester) or pressure-vacuum																					
NOTES																					

METHYL ISOBUTYL KETONE

MIK

Common Synonyms 4-Methyl-2-pentanone isobutyl methyl ketone MIBK Hexone isopropylacetone MIK		Watery liquid Colorless Mild pleasant odor
Floats and mixes slowly with water. Flammable, irritating vapor is produced.		
Stop discharge if possible. Keep people away. Shut off ignition sources and call fire department. Stay upwind and use water spray to "knock down" vapor. Avoid contact with liquid and vapor. Isolate and remove discharged material. Notify local health and pollution control agencies.		
Fire	FLAMMABLE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemical, alcohol foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.	
Exposure	CALL FOR MEDICAL AID. VAPOR Irritating to eyes, nose and throat. If inhaled, will cause dizziness or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.	
Water Pollution	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.	
1. RESPONSE TO DISCHARGE (See Response Methods Handbook) Issue warning-high flammability Evacuate area Disperse and flush		2. LABEL 2.1 Category: None 2.2 Class: Not pertinent
3. CHEMICAL DESIGNATIONS 3.1 CG Compatibility Class: Ketone 3.2 Formula: $(CH_3)_2CHCH_2COCH_3$ 3.3 MSD/UN Designation: 3.2/1245 3.4 DOT ID No.: 1245 3.5 CAS Registry No.: 108-10-1		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Pleasant; mild, characteristic; sharp; non-residual; ketonic
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Organic canister or air pack; rubber gloves; goggles or face shield. 5.2 Symptoms Following Exposure: Vapor causes irritation of eyes and nose; high concentrations cause anesthesia and depression. Liquid dries out skin and may cause dermatitis; irritates eyes but does not injure them. 5.3 Treatment of Exposure: INHALATION: remove to fresh air, give artificial respiration if needed; call a doctor. SKIN OR EYES: wash eyes thoroughly with water; wash skin with water until irritation stops. 5.4 Threshold Limit Value: 50 ppm 5.5 Short Term Inhalation Limit: 100 ppm for 60 min. 5.6 Toxicity by Ingestion: Grade 2; LD ₅₀ = 0.5 to 5 g/kg (rat) 5.7 Late Toxicity: None 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin. 5.10 Odor Threshold: 0.47 ppm 5.11 IDLN Value: Data not available		

6. FIRE HAZARDS 6.1 Flash Point: 73°F C.C., 75°F O.C. 6.2 Flammable Limits in Air: 1.4%-7.5% 6.3 Fire Extinguishing Agents: Alcohol foam, dry chemical, or carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective 6.5 Special Hazards of Combustion Products: Irritating vapors are generated when heated. 6.6 Behavior in Fire: Vapors may travel a considerable distance and ignite. 6.7 Ignition Temperature: 854°F 6.8 Electrical Hazard: Class I, Group D 6.9 Burning Rate: Data not available 6.10 Adiabatic Flame Temperature: Data not available 6.11 Stoichiometric Air to Fuel Ratio: Data not available 6.12 Flame Temperature: Data not available	10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook) A-P-Q-T-U																																				
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Flammability (Red)	3																																				
Reactivity (Yellow)	0																																				
8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): (theor.) 1.8%, 0.5 day; (theor.) 12%, 5 days 8.4 Food Chain Concentration Potential: None	12. PHYSICAL AND CHEMICAL PROPERTIES 12.1 Physical State at 15°C and 1 atm: Liquid 12.2 Molecular Weight: 100.16 12.3 Boiling Point at 1 atm: 241.2°F = 116.2 = 389.4°K 12.4 Freezing Point: -119°F = -84°C = 189°K 12.5 Critical Temperature: 568.9°F = 298.3°C = 571.5°K 12.6 Critical Pressure: 475 psia = 32.3 atm = 3.27 MN/m ² 12.7 Specific Gravity: 0.802 at 20°C (liquid) 12.8 Liquid Surface Tension: 23.6 dynes/cm = 0.0236 N/m at 20°C 12.9 Liquid Water Interfacial Tension: 15.7 dynes/cm = 0.0157 N/m at 22.7°C 12.10 Vapor (Gas) Specific Gravity: Not pertinent 12.11 Ratio of Specific Heats of Vapor (Gas): 1.061 12.12 Latent Heat of Vaporization: 149 Btu/lb = 82.5 cal/g = 3.45 X 10 ⁴ J/kg 12.13 Heat of Combustion (est.): -10,400 Btu/lb = -5,800 cal/g = -242 X 10 ³ J/kg 12.14 Heat of Decomposition: Not pertinent 12.15 Heat of Solution (est.) -9 Btu/lb = -5 cal/g = -0.2 X 10 ⁴ J/kg 12.16 Heat of Polymerization: Not pertinent 12.26 Heat of Fusion: Data not available 12.26 Limiting Value: Data not available 12.27 Reid Vapor Pressure: 0.8 psia																																				
9. SHIPPING INFORMATION 9.1 Grades of Purity: 99 - % 9.2 Storage Temperature: Ambient 9.3 Inert Atmosphere: No requirement 9.4 Venting: Open (flame arrester) or pressure-vacuum	NOTES																																				

MINERAL SPIRITS

MNS

Common Synonyms Petroleum spirits Naphtha	Watery liquid Floats on water.	Colorless	Gasoline-like odor
Stop discharge if possible. Call fire department. Avoid contact with liquid. Isolate and remove discharged material. Notify local health and pollution control agencies.			
Fire	Combustible. Extinguish with water, dry chemical, foam, or carbon dioxide. Cool exposed containers with water.		
Exposure	CALL FOR MEDICAL AID. LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.		
Water Pollution	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook) Mechanical containment Should be removed Chemical and physical treatment		2. LABEL 2.1 Category: None 2.2 Class: Not pertinent	
3. CHEMICAL DESIGNATIONS 3.1 CG Compatibility Class: Miscellaneous Hydrocarbon Mixtures 3.2 Formula: Not applicable 3.3 IMO/UN Designation: 3.3/1300 3.4 DOT ID No.: 1300 3.5 CAS Registry No.: Data not available		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Like gasoline	
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Plastic gloves; goggles or face shield (as for gasoline). 5.2 Symptoms Following Exposure: INHALATION: mild irritation of respiratory tract. ASPIRATION: severe lung irritation and rapidly developing pulmonary edema; central nervous system excitement followed by depression. INGESTION: irritation of stomach. 5.3 Treatment of Exposure: INHALATION: remove victim to fresh air. ASPIRATION: enforce bed rest; give oxygen; call a doctor. INGESTION: do NOT induce vomiting; guard against aspiration into lungs. EYES: wash with copious amounts of water. SKIN: wipe off and wash with soap and water. 5.4 Threshold Limit Value: Data not available 5.5 Short Term Inhalation Limits: 4000-7000 ppm for 60 min. 5.6 Toxicity by Ingestion: Grade 2; LD ₅₀ = 0.5 to 5 g/kg 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Vapors are nonirritating to the eyes and throat. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin. 5.10 Odor Threshold: Data not available 5.11 IDLH Value: Data not available			

6. FIRE HAZARDS

- 6.1 Flash Point: 105–140°F C.C., depending on grade
- 6.2 Flammable Limits in Air: 0.8%–5.0%
- 6.3 Fire Extinguishing Agents: Foam, carbon dioxide, dry chemical
- 6.4 Fire Extinguishing Agents Not to be Used: Do not use straight hose water stream.
- 6.5 Special Hazards of Combustion Products: Not pertinent
- 6.6 Behavior in Fire: Not pertinent
- 6.7 Ignition Temperature: 540°F
- 6.8 Electrical Hazard: Not pertinent
- 6.9 Burning Rate: 4 mm/min.
- 6.10 Adiabatic Flame Temperature: Data not available
- 6.11 Stoichiometric Air to Fuel Ratio: Data not available
- 6.12 Flame Temperature: Data not available

7. CHEMICAL REACTIVITY

- 7.1 Reactivity With Water: No reaction
- 7.2 Reactivity with Common Materials: No reaction
- 7.3 Stability During Transport: Stable
- 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 7.5 Polymerization: Not pertinent
- 7.6 Inhibitor of Polymerization: Not pertinent
- 7.7 Molar Ratio (Reactant to Product): Data not available
- 7.8 Reactivity Group: 33

8. WATER POLLUTION

- 8.1 Aquatic Toxicity: Data not available
- 8.2 Waterfowl Toxicity: Data not available
- 8.3 Biological Oxygen Demand (BOD): 8%, 5 days
- 8.4 Food Chain Concentration Potential: None

9. SHIPPING INFORMATION

- 9.1 Grades of Purity: Various grades available. 70–100% of the materials are derived from petroleum, and 0–30% are aromatic hydrocarbons like benzene and toluene. Flash points vary with the exact composition but are usually above 100°F.
- 9.2 Storage Temperature: Ambient
- 9.3 Inert Atmosphere: No requirement
- 9.4 Venting: Open (flame arrester)

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

11. HAZARD CLASSIFICATIONS

- 11.1 Code of Federal Regulations: Combustible liquid
- 11.2 HAS Hazard Rating for Bulk Water Transportation: Not listed
- 11.3 NFPA Hazard Classification:

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

12. PHYSICAL AND CHEMICAL PROPERTIES

- 12.1 Physical State at 15°C and 1 atm: Liquid
- 12.2 Molecular Weight: Not pertinent
- 12.3 Boiling Point at 1 atm: 310–395°F = 154–202°C = 428–475°K
- 12.4 Freezing Point: Not pertinent
- 12.5 Critical Temperature: Not pertinent
- 12.6 Critical Pressure: Not pertinent
- 12.7 Specific Gravity: 0.78 at 20°C (liquid)
- 12.8 Liquid Surface Tension: Data not available
- 12.9 Liquid Water Interfacial Tension: Data not available
- 12.10 Vapor (Gas) Specific Gravity: Not pertinent
- 12.11 Ratio of Specific Heats of Vapor (Gas) (est.) 1.030
- 12.12 Latent Heat of Vaporization: Data not available
- 12.13 Heat of Combustion: Data not available
- 12.14 Heat of Decomposition: Not pertinent
- 12.15 Heat of Solution: Not pertinent
- 12.16 Heat of Polymerization: Not pertinent
- 12.25 Heat of Fusion: Data not available
- 12.26 Limiting Value: Data not available
- 12.27 Reid Vapor Pressure: 0.13 psia

NOTES

NICKEL CHLORIDE

NCL

<p>Common Synonyms Nickel chloride hexahydrate</p>	<p>Solid</p> <p>Sinks and mixes with water.</p>	<p>Green</p>	<p>Odorless</p>		
<p>Avoid contact with solid and dust; keep people away. Stop discharge if possible. Isolate and remove discharged material. Notify local health and pollution control agencies.</p>					
Fire	<p>Not flammable.</p>				
Exposure	<p>CALL FOR MEDICAL AID</p> <p>DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.</p> <p>SOLID Irritating to skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.</p>				
Water Pollution	<p>HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes.</p> <p>Notify local health and wildlife officials. Notify operators of nearby water intakes.</p>				
<p>1. RESPONSE TO DISCHARGE (See Response Methods Handbook) Disperse and flush</p>		<p>2. LABEL</p> <p>2.1 Category: None 2.2 Class: Not pertinent</p>			
<p>3. CHEMICAL DESIGNATIONS</p> <p>3.1 CG Compatibility Class: Not listed 3.2 Formula: NiCl₂·6H₂O 3.3 IMO/UN Designation: Not listed 3.4 DOT ID No.: 1378 3.5 CAS Registry No.: 7718-54-9</p>		<p>4. OBSERVABLE CHARACTERISTICS</p> <p>4.1 Physical State (as shipped): Solid 4.2 Color: Green 4.3 Odor: None</p>			
<p style="text-align: center;">5. HEALTH HAZARDS</p> <p>5.1 Personal Protective Equipment: Goggles or face shield, protective gloves, Bu. Mines approved respirator, protective clothing. 5.2 Symptoms Following Exposure: Inhalation of dust causes irritation of nose and throat. Ingestion causes vomiting. Dust irritates eyes and may cause dermatitis in contact with skin. 5.3 Treatment of Exposure: INHALATION: move to fresh air; get medical attention if exposure has been severe. INGESTION: give large amount of water. EYES: flush with plenty of water for at least 15 min. SKIN: flush with water. 5.4 Threshold Limit Value: 0.1 mg/m³ (as nickel) 5.5 Short Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 2, LD₅₀ = 0.5-5 g/kg 5.7 Late Toxicity: Possible lung cancer 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available 5.11 IDLH Value: Data not available</p>					
<p style="text-align: center;">6. FIRE HAZARDS</p> <p>6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Data not available 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent 6.10 Adiabatic Flame Temperature: Data not available 6.11 Stoichiometric Air to Fuel Ratio: Data not available 6.12 Flame Temperature: Data not available</p>					
<p style="text-align: center;">7. CHEMICAL REACTIVITY</p> <p>7.1 Reactivity With Water: No reaction 7.2 Reactivity with Common Materials: Data not available 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent 7.7 Molar Ratio (Reactant to Product): Data not available 7.8 Reactivity Group: Data not available</p>					
<p style="text-align: center;">8. WATER POLLUTION</p> <p>8.1 Aquatic Toxicity: 259 mg/l/7-minnow Iundulus/survived/salt water 5.18 ppm/96 hr/fathead minnow/TL₅₀/soft water 42.4 ppm/96 hr/fathead minnow/TL₅₀/hard water *Time period not specified 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): None 8.4 Food Chain Concentration Potential: None</p>					
<p style="text-align: center;">9. SHIPPING INFORMATION</p> <p>9.1 Grades of Purity: Technical, 99+ % 9.2 Storage Temperature: Ambient 9.3 Inert Atmosphere: No requirement 9.4 Venting: Open</p>					
<p style="text-align: center;">10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook) SS</p>					
<p style="text-align: center;">11. HAZARD CLASSIFICATIONS</p> <p>11.1 Code of Federal Regulations: ORM-E 11.2 NAB Hazard Rating for Bulk Water Transportation: Not listed 11.3 NFPA Hazard Classification: Not listed</p>					
<p style="text-align: center;">12. PHYSICAL AND CHEMICAL PROPERTIES</p> <p>12.1 Physical State at 15°C and 1 atm: Solid 12.2 Molecular Weight: 237.7 12.3 Boiling Point at 1 atm: Not pertinent 12.4 Freezing Point: Not pertinent 12.5 Critical Temperature: Not pertinent 12.6 Critical Pressure: Not pertinent 12.7 Specific Gravity: 3.55 at 15°C (solid) 12.8 Liquid Surface Tension: Not pertinent 12.9 Liquid Water Interfacial Tension: Not pertinent 12.10 Vapor (Gas) Specific Gravity: Not pertinent 12.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 12.12 Latent Heat of Vaporization: Not pertinent 12.13 Heat of Combustion: Not pertinent 12.14 Heat of Decomposition: Not pertinent 12.15 Heat of Solution: 8.8 Btu/lb = 4.9 cal/g = 0.21 X 10⁶ J/kg 12.16 Heat of Polymerization: Not pertinent 12.25 Heat of Fusion: 142.5 cal/g 12.26 Limiting Value: Data not available 12.27 Reid Vapor Pressure: Data not available</p>					
<p>NOTES</p>					

OILS: DIESEL

ODS

Common Synonyms Fuel oil 1-D Fuel oil 2-D		Oily liquid Yellow-brown Lube or fuel oil odor
Floats on water.		
Stop discharge if possible. Call fire department. Avoid contact with liquid. Isolate and remove discharged material. Notify local health and pollution control agencies.		
Fire	Combustible. Extinguish with dry chemical, foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.	
Exposure	CALL FOR MEDICAL AID. LIQUID Irritating to skin and eyes. Harmful if swallowed. Removes contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.	
Water Pollution	Dangerous to aquatic life in high concentrations. Fouling to shorelines. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.	
1. RESPONSE TO DISCHARGE (See Response Methods Handbook) Mechanical containment Should be removed Chemical and physical treatment		2. LABEL 2.1 Category: None 2.2 Class: Not pertinent
3. CHEMICAL DESIGNATIONS 3.1 CG Compatibility Class: Miscellaneous Hydrocarbon Mixtures 3.2 Formula: Not applicable 3.3 IMO/UN Designation: 3.1/1270 3.4 DOT ID No.: 1270 3.5 CAS Registry No.: Data not available		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Light brown 4.3 Odor: Like fuel oil
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles or face shield. 5.2 Symptoms Following Exposure: If liquid is ingested, an increased frequency of bowel movements will occur. 5.3 Treatment of Exposure: INGESTION: do NOT induce vomiting. SKIN: wipe off, wash with soap and water. EYES: wash with copious amounts of water for at least 15 min. 5.4 Threshold Limit Value: No single TLV applicable. 5.5 Short Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 1; LD ₅₀ = 5 to 15 g/kg 5.7 Lethal Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin. 5.10 Odor Threshold: Data not available 5.11 IDLH Value: Data not available		

6. FIRE HAZARDS 6.1 Flash Point: (1-D) 100°F C.C.; (2-D) 125°F C.C. 6.2 Flammable Limits in Air: 1.3-8.0 vol.% 6.3 Fire Extinguishing Agents: Dry chemical, foam, or carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: (1-D) 350-625°F (2-D) 490-545°F 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: 4 mm/min. 6.10 Adiabatic Flame Temperature: Data not available 6.11 Stoichiometric Air to Fuel Ratio: Data not available 6.12 Flame Temperature: Data not available	10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook) A-T-U
7. CHEMICAL REACTIVITY 7.1 Reactivity With Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent 7.7 Molar Ratio (Reactant to Product): Data not available 7.8 Reactivity Group: 3	11. HAZARD CLASSIFICATIONS 11.1 Code of Federal Regulations: Combustible liquid 11.2 NAB Hazard Rating for Bulk Water Transportation: Not listed 11.3 NFPA Hazard Classification: Category Classification Health Hazard (Blue) _____ 0 Flammability (Red) _____ 2 Reactivity (Yellow) _____ 0
8. WATER POLLUTION 8.1 Aquatic Toxicity: 204 mg/1/24 hr/Juvenile American shad/TL ₅₀ /salt water 8.2 Waterfowl Toxicity: >20 ml/kg /LD ₅₀ /mallards 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None	12. PHYSICAL AND CHEMICAL PROPERTIES 12.1 Physical State at 15°C and 1 atm: Liquid 12.2 Molecular Weight: Not pertinent 12.3 Boiling Point at 1 atm: 550-640°F = 268-338°C = 561-612°K 12.4 Freezing Point: 0 to -30°F = -18 to -34°C = 255 to 239°K 12.5 Critical Temperature: Not pertinent 12.6 Critical Pressure: Not pertinent 12.7 Specific Gravity: 0.841 at 18°C (liquid) 12.8 Liquid Surface Tension: (est.) 25 dynes/cm = 0.025 N/m at 20°C 12.9 Liquid Water Interfacial Tension: (est.) 50 dynes/cm = 0.05 N/m at 20°C 12.10 Vapor (Gas) Specific Gravity: Not pertinent 12.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 12.12 Latent Heat of Vaporization: Not pertinent 12.13 Heat of Combustion: -18,400 Btu/lb = -10,200 cal/g = 429 x 10 ³ J/kg 12.14 Heat of Decomposition: Not pertinent 12.15 Heat of Solution: Not pertinent 12.16 Heat of Polymerization: Not pertinent 12.25 Heat of Fusion: Data not available 12.26 Limiting Value: Data not available 12.27 Reid Vapor Pressure: Varies
9. SHIPPING INFORMATION 9.1 Grades of Purity: Diesel Fuel 1-D (ASTM); Diesel Fuel 2-D (ASTM) 9.2 Storage Temperature: Ambient 9.3 Inert Atmosphere: No requirement 9.4 Venting: Open (flame arrester)	NOTES

OILS, MISCELLANEOUS: LUBRICATING

OLB

<p>Common Synonyms</p> <p>Crankcase oil Transmission oil Motor oil</p>	<p> oily liquid</p> <p>Yellow-brown</p> <p>Lube oil odor</p>	<p>Floats on water.</p>
<p>Stop discharge if possible. Call fire department. Avoid contact with liquid. Isolate and remove discharged material. Notify local health and pollution control agencies.</p>		
<p>Fire</p>	<p>Combustible. Extinguish with dry chemical, foam or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.</p>	
<p>Exposure</p>	<p>CALL FOR MEDICAL AID. LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.</p>	
<p>Water Pollution</p>	<p>Effect of low concentrations on aquatic life is unknown. Floating to shorelines. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.</p>	
<p>1. RESPONSE TO DISCHARGE (See Response Methods Handbook) Mechanical containment Should be removed Chemical and physical treatment</p>	<p>2. LABEL</p> <p>2.1 Category: None 2.2 Class: Not pertinent</p>	
<p>3. CHEMICAL DESIGNATIONS</p> <p>3.1 CG Compatibility Class: Miscellaneous Hydrocarbon Mixtures 3.2 Formula: Not applicable 3.3 IMO/UN Designation: 3.3/1270 3.4 DOT ID No.: 1270 3.5 CAS Registry No.: Data not available</p>	<p>4. OBSERVABLE CHARACTERISTICS</p> <p>4.1 Physical State (as shipped): Liquid 4.2 Color: Yellow fluorescent 4.3 Odor: Characteristic</p>	
<p>5. HEALTH HAZARDS</p> <p>5.1 Personal Protective Equipment: Protective gloves; goggles or face shield. 5.2 Symptoms Following Exposure: INGESTION: minimal gastrointestinal tract irritation; increased frequency of bowel passage may occur. ASPIRATION: pulmonary irritation is normally minimal but may become more severe several hours after exposure. 5.3 Treatment of Exposure: INGESTION: do NOT induce vomiting. ASPIRATION: treatment probably not required; delayed development of pulmonary irritation can be detected by serial chest x-rays. EYES: wash with copious quantity of water. SKIN: wipe off and wash with soap and water. 5.4 Threshold Limit Value: Data not available 5.5 Short Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 1; LD₅₀ = 5 to 15 g/kg 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin. 5.10 Odor Threshold: Data not available 5.11 IDLN Value: Data not available</p>		

<p>6. FIRE HAZARDS</p> <p>6.1 Flash Point: 300°F C.C. 6.2 Flammable Limits In Air: Data not available 6.3 Fire Extinguishing Agents: Dry chemical, foam, or carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water of foam may cause frothing. 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: 500°F-700°F 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: 4 mm/min. 6.10 Adiabatic Flame Temperature: Data not available 6.11 Stoichiometric Air to Fuel Ratio: Data not available 6.12 Flame Temperature: Data not available</p>	<p>10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook) A-T-U</p>
<p>7. CHEMICAL REACTIVITY</p> <p>7.1 Reactivity With Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent 7.7 Molar Ratio (Reactant to Product): Data not available 7.8 Reactivity Group: 33</p>	<p>11. HAZARD CLASSIFICATIONS</p> <p>11.1 Code of Federal Regulations: Not listed 11.2 NAB Hazard Rating for Bulk Water Transportation: Not listed 11.3 NFPA Hazard Classifications: Category Classification Health Hazard (Blue)..... 0 Flammability (Red)..... 1 Reactivity (Yellow)..... 0</p>
<p>8. WATER POLLUTION</p> <p>8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None</p>	<p>12. PHYSICAL AND CHEMICAL PROPERTIES</p> <p>12.1 Physical State at 15°C and 1 atm: Liquid 12.2 Molecular Weight: Not pertinent 12.3 Boiling Point at 1 atm: Very high 12.4 Freezing Point: Not pertinent 12.5 Critical Temperature: Not pertinent 12.6 Critical Pressure: Not pertinent 12.7 Specific Gravity: (est.) 0.902 at 20°C (liquid) 12.8 Liquid Surface Tension: 36-37.5 dynes/cm = 0.006-0.0075 N/m at 20°C 12.9 Liquid Water Interfacial Tension: 33-54 dynes/cm = 0.003-0.054 N/m at 20°C 12.10 Vapor (Gas) Specific Gravity: Not pertinent 12.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 12.12 Latent Heat of Vaporization: Not pertinent 12.13 Heat of Combustion: -18,486 Btu/lb = -10,270 cal/g = -429.98 X 10³ J/kg 12.14 Heat of Decomposition: Not pertinent 12.15 Heat of Solution: Not pertinent 12.16 Heat of Polymerization: Not pertinent 12.25 Heat of Fusion: Data not available 12.26 Limiting Value: Data not available 12.27 Reid Vapor Pressure: Data not available</p>
<p>NOTES</p>	

OILS, MISCELLANEOUS: PENETRATING

OPT

<p>Common Synonyms Preservative oil Water displacing oil</p>	<p>Oily liquid Yellow Motor oil-like odor</p> <p>Floats on water.</p>
<p>Stop discharge if possible. Call fire department. Avoid contact with liquid. Isolate and remove discharged material. Notify local health and pollution control agencies.</p>	
<p>Fire</p>	<p>Combustible. Extinguish with foam, dry chemical, or carbon dioxide. Water may be ineffective on fire.</p>
<p>Exposure</p>	<p>CALL FOR MEDICAL AID.</p> <p>LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.</p>
<p>Water Pollution</p>	<p>Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.</p>
<p>1. RESPONSE TO DISCHARGE (See Response Methods Handbook) Mechanical containment Should be removed Chemical and physical treatment</p>	<p>2. LABEL 2.1 Category: None 2.2 Class: Not pertinent</p>
<p>3. CHEMICAL DESIGNATIONS 3.1 CG Competibility Class: Miscellaneous Hydrocarbon Mixtures 3.2 Formula: Not applicable 3.3 IMO/UN Designation: 3.3/1270 3.4 DOT ID No.: 1270 3.5 CAS Registry No.: Data not available</p>	<p>4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Yellowish 4.3 Odor: Like motor oil</p>
<p style="text-align: center;">5. HEALTH HAZARDS</p> <p>5.1 Personal Protective Equipment: Protective gloves; goggles or face shield. 5.2 Symptoms Following Exposure: Liquid may irritate stomach and increase frequency of bowel movements. 5.3 Treatment of Exposure: INGESTION: have victim drink water or milk; do NOT induce vomiting. ASPIRATION: check for delayed development of pulmonary irritation by serial x-rays. EYES: wash with copious amounts of water. SKIN: wipe off, wash with soap and water. 5.4 Threshold Limit Value: Data not available 5.5 Short Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 1; LD₅₀ = 5 to 15 g/kg 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin. 5.10 Odor Threshold: Data not available 5.11 IDLH Value: Data not available</p>	

<p>6. FIRE HAZARDS</p> <p>6.1 Flash Point: 295°F 6.2 Flammable Limits in Air: Data not available 6.3 Fire Extinguishing Agents: Foam, dry chemical, or carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water or foam may cause frothing. 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Data not available 6.10 Adiabatic Flame Temperature: Data not available 6.11 Stoichiometric Air to Fuel Ratio: Data not available 6.12 Flame Temperature: Data not available</p>	<p>10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook) A-T-U</p>
<p>7. CHEMICAL REACTIVITY</p> <p>7.1 Reactivity With Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent 7.7 Molar Ratio (Reactant to Product): Data not available 7.8 Reactivity Group: 33</p>	<p>11. HAZARD CLASSIFICATIONS</p> <p>11.1 Code of Federal Regulations: Not listed 11.2 NAB Hazard Rating for Bulk Water Transportation: Not listed 11.3 NFPA Hazard Classification: Not listed</p>
<p>8. WATER POLLUTION</p> <p>8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None</p>	<p>12. PHYSICAL AND CHEMICAL PROPERTIES</p> <p>12.1 Physical State at 15°C and 1 atm: Liquid 12.2 Molecular Weight: Not pertinent 12.3 Boiling Point at 1 atm: Very high 12.4 Freezing Point: Not pertinent 12.5 Critical Temperature: Not pertinent 12.6 Critical Pressure: Not pertinent 12.7 Specific Gravity: 0.8061 at 20°C (liquid) 12.8 Liquid Surface Tension: 29.8 dynes/cm = 0.0298 N/m at 24°C 12.9 Liquid Water Interfacial Tension: 5.5 dynes/cm = 0.0055 N/m at 22°C 12.10 Vapor (Gas) Specific Gravity: Not pertinent 12.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 12.12 Latent Heat of Vaporization: Not pertinent 12.13 Heat of Combustion (est.): -18,000 Btu/lb = -10,000 cal/g = -420 X 10³ J/kg 12.14 Heat of Decomposition: Not pertinent 12.15 Heat of Solution: Not pertinent 12.16 Heat of Polymerization: Not pertinent 12.26 Heat of Fusion: Data not available 12.26 Limiting Value: Data not available 12.27 Reid Vapor Pressure: Data not available</p>
<p style="text-align: center;">9. SHIPPING INFORMATION</p> <p>9.1 Grades of Purity: Commercial 9.2 Storage Temperature: Ambient 9.3 Inert Atmosphere: No requirement 9.4 Venting: Open (flame arrester)</p>	
<p style="text-align: center;">NOTES</p>	

PETROLEUM NAPHTHA

PTN

Common Synonyms Petroleum solvent	Liquid Colorless Gasoline odor Floats on water. Flammable vapor is produced.
<p>Stop discharge if possible. Keep people away. Shut off ignition sources and call fire department. Stay upwind and use water spray to "knock down" vapor. Avoid contact with liquid. Isolate and remove discharged material. Notify local health and pollution control agencies.</p>	
Fire	<p>FLAMMABLE Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with foam, dry chemicals, or carbon dioxide. Cool exposed containers with water.</p>
Exposure	<p>CALL FOR MEDICAL AID</p> <p>VAPOR Not irritating to eyes, nose, or throat.</p> <p>LIQUID Harmful if swallowed. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.</p>
Water Pollution	<p>Effect of low concentrations on aquatic life is unknown. Floating to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.</p>
1. RESPONSE TO DISCHARGE (See Response Methods Handbook) Issue warning-high flammability Restrict access Evacuate area	2. LABEL 2.1 Category: Flammable liquid 2.2 Class: 3
3. CHEMICAL DESIGNATIONS 3.1 CG Compatibility Class: Miscellaneous Hydrocarbon Mixtures 3.2 Formula: Not applicable 3.3 IMO/UN Designation: 3.2/1255 3.4 DOT ID No.: 1255 3.5 CAS Registry No.: 8030-90-6	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Like gasoline and kerosene
<p>5. HEALTH HAZARDS</p> <p>5.1 Personal Protective Equipment: Goggles or face shield (as for gasoline). 5.2 Symptoms Following Exposure: Inhalation of concentrated vapor may cause intoxication. Liquid is not very irritating to skin or eyes but may get into lungs by aspiration. 5.3 Treatment of Exposure: INHALATION: remove victim to fresh air and treat symptoms. INGESTION: have victim drink water or milk; do NOT induce vomiting. EYES: flush with water for 15 min. SKIN: wipe off and wash with soap and water. 5.4 Threshold Limit Value: No single TLV applicable. 5.5 Short Term Inhalation Limits: 500 ppm for 30 min. 5.6 Toxicity by Ingestion: Grade 2; LD₅₀ = 0.5 to 5 g/kg 5.7 Late Toxicity: None 5.8 Vapor (Gas) Irritant Characteristics: Vapors are non-irritating to the eyes and throat. 5.9 Liquid or Solid Irritant Characteristics: No appreciable hazard. Practically harmless to the skin. 5.10 Odor Threshold: Data not available 5.11 IDLH Value: 10,000 ppm</p>	

<p>6. FIRE HAZARDS</p> <p>6.1 Flash Point: 20°F (approx.) C.C. 6.2 Flammable Limits in Air: 0.9%-6.0% 6.3 Fire Extinguishing Agents: Foam, carbon dioxide, or dry chemical 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective. 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: 450°F (approx.) 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: 4 mm/min. 6.10 Adiabatic Flame Temperature: Data not available 6.11 Stoichiometric Air to Fuel Ratio: Data not available 6.12 Flame Temperature: Data not available</p>	<p>10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook) A-T-U-V-W</p> <p>11. HAZARD CLASSIFICATIONS</p> <p>11.1 Code of Federal Regulations: Flammable liquid 11.2 NAB Hazard Rating for Bulk Water Transportation: Not listed 11.3 NFPA Hazard Classification: Not listed</p>
<p>7. CHEMICAL REACTIVITY</p> <p>7.1 Reactivity With Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent 7.7 Molar Ratio (Reactant to Product): Data not available 7.8 Reactivity Group: 33</p>	<p>12. PHYSICAL AND CHEMICAL PROPERTIES</p> <p>12.1 Physical State at 15°C and 1 atm: Liquid 12.2 Molecular Weight: Not pertinent 12.3 Boiling Point at 1 atm: 207.0°F = 97.2°C = 370.4°K 12.4 Freezing Point: Not pertinent 12.5 Critical Temperature: Not pertinent 12.6 Critical Pressure: Not pertinent 12.7 Specific Gravity: 0.74 at 20°C (liquid) 12.8 Liquid Surface Tension: 19-23 dynes/cm = 0.019-0.023 N/m at 20°C 12.9 Liquid Water Interfacial Tension: 39-51 dynes/cm = 0.039-0.051 N/m at 20°C 12.10 Vapor (Gas) Specific Gravity: Not pertinent 12.11 Ratio of Specific Heats of Vapor (Gas): (est) 1.030 12.12 Latent Heat of Vaporization: 130-150 Btu/lb = 71-81 cal/g = 3.0-3.4 X 10⁴ J/kg 12.13 Heat of Combustion: Data not available 12.14 Heat of Decomposition: Not pertinent 12.15 Heat of Solution: Not pertinent 12.16 Heat of Polymerization: Not pertinent 12.16 Heat of Fusion: Data not available 12.26 Limiting Value: Data not available 12.27 Reid Vapor Pressure: Data not available</p>
<p>8. WATER POLLUTION</p> <p>8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None</p>	
<p>9. SHIPPING INFORMATION</p> <p>9.1 Grades of Purity: Data not available 9.2 Storage Temperature: Ambient 9.3 Inert Atmosphere: No requirement 9.4 Venting: Open (flame arrester) or pressure-vacuum</p>	
NOTES	

PCW250 CAS: 85-01-8 HR: 3

PHENANTHRENE

mf: C₁₄H₁₀ mw: 178.24

PROP: Solid or monoclinic crystals. Mp: 100°, bp: 339°, d: 1.179 (at 25°, vap press: 1 mm (at 118.3°, vap d: 6.14. Insol in water; sol in CS₂, benzene, and hot alc; very sol in ether.

SYNS: PHENANTHREN (GERMAN) * PHENANTRIN

CONSENSUS REPORTS: IARC Cancer Review: GROUP 3 IMEMDT 7,56,87; Animal Inadequate Evidence IMEMDT 32,419,83. Reported in EPA TSCA Inventory. EPA Genetic Toxicology Program.

OSHA PEL: TWA 0.2 mg/m³

SAFETY PROFILE: Poison by intravenous route. Moderately toxic by ingestion. Mutation data reported. A human skin photosensitizer. Questionable carcinogen with experimental neoplastigenic and tumorigenic data by skin contact. Combustible when exposed to heat or flame; can react vigorously with oxidizing materials. To fight fire, use water, foam, CO₂, dry chemical. When heated to decomposition it emits acrid smoke and irritating fumes.

PHENOL

PHN

<p>Common Synonyms</p> <p>Hydroxybenzene Carbolic acid Phenic acid Phenyl hydroxide</p>	<p>Solid crystals, or watery liquid</p> <p>White solid, or light pink liquid</p> <p>Sweet tarry odor</p> <p>May float or sink, and mixes slowly with water.</p>	
<p>AVOID CONTACT WITH LIQUID AND SOLID. Keep people away. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Stop discharge if possible. Call fire department. Evacuate area in case of large discharge. Isolate and remove discharged material. Notify local health and pollution control agencies.</p>		
Fire	<p>Combustible POISONOUS GASES ARE PRODUCED IN FIRE. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Extinguish with water, carbon dioxide, dry chemical, or foam. Cool exposed containers with water.</p>	
Exposure	<p>CALL FOR MEDICAL AID.</p> <p>LIQUID OR SOLID POISONOUS IF SWALLOWED. Wash burn skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES: hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS: have victim drink water or milk. DO NOT INDUCE VOMITING.</p>	
Water Pollution	<p>HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.</p>	
<p>1. RESPONSE TO DISCHARGE (See Response Methods Handbook) Issue warning-poison Restrict access Should be removed Chemical and physical treatment</p>		<p>2. LABEL</p> <p>2.1 Category: Poison 2.2 Class: 6</p>
<p>3. CHEMICAL DESIGNATIONS</p> <p>3.1 CG Compatibility Class: Phenol, cresol 3.2 Formula: C₆H₅OH 3.3 IMO/UN Designation: 9.0/1671 3.4 DOT ID No.: 1671 3.5 CAS Registry No.: 106-95-2</p>		<p>4. OBSERVABLE CHARACTERISTICS</p> <p>4.1 Physical State (as shipped): Solid or molten liquid 4.2 Color: Colorless to light pink 4.3 Odor: Characteristically sweet; sweet, tarry, pungent, distinctive; distinct, aromatic, somewhat sickening sweet and acid</p>
<p>5. HEALTH HAZARDS</p> <p>5.1 Personal Protective Equipment: Fresh-air mask for confined areas; rubber gloves; protective clothing; full face shield. 5.2 Symptoms Following Exposure: Will burn eyes and skin. The analgesic action may cause loss of pain sensation. Readily absorbed through skin, causing increase in heart rate, convulsions, and death. 5.3 Treatment of Exposure: INHALATION: if victim shows any ill effects, move him to fresh air, keep him quiet and warm, and call a doctor immediately; if breathing stops, give artificial respiration. INGESTION: do NOT induce vomiting; give milk, egg whites, or large amounts of water and call doctor immediately; no known antidote; treat the symptoms. EYES: immediately flush with plenty of water for at least 15 min.; continue for another 15 min. if doctor has not taken over. SKIN: immediately remove all clothing while in a shower and wash affected area with abundant flowing water or soap and water for at least 15 min.; clean clothing thoroughly or discard. 5.4 Threshold Limit Value: 5 ppm (includes skin exposure). 5.5 Short Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 2; LD₅₀ = 0.5 to 5 g/kg (rat) 5.7 Late Toxicity: Carcinogenic in laboratory animals 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary 5.9 Liquid or Solid Irritant Characteristics: Fairly severe skin irritant; may cause pain and second-degree burns after a few minutes' contact. 5.10 Odor Threshold: 0.05 ppm 5.11 IDLH Value: 100 ppm</p>		

<p>6. FIRE HAZARDS</p> <p>6.1 Flash Point: 185°F O.C.; 175°F C.C. 6.2 Flammable Limits in Air: 1.7%-8.6% 6.3 Fire Extinguishing Agents: Water-fog, foam, carbon dioxide, or dry chemical 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Toxic and irritating vapors are generated when heated. 6.6 Behavior in Fire: Yields flammable vapors when heated which will form explosive mixtures with air. 6.7 Ignition Temperature: 1319°F 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: 3.5 mm/min. 6.10 Adiabatic Flame Temperature: Data not available</p> <p style="text-align: right;"><i>(Continued)</i></p> <p>7. CHEMICAL REACTIVITY</p> <p>7.1 Reactivity With Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent 7.7 Molar Ratio (Reactant to Product): Data not available 7.8 Reactivity Group: 21</p>	<p>10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook) A-P-Q</p> <p>11. HAZARD CLASSIFICATIONS</p> <p>11.1 Code of Federal Regulations: Poison, B 11.2 MAS Hazard Rating for Bulk Water Transportation:</p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Category</th> <th style="text-align: left;">Rating</th> </tr> </thead> <tbody> <tr> <td>Fire.....</td> <td>1</td> </tr> <tr> <td>Health.....</td> <td></td> </tr> <tr> <td>Vapor Irritant.....</td> <td>2</td> </tr> <tr> <td>Liquid or Solid Irritant.....</td> <td>3</td> </tr> <tr> <td>Poisons.....</td> <td>3</td> </tr> <tr> <td>Water Pollution.....</td> <td></td> </tr> <tr> <td>Human Toxicity.....</td> <td>2</td> </tr> <tr> <td>Aquatic Toxicity.....</td> <td>3</td> </tr> <tr> <td>Aesthetic Effect.....</td> <td>3</td> </tr> <tr> <td>Reactivity.....</td> <td></td> </tr> <tr> <td>Other Chemicals.....</td> <td>2</td> </tr> <tr> <td>Water.....</td> <td>0</td> </tr> <tr> <td>Soil Reaction.....</td> <td>0</td> </tr> </tbody> </table> <p>11.3 NFPA Hazard Classification:</p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Category</th> <th style="text-align: left;">Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (Blue).....</td> <td>3</td> </tr> <tr> <td>Flammability (Red).....</td> <td>2</td> </tr> <tr> <td>Reactivity (Yellow).....</td> <td>0</td> </tr> </tbody> </table>	Category	Rating	Fire.....	1	Health.....		Vapor Irritant.....	2	Liquid or Solid Irritant.....	3	Poisons.....	3	Water Pollution.....		Human Toxicity.....	2	Aquatic Toxicity.....	3	Aesthetic Effect.....	3	Reactivity.....		Other Chemicals.....	2	Water.....	0	Soil Reaction.....	0	Category	Classification	Health Hazard (Blue).....	3	Flammability (Red).....	2	Reactivity (Yellow).....	0
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<p>8. WATER POLLUTION</p> <p>8.1 Aquatic Toxicity: 11.5-26.5 mg/l/96 hr/bluegill/TL₅₀/fresh water 1.5 ppm/48 hr/rainbow trout/TL₅₀/fresh water 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): 200%, 5 days 8.4 Food Chain Concentration Potential: None</p>	<p>12. PHYSICAL AND CHEMICAL PROPERTIES</p> <p>12.1 Physical State at 15°C and 1 atm: Solid or liquid 12.2 Molecular Weight: 94.11 12.3 Boiling Point at 1 atm: 356.2°F = 181.8°C = 455.0°K 12.4 Freezing Point: 105.8°F = 40.9°C = 314.1°K 12.5 Critical Temperature: 790.0°F = 421.1°C = 694.3°K 12.6 Critical Pressure: 889 psia = 60.5 atm = 6.13 MN/m² 12.7 Specific Gravity: 1.058 at 41°C (liquid) 12.8 Liquid Surface Tension: 36.5 dynes/cm = 0.0365 N/m at 55°C 12.9 Liquid Water Interfacial Tension: (est.) 20 dynes/cm = 0.02 N/m at 42°C 12.10 Vapor (Gas) Specific Gravity: Not pertinent 12.11 Ratio of Specific Heats of Vapor (Gas): 1.089 12.12 Latent Heat of Vaporization: 130 Btu/lb = 72 cal/g = 3.0 X 10⁴ J/kg 12.13 Heat of Combustion: -13,400 Btu/lb = -7,445 cal/g = -311.7 X 10³ J/kg 12.14 Heat of Decomposition: Not pertinent 12.15 Heat of Solution: Not pertinent 12.16 Heat of Polymerization: Not pertinent 12.25 Heat of Fusion: Data not available 12.26 Limiting Value: Data not available 12.27 Reid Vapor Pressure: 0.3 psia</p>																																				
<p>9. SHIPPING INFORMATION</p> <p>9.1 Grades of Purity: 90-99% (solid), 60-85% (liquid); Technical: 82-92% (contains cresols) 9.2 Storage Temperature: Ambient 9.3 Inert Atmosphere: No requirement 9.4 Venting: Pressure-vacuum</p>																																					
<p>6. FIRE HAZARDS (Continued)</p> <p>6.11 Stoichiometric Air to Fuel Ratio: Data not available 6.12 Flame Temperature: Data not available</p>																																					

PON250 CAS: 129-00-0 HR: 3
PYRENE

mf: C₁₆H₁₀ mw: 202.26

PROP: Colorless solid, solutions have a slight blue color. Mp: 156°, d: 1.271 @ 23°, bp: 404°. Insol in water; fairly sol in organic solvents. (A condensed ring hydrocarbon).

SYNS: BENZODEPHENANTHRENE * PYREN (GERMAN) * β-PYRINE

CONSENSUS REPORTS: IARC Cancer Review: GROUP 3 IMEMDT 7,56,87; Animal No Evidence IMEMDT 32,431,83. EPA Extremely Hazardous Substances List. Reported in EPA TSCA Inventory. EPA Genetic Toxicology Program.

OSHA PEL: TWA 0.2 mg/m³

SAFETY PROFILE: Poison by inhalation. Moderately toxic by ingestion and intraperitoneal routes. A skin irritant. Questionable carcinogen with experimental tumorigenic data. Human mutation data reported. When heated to decomposition it emits acrid smoke and irritating fumes.

IBZ000

CAS: 193-39-5

HR: 3

INDENO(1,2,3-cd)PYRENE

mf: C₂₂H₁₂ mw: 276.34

SYNS: 2,3-PHENYLENEPYRENE * 2,3,6-PHENYLENEPYRENE * 1,10,6-PHENYLENEPYRENE * 1,10-(1,2-PHENYLENE)PYRENE * RCRA WASTE NUMBER 0137

CONSENSUS REPORTS: IARC Cancer Review: GROUP 2B IMEMDT 7,56,87; Animal Sufficient Evidence IMEMDT 32,373,83; IMEMDT 3,229,73. NTP Fourth Annual Report On Carcinogens, 1984. Reported in EPA TSCA Inventory.

SAFETY PROFILE: Confirmed carcinogen with experimental carcinogenic and tumorigenic data. Mutation data reported. When heated to decomposition it emits acrid smoke and fumes.

TETRACHLOROETHANE

TEC

<p>Common Synonyms 1, 1, 2, 2-Tetrachloroethane Acetylene tetrachloride</p>	<p>Liquid Colorless to pale yellow Sweet odor</p> <p>Sinks in water.</p>
<p>AVOID CONTACT WITH LIQUID AND VAPOR. KEEP PEOPLE AWAY. Wear rubber overclothing (including gloves). Stop discharge if possible. Isolate and remove discharged material. Notify local health and pollution control agencies.</p>	
<p>Fire</p>	<p>Not flammable. Poisonous gases may be produced when heated.</p>
<p>Exposure</p>	<p>CALL FOR MEDICAL AID</p> <p>VAPOR Irritating to eyes, nose and throat. Harmful if inhaled. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.</p> <p>LIQUID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED. Irritating to skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. If in EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.</p>
<p>Water Pollution</p>	<p>Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.</p>
<p>1. RESPONSE TO DISCHARGE (See Response Methods Handbook) Issue warning-poison, air contaminant Restrict access Should be removed Chemical and physical treatment</p>	<p>2. LABEL 2.1 Category: None 2.2 Class: Not pertinent</p>
<p>3. CHEMICAL DESIGNATIONS 3.1 CG Competibility Class: Halogenated hydrocarbon 3.2 Formula: C₂HCl₄ 3.3 IMO/UN Designation: Not listed 3.4 DOT ID No.: 1702 3.5 CAS Registry No.: 1299-90-7</p>	<p>4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless yellowish green 4.3 Odor: Chloroform-like, pleasant, like carbon tetrachloride; mild, sweetish, similar to several other chlorinated hydrocarbons.</p>
<p>5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Chemical safety goggles; plastic face shield; air- or oxygen-supplied mask; safety hat with brim; solvent-proof apron; synthetic rubber gloves 5.2 Symptoms Following Exposure: Compound is a powerful narcotic and liver poison; may also cause changes in blood composition and neurological disturbances. Repeated exposure by inhalation can be fatal. Ingestion causes vomiting, diarrhea, severe mucosal injury, liver necrosis, cyanosis, unconsciousness, loss of reflexes, and death. Contact with eyes causes irritation and lachrymation. Can be absorbed through the skin and may produce severe skin lesions. 5.3 Treatment of Exposure: INHALATION: remove victim from exposure; begin artificial respiration if breathing has ceased. INGESTION: induce vomiting; call a physician. EYES: irrigate with water for 15 min. SKIN: remove clothing; wash skin thoroughly with warm water and soap. 5.4 Threshold Limit Value: 1 ppm 5.5 Short Term Inhalation Limits: 10 ppm, 30 min. 5.6 Toxicity by Ingestion: Grade 3; oral LD₅₀ = 200 mg/kg (rat) 5.7 Late Toxicity: Liver poisoning; nervous disorders 5.8 Vapor (Gas) Irritant Characteristics: Vapor is moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin. 5.10 Odor Threshold: 0.5 ppm 5.11 IDLH Value: 150 ppm</p>	

<p>6. FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Irritating hydrogen chloride vapor may form in fire. 6.6 Behavior in Fire: Data not available 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent 6.10 Adiabatic Flame Temperature: Data not available 6.11 Stoichiometric Air to Fuel Ratio: Data not available 6.12 Flame Temperature: Data not available</p>	<p>10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook) A-X</p> <p>11. HAZARD CLASSIFICATIONS 11.1 Code of Federal Regulations: ORM-A 11.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 11.3 NFPA Hazard Classification: Not listed</p>
<p>7. CHEMICAL REACTIVITY 7.1 Reactivity With Water: No reaction 7.2 Reactivity with Common Materials: May attack some forms of plastics 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent 7.7 Molar Ratio (Reactant to Product): Data not available 7.8 Reactivity Group: 36</p>	<p>12. PHYSICAL AND CHEMICAL PROPERTIES 12.1 Physical State at 15°C and 1 atm: Liquid 12.2 Molecular Weight: 167.85 12.3 Boiling Point at 1 atm: 295.3°F = 146.3°C = 419.5°K 12.4 Freezing Point: -45.8°F = -43.8°C = 229.4°K 12.5 Critical Temperature: Data not available 12.6 Critical Pressure: Data not available 12.7 Specific Gravity: 1.595 at 20°C (liquid) 12.8 Liquid Surface Tension: 37.85 dynes/cm = 0.03785 N/m at 20°C 12.9 Liquid Water Interfacial Tension: Data not available 12.10 Vapor (Gas) Specific Gravity: 5.79 12.11 Ratio of Specific Heats of Vapor (Gas): 1.090 at 25°C 12.12 Latent Heat of Vaporization: 99.2 Btu/lb = 55.1 cal/g = 2.30 X 10⁴ J/kg 12.13 Heat of Combustion: Not pertinent 12.14 Heat of Decomposition: Not pertinent 12.15 Heat of Solution: Not pertinent 12.16 Heat of Polymerization: Not pertinent 12.26 Heat of Fusion: Data not available 12.26 Limiting Value: Data not available 12.27 Reid Vapor Pressure: 0.5 psia</p>
<p>8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: Data not available</p>	
<p>9. SHIPPING INFORMATION 9.1 Grades of Purity: Technical, 98% 9.2 Storage Temperature: Ambient 9.3 Inert Atmosphere: No requirement 9.4 Venting: Open</p>	
<p>NOTES</p>	

TETRAETHYL LEAD

TEL

<p>Common Synonyms TEL Lead tetraethyl</p>		<p>Oily liquid</p> <p>Colorless, but generally dyed red</p> <p>Fruity odor</p>
<p>Sinks in water. Poisonous, flammable vapor is produced.</p>		
<p>AVOID CONTACT WITH LIQUID AND VAPOR. Keep people away. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Stop discharge if possible. Call fire department. Stay upwind and use water spray to "knock down" vapor. Isolate and remove discharged material. Notify local health and pollution control agencies.</p>		
<p>Fire</p>	<p>Combustible. POISONOUS GASES ARE PRODUCED IN FIRE. Containers may explode in fire. Vapor may explode if ignited in an enclosed area. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Combat fires from behind barrier or protected location. Flood discharge area with water. Extinguish with water, dry chemical, foam, or carbon dioxide. Cool exposed containers with water.</p>	
<p>Exposure</p>	<p>CALL FOR MEDICAL AID.</p> <p>VAPOR POISONOUS IF INHALED OR IF SKIN IS EXPOSED. Irritating to eyes. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.</p> <p>LIQUID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED. Will burn eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.</p>	
<p>Water Pollution</p>	<p>HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.</p>	
<p>1. RESPONSE TO DISCHARGE (See Response Methods Handbook) Issue warning-poison, water contaminant Restrict access Should be removed Chemical and physical treatment</p>	<p>2. LABEL 2.1 Category: Poison 2.2 Class: 6</p>	
<p>3. CHEMICAL DESIGNATIONS 3.1 CG Compatibility Class: Not listed 3.2 Formula: Pb(C₂H₅)₄ 3.3 IMO/UN Designation: 6.1/1549 3.4 DOT ID No.: 1549 3.5 CAS Registry No.: 78-00-2</p>	<p>4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Dyed red or other distinctive color. 4.3 Odor: Sweet</p>	
<p>5. HEALTH HAZARDS</p> <p>6.1 Personal Protective Equipment: Organic vapor type canister face mask for short periods; air type for longer periods; neoprene-coated, liquid-proof gloves; protective goggles or face shield; white or light-colored clothing; rubber shoes or boots.</p> <p>6.2 Symptoms Following Exposure: Increased urinary output of lead. If a large degree of absorption from inhalation or skin contact, may cause incoordination, excitability, delirium, coma and death. Do not confuse with inorganic lead.</p> <p>6.3 Treatment of Exposure: Remove victim from contaminated area and consult physician immediately. INGESTION: induce vomiting. SKIN: wash immediately with kerosene or similar petroleum distillate followed by soap and water.</p> <p>6.4 Threshold Limit Value: 0.1 mg/m³</p> <p>6.5 Short Term Inhalation Limit: 0.15 mg Pb/m³ for 30 min.</p> <p>6.6 Toxicity by Ingestion: Oral rat LD₅₀ = 17 mg/kg</p> <p>6.7 Late Toxicity: Lead poisoning</p> <p>6.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.</p> <p>6.9 Liquid or Solid Irritant Characteristics: Causes smarting of the skin and first-degree burns on short exposure; may cause secondary burns on long exposure.</p> <p>6.10 Odor Threshold: Data not available</p> <p>6.11 IDLH Value: 40 mg/m³</p>		

6. FIRE HAZARDS

6.1 Flash Point: 200°F C.C.; 185°F O.C.

6.2 Flammable Limits in Air: Data not available

6.3 Fire Extinguishing Agents: Water, foam, dry chemical, or carbon dioxide

6.4 Fire Extinguishing Agents Not to be Used: Not pertinent

6.5 Special Hazards of Combustion: Products: Toxic gases are generated in fire.

6.6 Behavior in Fire: May explode in fire.

6.7 Ignition Temperature: Decomposes above 230°F

6.8 Electrical Hazard: Not pertinent

6.9 Burning Rate: Data not available

6.10 Adiabatic Flame Temperature: Data not available

(Continued)

7. CHEMICAL REACTIVITY

7.1 Reactivity With Water: No reaction

7.2 Reactivity with Common Materials: Rust and some metals cause decomposition.

7.3 Stability During Transport: Stable below 230°F. At higher temperatures, may detonate or explode when confined.

7.4 Neutralizing Agents for Acids and Caustics: Not pertinent

7.5 Polymerization: Not pertinent

7.6 Inhibitor of Polymerization: Not pertinent

7.7 Molar Ratio (Reactant to Product): Data not available

7.8 Reactivity Group: Data not available

8. WATER POLLUTION

8.1 Aquatic Toxicity: 0.20 mg/l/96 hr/bluegill/TL₅₀/fresh water

8.2 Waterfowl Toxicity: Data not available

8.3 Biological Oxygen Demand (BOD): Data not available

8.4 Food Chain Concentration Potential: Data not available

9. SHIPPING INFORMATION

9.1 Grades of Purity: Technical

9.2 Storage Temperature: Ambient

9.3 Inert Atmosphere: No requirement

9.4 Venting: Pressure-vacuum

6. FIRE HAZARDS (Continued)

6.11 Stoichiometric Air to Fuel Ratio: Data not available

6.12 Flame Temperature: Data not available

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

11. HAZARD CLASSIFICATIONS

11.1 Code of Federal Regulations: Poison, B

11.2 HAS Hazard Rating for Bulk Water Transportation: Not listed

11.3 NFPA Hazard Classification:

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

12. PHYSICAL AND CHEMICAL PROPERTIES

12.1 Physical State at 15°C and 1 atm: Liquid

12.2 Molecular Weight: 323.44

12.3 Boiling Point at 1 atm: Decomposes

12.4 Freezing Point: -215°F = -137°C = 136°K

12.5 Critical Temperature: Not pertinent

12.6 Critical Pressure: Not pertinent

12.7 Specific Gravity: 1.633 at 20°C (liquid)

12.8 Liquid Surface Tension: 28.5 dynes/cm = 0.0285 N/m at (est.) 25°C

12.9 Liquid Water Intercfacial Tension: (est.) 40 dynes/cm = 0.04 N/m at 20°C

12.10 Vapor (Gas) Specific Gravity: Not pertinent

12.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent

12.12 Latent Heat of Vaporization: Not pertinent

12.13 Heat of Combustion: (est.) -7,870 Btu/lb = -4,380 cal/g = -183 X 10⁴ J/kg

12.14 Heat of Decomposition: Not pertinent

12.15 Heat of Solution: Not pertinent

12.16 Heat of Polymerization: Not pertinent

12.25 Heat of Fusion: Data not available

12.26 Limiting Value: Data not available

12.27 Reid Vapor Pressure: Data not available

TOLUENE

TOL

Common Synonyms Toluol Methylbenzene Methylbenzol	Watery liquid Colorless Pleasant odor Floats on water. Flammable, irritating vapor is produced.
Stop discharge if possible. Keep people away. Shut off ignition sources and call fire department. Stay upwind and use water spray to "knock down" vapor. Avoid contact with liquid and vapor. Isolate and remove discharged material. Notify local health and pollution control agencies.	
Fire	FLAMMABLE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemical, foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
Exposure	CALL FOR MEDICAL AID. VAPOR Irritating to eyes, nose and throat. If inhaled, will cause nausea, vomiting, headache, dizziness, difficult breathing, or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing difficult, give oxygen. LIQUID Irritating to skin and eyes. If swallowed, will cause nausea, vomiting or loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
Water Pollution	Dangerous to aquatic life in high concentrations. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.
1. RESPONSE TO DISCHARGE (See Response Methods Handbook) Issue warning-high flammability Evacuate area	2. LABEL 2.1 Category: Flammable liquid 2.2 Class: 3
3. CHEMICAL DESIGNATIONS 3.1 CG Competibility Class: Aromatic Hydrocarbon 3.2 Formula: C ₆ H ₅ CH ₃ 3.3 IMO/UN Designation: 3.2/1294 3.4 DOT ID No.: 1294 3.5 CAS Registry No.: 108-88-3	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Pungent, aromatic, benzene-like; distinct, pleasant
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Air-supplied mask; goggles or face shield; plastic gloves. 5.2 Symptoms Following Exposure: Vapors irritate eye and upper respiratory tract; cause dizziness, headache, anesthesia, respiratory arrest. Liquid irritates eyes and causes drying of skin. If aspirated, causes coughing, gagging, distress, and rapidly developing pulmonary edema. If ingested causes vomiting, griping, diarrhea, depressed respiration. 5.3 Treatment of Exposure: INHALATION: remove to fresh air, give artificial respiration and oxygen if needed; call a doctor. INGESTION: do NOT induce vomiting; call a doctor. EYES: flush with water for at least 15 min. SKIN: wipe off, wash with soap and water. 5.4 Threshold Limit Value: 100 ppm 5.5 Short Term Inhalation Limits: 600 ppm for 30 min. 5.6 Toxicity by Ingestion: Grade 2; LD ₅₀ = 0.5 to 5 g/kg 5.7 Late Toxicity: Kidney and liver damage may follow ingestion. 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin. 5.10 Odor Threshold: 0.17 ppm 5.11 IDLH Value: 2,000 ppm	

6. FIRE HAZARDS 6.1 Flash Point: 40°F C.C.; 55°F O.C. 6.2 Flammable Limits in Air: 1.27%-7% 6.3 Fire Extinguishing Agents: Carbon dioxide or dry chemical for small fires, ordinary foam for large fires. 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back. 6.7 Ignition Temperature: 997°F 6.8 Electrical Hazard: Class I, Group D 6.9 Burning Rate: 5.7 mm/min. 6.10 Adiabatic Flame Temperature: Data not available (Continued)	10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook) <p style="text-align: center;">A-T-U</p> 11. HAZARD CLASSIFICATIONS 11.1 Code of Federal Regulations: Flammable liquid 11.2 NAS Hazard Rating for Bulk Water Transportation: <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Category</th> <th style="text-align: center;">Rating</th> </tr> </thead> <tbody> <tr> <td>Fire</td> <td style="text-align: right;">3</td> </tr> <tr> <td>Health</td> <td></td> </tr> <tr> <td>Vapor Irritant</td> <td style="text-align: right;">1</td> </tr> <tr> <td>Liquid or Solid Irritant</td> <td style="text-align: right;">1</td> </tr> <tr> <td>Poisons</td> <td style="text-align: right;">2</td> </tr> <tr> <td>Water Pollution</td> <td></td> </tr> <tr> <td>Human Toxicity</td> <td style="text-align: right;">1</td> </tr> <tr> <td>Aquatic Toxicity</td> <td style="text-align: right;">3</td> </tr> <tr> <td>Anesthetic Effect</td> <td style="text-align: right;">2</td> </tr> <tr> <td>Reactivity</td> <td></td> </tr> <tr> <td>Other Chemicals</td> <td style="text-align: right;">1</td> </tr> <tr> <td>Water</td> <td style="text-align: right;">0</td> </tr> <tr> <td>Self Reaction</td> <td style="text-align: right;">0</td> </tr> </tbody> </table> 11.3 NFPA Hazard Classification: <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Category</th> <th style="text-align: center;">Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td> <td style="text-align: right;">2</td> </tr> <tr> <td>Flammability (Red)</td> <td style="text-align: right;">3</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td style="text-align: right;">0</td> </tr> </tbody> </table>	Category	Rating	Fire	3	Health		Vapor Irritant	1	Liquid or Solid Irritant	1	Poisons	2	Water Pollution		Human Toxicity	1	Aquatic Toxicity	3	Anesthetic Effect	2	Reactivity		Other Chemicals	1	Water	0	Self Reaction	0	Category	Classification	Health Hazard (Blue)	2	Flammability (Red)	3	Reactivity (Yellow)	0
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7. CHEMICAL REACTIVITY 7.1 Reactivity With Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent 7.7 Molar Ratio (Reactant to Product): Data not available 7.8 Reactivity Group: 32	12. PHYSICAL AND CHEMICAL PROPERTIES 12.1 Physical State at 18°C and 1 atm: Liquid 12.2 Molecular Weight: 92.14 12.3 Boiling Point at 1 atm: 231.1°F = 110.6°C = 383.8°K 12.4 Freezing Point: -139°F = -95.0°C = 178.2°K 12.5 Critical Temperature: 605.4°F = 318.8°C = 591.8°K 12.6 Critical Pressure: 596.1 psia = 40.55 atm = 4.108 MN/m ² 12.7 Specific Gravity: 0.867 at 20°C (liquid) 12.8 Liquid Surface Tension: 29.0 dynes/cm = 0.0290 N/m at 20°C 12.9 Liquid Water Intertacial Tension: 36.1 dynes/cm = 0.0361 N/m at 25°C 12.10 Vapor (Gas) Specific Gravity: Not pertinent 12.11 Ratio of Specific Heats of Vapor (Gas): 1.089 12.12 Latent Heat of Vaporization: 155 Btu/lb = 86.1 cal/g = 3.61 X 10 ⁴ J/kg 12.13 Heat of Combustion: -17,430 Btu/lb = -9686 cal/g = -406.5 X 10 ⁴ J/kg 12.14 Heat of Decomposition: Not pertinent 12.15 Heat of Solution: Not pertinent 12.16 Heat of Polymerization: Not pertinent 12.25 Heat of Fusion: 17.17 cal/g 12.26 Limiting Value: Data not available 12.27 Reid Vapor Pressure: 1.1 psia																																				
8. WATER POLLUTION 8.1 Aquatic Toxicity: 1180 mg/L/96 hr/sunfish/TL ₅₀ /fresh water 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): 0%, 5 days; 36% (theor), 8 days 8.4 Food Chain Concentration Potential: None	9. SHIPPING INFORMATION 9.1 Grades of Purity: Research, reagent, nitration-99.8 + %; Industrial: contains 94 + %, with 5% xylene and small amounts of benzene and nonaromatic hydrocarbons; 80/120: less pure than industrial. 9.2 Storage Temperature: Ambient 9.3 Inert Atmosphere: No requirement 9.4 Venting: Open (flame arrester) or pressure-vacuum																																				
6. FIRE HAZARDS (Continued) 6.11 Stoichiometric Air to Fuel Ratio: Data not available 6.12 Flame Temperature: Data not available																																					

TRICHLOROETHANE

TCE

Common Synonyms 1,1,1-Trichloroethane Methylchloroform Aeroflone Chlorothene		Watery liquid Colorless Sweet odor
Sinks in water. Irritating vapor is produced.		
Stop discharge if possible. Keep people away. Avoid contact with liquid and vapor. Call fire department. Isolate and remove discharged material. Notify local health and pollution control agencies.		
Fire	Combustible POISONOUS GASES ARE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemical, carbon dioxide, or foam.	
Exposure	CALL FOR MEDICAL AID. VAPOR Irritating to eyes, nose and throat. If inhaled, will cause dizziness or difficult breathing. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. LIQUID Irritating to skin and eyes. If swallowed, may produce nausea. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES: hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.	
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.	
1. RESPONSE TO DISCHARGE (See Response Methods Handbook) Should be removed Chemical and physical treatment		2. LABEL 2.1 Category: None 2.2 Class: Not pertinent
3. CHEMICAL DESIGNATIONS 3.1 CG Competibility Class: Halogenated hydrocarbon 3.2 Formula: CH ₂ Cl ₃ 3.3 IMO/UN Designations: Not listed 3.4 DOT ID No.: 2831 3.5 CAS Registry No.: 71-55-6		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Chloroform-like; sweetish
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Organic vapor-acid gas canister; self-contained breathing apparatus for emergencies; neoprene or polyvinyl-alcohol-type gloves; chemical safety goggles and face shield; neoprene safety shoes (or leather safety shoes plus neoprene footwear); neoprene or polyvinyl alcohol suit or apron for splash protection. 5.2 Symptoms Following Exposure: INHALATION: symptoms range from loss of equilibrium and incoordination to loss of consciousness; high concentration can be fatal due to simple asphyxiation combined with loss of consciousness. INGESTION: produces effects similar to inhalation and may cause some feeling of nausea. EYES: slightly irritating and lachrymatory. SKIN: defatting action may cause dermatitis. 5.3 Treatment of Exposure: Get medical attention for all eye exposures and any other serious over-exposures. Do NOT administer adrenalin or epinephrine; otherwise, treatment is symptomatic. INHALATION: remove victim to fresh air; if necessary, apply artificial respiration and/or administer oxygen. INGESTION: have victim drink water and induce vomiting. EYES: flush thoroughly with water. SKIN: remove contaminated clothing and wash exposed area thoroughly with soap and warm water. 5.4 Threshold Limit Value: 350 ppm 5.5 Short Term Inhalation Limits: 1,000 ppm for 60 min. in man 5.6 Toxicity by Ingestion: Grade 1; LD ₅₀ = 5 to 15 g/kg (rat, mouse, rabbit, guinea pig) 5.7 Lethal Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin. 5.10 Odor Threshold: 100 ppm 5.11 IDLH Value: 1,000 ppm		

6. FIRE HAZARDS 6.1 Flash Point: Data not available 6.2 Flammable Limits in Air: 7%-16% 6.3 Fire Extinguishing Agents: Dry chemical, foam, or carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Toxic and irritating gases are generated in fires. 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: 932°F 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: (est.) 2.9 mm/min. 6.10 Adiabatic Flame Temperature: Data not available 6.11 Stoichiometric Air to Fuel Ratio: Data not available 6.12 Flame Temperature: Data not available	10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook) A-X-Y 11. HAZARD CLASSIFICATIONS 11.1 Code of Federal Regulations: ORM-A 11.2 NAS Hazard Rating for Bulk Water Transportation: <table border="1"> <thead> <tr> <th>Category</th> <th>Rating</th> </tr> </thead> <tbody> <tr> <td>Fire.....</td> <td>1</td> </tr> <tr> <td>Health.....</td> <td></td> </tr> <tr> <td>Vapor Irritant.....</td> <td>1</td> </tr> <tr> <td>Liquid or Solid Irritant.....</td> <td>1</td> </tr> <tr> <td>Poisons.....</td> <td>2</td> </tr> <tr> <td>Water Pollution.....</td> <td></td> </tr> <tr> <td>Human Toxicity.....</td> <td>1</td> </tr> <tr> <td>Aquatic Toxicity.....</td> <td>3</td> </tr> <tr> <td>Aesthetic Effect.....</td> <td>2</td> </tr> <tr> <td>Reactivity.....</td> <td></td> </tr> <tr> <td>Other Chemicals.....</td> <td>1</td> </tr> <tr> <td>Water.....</td> <td>0</td> </tr> <tr> <td>Self Reaction.....</td> <td>0</td> </tr> </tbody> </table> 11.3 NFPA Hazard Classification: <table border="1"> <thead> <tr> <th>Category</th> <th>Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (Blue).....</td> <td>2</td> </tr> <tr> <td>Flammability (Red).....</td> <td>1</td> </tr> <tr> <td>Reactivity (Yellow).....</td> <td>0</td> </tr> </tbody> </table>	Category	Rating	Fire.....	1	Health.....		Vapor Irritant.....	1	Liquid or Solid Irritant.....	1	Poisons.....	2	Water Pollution.....		Human Toxicity.....	1	Aquatic Toxicity.....	3	Aesthetic Effect.....	2	Reactivity.....		Other Chemicals.....	1	Water.....	0	Self Reaction.....	0	Category	Classification	Health Hazard (Blue).....	2	Flammability (Red).....	1	Reactivity (Yellow).....	0
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7. CHEMICAL REACTIVITY 7.1 Reactivity With Water: Reacts slowly, releasing corrosive hydrochloric acid. 7.2 Reactivity with Common Materials: Corrodes aluminum, but reaction is not hazardous 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent 7.7 Molar Ratio (Reactant to Product): Data not available 7.8 Reactivity Group: 36	12. PHYSICAL AND CHEMICAL PROPERTIES 12.1 Physical State at 15°C and 1 atm: Liquid 12.2 Molecular Weight: 133.41 12.3 Boiling Point at 1 atm: 165°F = 74°C = 347°K 12.4 Freezing Point: <-38°F = <-39°C = <234°K 12.5 Critical Temperature: Not pertinent 12.6 Critical Pressure: Not pertinent 12.7 Specific Gravity: 1.31 at 20°C (liquid) 12.8 Liquid Surface Tension: 25.4 dynes/cm = 0.0254 N/m at 20°C 12.9 Liquid Water Interfacial Tension: (est.) 45 dynes/cm = 0.045 N/m at 20°C 12.10 Vapor (Gas) Specific Gravity: 4.6 12.11 Ratio of Specific Heats of Vapor (Gas): 1.104 12.12 Latent Heat of Vaporization: 100 Btu/lb = 58 cal/g = 2.4 X 10 ⁴ J/kg 12.13 Heat of Combustion: (est.) 4700 Btu/lb = 2600 cal/g = 110 X 10 ⁴ J/kg 12.14 Heat of Decomposition: Not pertinent 12.15 Heat of Solution: Not pertinent 12.16 Heat of Polymerization: Not pertinent 12.25 Heat of Fusion: Data not available 12.26 Limiting Value: Data not available 12.27 Reid Vapor Pressure: 4.0 psia																																				
8. WATER POLLUTION 8.1 Aquatic Toxicity: 75-150 ppm/**/pinfish/TL ₅₀ /salt water *Time period not specified. 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None	9. SHIPPING INFORMATION 9.1 Grades of Purity: Uninhibited; inhibited, industrial inhibited; white room; cold cleaning 9.2 Storage Temperature: Ambient 9.3 Inert Atmosphere: No requirement 9.4 Venting: Pressure-vacuum																																				
NOTES																																					

NER CODE A-III

MONSANTO PRODUCT NAME
**TRISODIUM PHOSPHATE
CRYSTALLINE**

MONSANTO COMPANY
800 N. LINDBERGH BLVD.
ST. LOUIS, MO 63167

Emergency Phone No.
(Call Collect)
314-694-1000

PRODUCT IDENTIFICATION

Synonyms: TSP/C; Trisodium orthophosphate; Sodium phosphate, tribasic; Phosphoric acid, trisodium salt; Trisodium phosphate dodecahydrate

Chemical Formula: $Na_3PO_4 \cdot 12H_2O \cdot 1/4 NaOH$ (approximately)

CAS No.: 10101-89-0

DOT Proper Shipping Name: Sodium Phosphate, Tribasic (see NOTE below)

DOT Hazard Class/ I.D. No.: ORM-E/NA9148

DOT Label(s): Not Applicable

Hazardous Substance(s)/ RQ(s): Yes/5,000 lbs.

U.S. Surface Freight Classification: Trisodium Phosphate

Note: Bagged material is not regulated.

*Since hydrated materials could not be reported on the TSCA Initial Inventory List, Trisodium Phosphate Crystalline was reported as anhydrous with the CAS No. 7601-54-9.

WARNING STATEMENTS

DANGER!
CAUSES EYE BURNS
CAUSES SKIN IRRITATION

PRECAUTIONARY MEASURES

Do not get in eyes, on skin, on clothing.
Avoid breathing dust.
Keep container closed.
Use with adequate ventilation.
Wash thoroughly after handling.

EMERGENCY AND FIRST AID PROCEDURES

FIRST AID: IF IN EYES, immediately flush with plenty of water for at least 15 minutes.
Call a physician.

IF ON SKIN, immediately flush with plenty of water. Remove contaminated clothing.
Wash clothing before reuse.

OCCUPATIONAL CONTROL PROCEDURES

Eye Protection: Wear chemical safety goggles to prevent eye contact. Have eye baths immediately available where eye contact can occur.

Skin Protection: Wear appropriate impervious gloves and protective clothing to prevent skin contact. Launder contaminated clothing and clean protective equipment before reuse.

Respiratory Protection: Use NIOSH approved equipment suitable for nuisance dust when airborne exposure is excessive. Consult respirator manufacturer to determine appropriate type equipment for given application.

Ventilation: Provide ventilation to minimize exposure. Local exhaust ventilation preferred.

Airborne Exposure Limits: Product: Trisodium phosphate dodecahydrate

Although no specific exposure limit has been established for this material, OSHA and ACGIH have established limits for nuisance dusts:

OSHA PEL/TWA: Total 15 mg/m³; Respirable 5 mg/m³
 ACGIH TLV/TWA: Total 10 mg/m³; Respirable 5 mg/m³

Keep exposure below these limits.

FIRE PROTECTION INFORMATION

This material is not combustible.

REACTIVITY DATA

Materials to Avoid: Trisodium Phosphate Crystalline could be corrosive to aluminum surfaces because of high pH. Sealed containers should be kept free of water because of its corrosivity when wet.

Hazardous Decomposition Products: None.

Hazardous Polymerization: Does not occur.

PHYSIOLOGICAL EFFECTS SUMMARY

Oral LD₅₀ (Rat): 6,500 mg/kg, Practically Nontoxic
 Dermal LD₅₀ (Rabbit): 7,940 mg/kg, Practically Nontoxic
 Eye Irritation (Rabbit): (FHSA) Corrosive
 Skin Irritation (Rabbit): (FHSA) 3.3 on a scale of 8.0, Moderately Irritating

PHYSICAL DATA

Appearance and Odor: White, crystalline, free-flowing granules or powder; odorless

pH (1% solution @ 25°C): 12.0

Bulk Density (lbs./cu. ft.): Powder 61-65
Granular 58-64

Solubility (g/100 g H₂O) (Anhydrous Salt Basis):

11.6 @	25°C
17.5 @	40°C
35.3 @	60°C
61.3 @	80°C
84.5 @	100°C

Note: These physical data are typical values based on material tested but may vary from sample to sample. Typical values should not be construed as a guaranteed analysis of any specific lot or as specification items.

MATERIAL SAFETY DATA

SPILL, LEAK & DISPOSAL INFORMATION

Waste Disposal: Dispose of in a landfill in accordance with all local, state and federal regulations.

Spill or Leakage Procedures:

Sodium phosphate, tribasic, as currently defined, is a *hazardous substance* in the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (Superfund) and in the current federal regulations 40 CFR, Part 116 (Section 311, Clean Water Act) with a reportable quantity of 5,000 pounds when released to the environment. Since federal, state and local laws may vary, consult your attorney or appropriate regulatory officials for information relating to spill reporting.

Sweep, scoop or vacuum up all spilled material, contaminated soil and other contaminated material and place in containers. If possible, complete cleanup on a dry basis. After all practical dry cleanup has been done, residual contamination can be flushed with plenty of water.

ADDITIONAL COMMENTS

Environmental Toxicity Information:

96-hr LC₅₀ (Bluegill) : 440 mg/l, Practically Nontoxic
96-hr LC₅₀ (Trout) : 260 mg/l, Practically Nontoxic

DATE: 8/1/83
MSDS NO.: 010101890

REVISED: X

SUPERSEDES: 5/78

FOR ADDITIONAL NON-EMERGENCY INFORMATION, CONTACT:

Product Acceptability Coordinator
Detergent Materials
Monsanto Industrial Chemicals Co.
314-694-2096
(A Unit of Monsanto Company)

MATERIAL SAFETY DATA

TRISODIUM PHOSPHATE CRYSTALLINE

Although the information and recommendations set forth herein (hereinafter "information") are presented in good faith and believed to be correct as of the date hereof, Monsanto Company makes no representations as to the completeness or accuracy thereof. Information is supplied upon the condition that the persons receiving same will make their own determination as to its suitability for their purposes prior to use. In no event will Monsanto Company be responsible for damages of any nature whatsoever resulting from the use of or reliance upon information. NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESS OR IMPLIED, OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR OF ANY OTHER NATURE ARE MADE HEREUNDER WITH RESPECT TO INFORMATION OR THE PRODUCT TO WHICH INFORMATION REFERS.

This form has been approved by the Occupational Safety and Health Administration as "equivalent to" OSHA Form 20.

VPK000 CAS: 75-35-4 HR: 3
VINYLIDENE CHLORIDE

DOT: UN 1303
mf: C₂H₂Cl₂ mw: 96.94

PROP: Colorless, volatile liquid. Bp: 31.6°,
lcl: 7.3%, ucl: 16.0%, sp: -122°, flash p: 0°F
(OC), d: 1.213 (@ 20°/4°, autoign temp: 1058°F.

SYNS: CHLORURE de VINYLIDENE (FRENCH)
* 1,1-DCE * 1,1-DICHLOROETHENE * 1,1-DI-
CHLOROETHYLENE * NCI-C54262 * RCRA WASTE
NUMBER 0078 * SCONATEX * VDC * VINYL-
IDENE CHLORIDE (H) * VINYLIDENE DICHLORIDE
* VINYLIDINE CHLORIDE

CONSENSUS REPORTS: IARC Cancer Re-
view: GROUP 3 IMEMDT 7,376,87; Human
Inadequate Evidence IMEMDT 39,195,86,
IMEMDT 19,439,79; Animal Limited Evi-
dence IMEMDT 39,195,86; Animal Sufficient
Evidence IMEMDT 19,439,79. EPA Genetic
Toxicology Program. Reported in EPA TSCA
Inventory. Community Right-To-Know List.

OSHA PEL: TWA 1 ppm
ACGIH TLV: TWA 5 ppm; STEL 20 ppm

DFG MAK: Suspected Carcinogen.
DOT Classification: Flammable Liquid; Label:
Flammable Liquid

SAFETY PROFILE: Suspected carcinogen with
experimental carcinogenic, neoplastigenic, and
tumorigenic data. Poison by inhalation, inges-
tion, and intravenous routes. Moderately toxic
by subcutaneous route. Human systemic effects
by inhalation: general anesthesia, liver and kid-
ney changes. Experimental teratogenic and re-
productive effects. Mutation data reported. A
very dangerous fire hazard when exposed to
heat or flame. Moderately explosive in the form
of gas when exposed to heat or flame. It forms
explosive peroxides upon exposure to air. Potenti-
ally explosive reaction with chlorotrifluoro-
ethylene at 180°C. Reaction with ozone forms
dangerous products. Explosive reaction with
perchloryl fluoride when heated above 100°C.
Also can explode spontaneously. Reacts vio-
lently with chlorosulfonic acid, HNO₃, oleum.
Can react vigorously with oxidizing materials.
To fight fire, use alcohol foam, CO₂, dry chemi-
cal. When heated to decomposition it emits toxic
fumes of Cl⁻.

m-XYLENE

XLM

<p>Common Synonyms 3-Dimethylbenzene Toluene</p>	<p>Watery liquid Colorless Sweet odor</p>	<p>Floats on water. Flammable, irritating vapor is produced.</p>
<p>Stop discharge if possible. Keep people away. Call fire department. Avoid contact with liquid and vapor. Isolate and remove discharged material. Notify local health and pollution control agencies.</p>		
<p>Fire</p>	<p>FLAMMABLE Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear self-contained breathing apparatus. Extinguish with foam, dry chemical, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.</p>	
<p>Exposure</p>	<p>CALL FOR MEDICAL AID.</p> <p>VAPOR Irritating to eyes, nose, and throat. If inhaled, will cause headache, difficult breathing, or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.</p> <p>LIQUID Irritating to skin and eyes. If swallowed, will cause nausea, vomiting, or loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.</p>	
<p>Water Pollution</p>	<p>HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. Fouling to shorelines. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.</p>	
<p>1. RESPONSE TO DISCHARGE (See Response Methods Handbook) Issue warning-high flammability Evacuate area Should be removed Chemical and physical treatment</p>		<p>2. LABEL 2.1 Category: Flammable liquid 2.2 Class: 3</p>
<p>3. CHEMICAL DESIGNATIONS 3.1 CG Compatibility Class: Aromatic Hydrocarbon 3.2 Formula: m-C₈H₁₀(CH₃)₂ 3.3 IMO/UN Designation: 3.2/1307 3.4 DOT ID No.: 1307 3.5 CAS Registry No.: 106-38-3</p>		<p>4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Like benzene; characteristic aromatic</p>
<p>5. HEALTH HAZARDS</p> <p>5.1 Personal Protective Equipment: Approved canister or air-supplied mask; goggles or face shield; plastic gloves and boots.</p> <p>5.2 Symptoms Following Exposure: Vapors cause headache and dizziness. Liquid irritates eyes and skin. If taken into lungs, causes severe coughing, distress, and rapidly developing pulmonary edema. If ingested, causes nausea, vomiting, cramps, headache, and coma; can be fatal. Kidney and liver damage can occur.</p> <p>5.3 Treatment of Exposure: INHALATION: remove to fresh air; administer artificial respiration and oxygen if required; call a doctor. INGESTION: do NOT induce vomiting; call a doctor. EYES: flush with water for at least 15 min. SKIN: wipe off, wash with soap and water.</p> <p>5.4 Threshold Limit Value: 100 ppm 5.5 Short Term Inhalation Limit: 300 ppm for 30 min. 5.6 Toxicity by Ingestion: Grade 3; LD₅₀ = 50 to 500 g/kg 5.7 Late Toxicity: Kidney and liver damage. 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin. 5.10 Odor Threshold: 0.05 ppm 5.11 IDLH Value: 10,000 ppm</p>		

<p>6. FIRE HAZARDS</p> <p>6.1 Flash Point: 84°F C.C. 6.2 Flammable Limits in Air: 1.1%-8.4% 6.3 Fire Extinguishing Agents: Foam, dry chemical, or carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective. 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back. 6.7 Ignition Temperature: 886°F 6.8 Electrical Hazard: Class I, Group D 6.9 Burning Rate: 5.8 mm/min. 6.10 Adiabatic Flame Temperature: Data not available 6.11 Stoichiometric Air to Fuel Ratio: Data not available 6.12 Flame Temperature: Data not available</p>
<p>7. CHEMICAL REACTIVITY</p> <p>7.1 Reactivity With Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent 7.7 Molar Ratio (Reactant to Product): Data not available 7.8 Reactivity Group: 32</p>

<p>8. WATER POLLUTION</p> <p>8.1 Aquatic Toxicity: 22 ppm/96 hr/blugill/TL₅₀/fresh water 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): 0 lb/lb, 5 days; 0% (theor.), 8 days 8.4 Food Chain Concentration Potential: Data not available</p>

<p>9. SHIPPING INFORMATION</p> <p>9.1 Grades of Purity: Research: 99.99%; Pure: 99.9%; Technical: 99.2% 9.2 Storage Temperature: Ambient 9.3 Inert Atmosphere: No requirement 9.4 Venting: Open (flame arrester) or pressure-vacuum</p>
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<p>10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook) A-T-U</p>																																				
<p>11. HAZARD CLASSIFICATIONS</p> <p>11.1 Code of Federal Regulations: Flammable liquid 11.2 NAB Hazard Rating for Bulk Water Transportation:</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: center;">Category</td> <td style="text-align: center;">Rating</td> </tr> <tr> <td>Fire _____</td> <td style="text-align: right;">3</td> </tr> <tr> <td>Health _____</td> <td></td> </tr> <tr> <td>Vapor Irritant _____</td> <td style="text-align: right;">1</td> </tr> <tr> <td>Liquid or Solid Irritant _____</td> <td style="text-align: right;">1</td> </tr> <tr> <td>Poisons _____</td> <td style="text-align: right;">2</td> </tr> <tr> <td>Water Pollution _____</td> <td></td> </tr> <tr> <td>Human Toxicity _____</td> <td style="text-align: right;">1</td> </tr> <tr> <td>Aquatic Toxicity _____</td> <td style="text-align: right;">3</td> </tr> <tr> <td>Aesthetic Effect _____</td> <td style="text-align: right;">2</td> </tr> <tr> <td>Reactivity _____</td> <td></td> </tr> <tr> <td>Other Chemicals _____</td> <td style="text-align: right;">1</td> </tr> <tr> <td>Water _____</td> <td style="text-align: right;">0</td> </tr> <tr> <td>Soil Reaction _____</td> <td style="text-align: right;">0</td> </tr> </table> <p>11.3 NFPA Hazard Classification:</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: center;">Category</td> <td style="text-align: center;">Classification</td> </tr> <tr> <td>Health Hazard (Blue) _____</td> <td style="text-align: right;">2</td> </tr> <tr> <td>Flammability (Red) _____</td> <td style="text-align: right;">3</td> </tr> <tr> <td>Reactivity (Yellow) _____</td> <td style="text-align: right;">0</td> </tr> </table>	Category	Rating	Fire _____	3	Health _____		Vapor Irritant _____	1	Liquid or Solid Irritant _____	1	Poisons _____	2	Water Pollution _____		Human Toxicity _____	1	Aquatic Toxicity _____	3	Aesthetic Effect _____	2	Reactivity _____		Other Chemicals _____	1	Water _____	0	Soil Reaction _____	0	Category	Classification	Health Hazard (Blue) _____	2	Flammability (Red) _____	3	Reactivity (Yellow) _____	0
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<p>12. PHYSICAL AND CHEMICAL PROPERTIES</p> <p>12.1 Physical State at 18°C and 1 atm: Liquid 12.2 Molecular Weight: 106.16 12.3 Boiling Point at 1 atm: 269.4°F = 131.9°C = 405.1°K 12.4 Freezing Point: -54.2°F = -47.9°C = 225.3°K 12.5 Critical Temperature: 650.8°F = 343.8°C = 817.0°K 12.6 Critical Pressure: 513.8 atm = 34.95 pasc = 3.540 MN/m² 12.7 Specific Gravity: 0.864 at 20°C (liquid) 12.8 Liquid Surface Tension: 28.6 dynes/cm = 0.0286 N/m at 20°C 12.9 Liquid Water Interfacial Tension: 36.4 dynes/cm = 0.0364 N/m at 30°C 12.10 Vapor (Gas) Specific Gravity: Not pertinent 12.11 Ratio of Specific Heats of Vapor (Gas): 1.071 12.12 Latent Heat of Vaporization: 147 Btu/lb = 81.9 cal/g = 3.43 X 10⁵ J/kg 12.13 Heat of Combustion: -17,554 Btu/lb = -8752.4 cal/g = -406.31 X 10³ J/kg 12.14 Heat of Decomposition: Not pertinent 12.15 Heat of Solution: Not pertinent 12.16 Heat of Polymerization: Not pertinent 12.25 Heat of Fusion: 26.01 cal/g 12.26 Limiting Value: Data not available 12.27 Reid Vapor Pressure: 0.34 pasc</p>
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NOTES

O-XYLENE

XLO

Common Synonyms 2-Dimethylbenzene Xylo		Watery liquid Colorless Sweet odor
Floats on water. Flammable, irritating vapor is produced.		
Stop discharge if possible. Keep people away. Call fire department. Avoid contact with liquid and vapor. Isolate and remove discharged material. Notify local health and pollution control agencies.		
Fire	FLAMMABLE Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear self-contained breathing apparatus. Extinguish with foam, dry chemical, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.	
Exposure	CALL FOR MEDICAL AID. VAPOR Irritating to eyes, nose and throat. If inhaled, will cause headache, difficult breathing, or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. LIQUID Irritating to skin and eyes. If swallowed, will cause nausea, vomiting, or loss of consciousness. Remove contaminated clothing and shoes. Flush affected area with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.	
Water Pollution	Dangerous to aquatic life in high concentrations. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.	
1. RESPONSE TO DISCHARGE (See Response Methods Handbook) Issue warning-high flammability Evacuate area Should be removed Chemical and physical treatment		2. LABEL 2.1 Category: Flammable liquid 2.2 Class: 3
3. CHEMICAL DESIGNATIONS 3.1 CG Compatibility Class: Aromatic Hydrocarbon 3.2 Formula: C_8H_{10} 3.3 IMO/UN Designation: 3.2/1307 3.4 DOT ID No.: 1307 3.5 CAS Registry No.: 95-47-6		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Benzene-like; characteristic aromatic
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Approved canister or air-supplied mask; goggles or face shield; plastic gloves and boots. 5.2 Symptoms Following Exposure: Vapors cause headache and dizziness. Liquid irritates eyes and skin. If taken into lungs, causes severe coughing, distress, and rapidly developing pulmonary edema. If ingested, causes nausea, vomiting, cramps, headache, and coma. Can be fatal. Kidney and liver damage can occur. 5.3 Treatment of Exposure: INHALATION: remove to fresh air; administer artificial respiration and oxygen if required; call a doctor. INGESTION: do NOT induce vomiting; call a doctor. EYES: flush with water for at least 15 min. SKIN: wipe off, wash with soap and water. 5.4 Threshold Limit Value: 100 ppm 5.5 Short Term Inhalation Limits: 300 ppm for 30 min. 5.6 Toxicity by Ingestion: Grade 3; LD ₅₀ = 50 to 500 mg/kg 5.7 Late Toxicity: Kidney and liver damage. 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight stinging of the eyes or respiratory system if present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If applied on clothing and allowed to remain, may cause stinging and reddening of the skin. 5.10 Odor Threshold: 0.06 ppm 5.11 IDLH Value: 10,000 ppm		

6. FIRE HAZARDS 6.1 Flash Point: 63°F C.C.; 75°F O.C. 6.2 Flammable Limits in Air: 1.1%-7.0% 6.3 Fire Extinguishing Agents: Foam, dry chemical, or carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective. 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back. 6.7 Ignition Temperature: 960°F 6.8 Electrical Hazard: Class I, Group D 6.9 Burning Rate: 6.8 mm/min. 6.10 Adiabatic Flame Temperature: Data not available 6.11 Stoichiometric Air to Fuel Ratio: Data not available 6.12 Flame Temperature: Data not available	10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook) A-T-U																																				
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8. WATER POLLUTION 8.1 Aquatic Toxicity: > 100 mg/l/96 hr/D, magna/TL ₀ /fresh water 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): 0 lb/lb. 5 days; 2.5% (theor.), 8 days 8.4 Food Chain Concentration Potential: Data not available	12. PHYSICAL AND CHEMICAL PROPERTIES 12.1 Physical State at 15°C and 1 atm: Liquid 12.2 Molecular Weight: 106.16 12.3 Boiling Point at 1 atm: 291.9°F = 144.4°C = 417.6°K 12.4 Freezing Point: -13.3°F = -25.2°C = 248.0°K 12.5 Critical Temperature: 674.8°F = 357.1°C = 630.3°K 12.6 Critical Pressure: 541.5 atm = 38.84 psia = 3.732 MN/m ² 12.7 Specific Gravity: 0.880 at 20°C (liquid) 12.8 Liquid Surface Tension: 30.53 dynes/cm = 0.0053 N/m at 15.5°C 12.9 Liquid Water Interfacial Tension: 36.06 dynes/cm = 0.00606 N/m at 20°C 12.10 Vapor (Gas) Specific Gravity: Not pertinent 12.11 Ratio of Specific Heats of Vapor (Gas): 1.066 12.12 Latent Heat of Vaporization: 149 Btu/lb = 82.9 cal/g = 3.47 X 10 ⁴ J/kg 12.13 Heat of Combustion: -17,556 Btu/lb = -8754.7 cal/g = -406.41 X 10 ⁴ J/kg 12.14 Heat of Decomposition: Not pertinent 12.15 Heat of Solution: Not pertinent 12.16 Heat of Polymerization: Not pertinent 12.26 Heat of Fusion: 30.84 cal/g 12.28 Limiting Value: Data not available 12.27 Reid Vapor Pressure: 0.28 psia																																				
9. SHIPPING INFORMATION 9.1 Grades of Purity: Research: 99.99%; Pure: 99.7%; Commercial: 95+% 9.2 Storage Temperature: Ambient 9.3 Inert Atmosphere: No reaction 9.4 Venting: Open (flame arrester) or pressure-vacuum																																					
NOTES																																					

p-XYLENE

XLP

<p>Common Synonyms 4-Dimethylbenzene Xylol</p>		<p>Watery liquid Colorless Sweet odor</p>
<p>Floats on water. Flammable, irritating vapor is produced. Freezing point is 56°F.</p>		
<p>Stop discharge if possible. Keep people away. Call fire department. Avoid contact with liquid and vapor. Isolate and remove discharged material. Notify local health and pollution control agencies.</p>		
<p>Fire</p>	<p>FLAMMABLE Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear self-contained breathing apparatus. Extinguish with foam, dry chemical, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.</p>	
<p>Exposure</p>	<p>CALL FOR MEDICAL AID. VAPOR Irritating to eyes, nose and throat. If inhaled, will cause dizziness, difficult breathing, or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. LIQUID Irritating to skin and eyes. If swallowed, will cause nausea, vomiting, loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.</p>	
<p>Water Pollution</p>	<p>HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.</p>	
<p>1. RESPONSE TO DISCHARGE (See Response Methods Handbook) Issue warning-high flammability Evacuate area Should be removed Chemical and physical treatment</p>	<p>2. LABEL 2.1 Category: Flammable liquid 2.2 Class: 3</p>	
<p>3. CHEMICAL DESIGNATIONS 3.1 CG Competibility Class: Aromatic Hydrocarbon 3.2 Formula: p-C₆H₄(CH₃)₂ 3.3 IMO/IUN Designation: 3.2/1307 3.4 DOT ID No.: 1307 3.5 CAS Registry No.: 106-42-3</p>	<p>4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Like benzene; characteristic aromatic</p>	
<p>5. HEALTH HAZARDS</p> <p>5.1 Personal Protective Equipment: Approved canister or air-supplied mask; goggles or face shield; plastic gloves and boots.</p> <p>5.2 Symptoms Following Exposure: Vapors cause headache and dizziness. Liquid irritates eyes and skin. If taken into lungs, causes severe coughing, distress, and rapidly developing pulmonary edema. If ingested, causes nausea, vomiting, cramps, headache, and coma. Can be fatal. Kidney and liver damage can occur.</p> <p>5.3 Treatment of Exposure: INHALATION: remove to fresh air; administer artificial respiration and oxygen if required; call a doctor. INGESTION: do NOT induce vomiting; call a doctor. EYES: flush with water for at least 15 min. SKIN: wipe off, wash with soap and water.</p> <p>5.4 Threshold Limit Value: 100 ppm</p> <p>5.5 Short Term Inhalation Limit: 300 ppm for 30 min.</p> <p>5.6 Toxicity by Ingestion: Grade 3; LD₅₀ = 50 to 500 mg/kg</p> <p>5.7 Late Toxicity: Kidney and liver damage.</p> <p>5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.</p> <p>5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.</p> <p>5.10 Odor Threshold: 0.05 ppm</p> <p>5.11 IDLH Value: 10,000 ppm</p>		

<p>6. FIRE HAZARDS</p> <p>6.1 Flash Point: 81°F C.C.</p> <p>6.2 Flammable Limits in Air: 1.1%-8.6%</p> <p>6.3 Fire Extinguishing Agents: Foam, dry chemical, or carbon dioxide</p> <p>6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective.</p> <p>6.5 Special Hazards of Combustion Products: Not pertinent</p> <p>6.6 Behavior in Fire: Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back.</p> <p>6.7 Ignition Temperature: 670°F</p> <p>6.8 Electrical Hazard: Class I, Group D</p> <p>6.9 Burning Rate: 5.8 mm/min.</p> <p>6.10 Adiabatic Flame Temperature: Data not available</p> <p>6.11 Stoichiometric Air to Fuel Ratio: Data not available</p> <p>6.12 Flame Temperature: Data not available</p>	<p>10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook) A-T-U</p>																																				
<p>7. CHEMICAL REACTIVITY</p> <p>7.1 Reactivity With Water: No reaction</p> <p>7.2 Reactivity with Common Materials: No reaction</p> <p>7.3 Stability During Transport: Stable</p> <p>7.4 Neutralizing Agents for Acids and Caustics: Not pertinent</p> <p>7.5 Polymerization: Not pertinent</p> <p>7.6 Inhibitor of Polymerization: Not pertinent</p> <p>7.7 Molar Ratio (Reactant to Product): Data not available</p> <p>7.8 Reactivity Group: 32</p>	<p>11. HAZARD CLASSIFICATIONS</p> <p>11.1 Code of Federal Regulations: Flammable liquid</p> <p>11.2 HAS Hazard Rating for Bulk Water Transportation:</p> <table border="1"> <thead> <tr> <th>Category</th> <th>Rating</th> </tr> </thead> <tbody> <tr> <td>Fire</td> <td>3</td> </tr> <tr> <td>Health</td> <td></td> </tr> <tr> <td>Vapor Irritant</td> <td>1</td> </tr> <tr> <td>Liquid or Solid Irritant</td> <td>1</td> </tr> <tr> <td>Poisons</td> <td>2</td> </tr> <tr> <td>Water Pollution</td> <td></td> </tr> <tr> <td>Human Toxicity</td> <td>1</td> </tr> <tr> <td>Aquatic Toxicity</td> <td>3</td> </tr> <tr> <td>Aesthetic Effect</td> <td>2</td> </tr> <tr> <td>Reactivity</td> <td></td> </tr> <tr> <td>Other Chemicals</td> <td>1</td> </tr> <tr> <td>Water</td> <td>0</td> </tr> <tr> <td>Salt Reaction</td> <td>0</td> </tr> </tbody> </table> <p>11.3 NFPA Hazard Classification:</p> <table border="1"> <thead> <tr> <th>Category</th> <th>Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td> <td>2</td> </tr> <tr> <td>Flammability (Red)</td> <td>3</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td>0</td> </tr> </tbody> </table>	Category	Rating	Fire	3	Health		Vapor Irritant	1	Liquid or Solid Irritant	1	Poisons	2	Water Pollution		Human Toxicity	1	Aquatic Toxicity	3	Aesthetic Effect	2	Reactivity		Other Chemicals	1	Water	0	Salt Reaction	0	Category	Classification	Health Hazard (Blue)	2	Flammability (Red)	3	Reactivity (Yellow)	0
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Flammability (Red)	3																																				
Reactivity (Yellow)	0																																				
<p>8. WATER POLLUTION</p> <p>8.1 Aquatic Toxicity: 22 ppm/96 hr/bluegill/TL₅₀/fresh water</p> <p>8.2 Waterfowl Toxicity: Data not available</p> <p>8.3 Biological Oxygen Demand (BOD): 0 lb/lb in 5 days</p> <p>8.4 Food Chain Concentration Potential: Data not available</p>	<p>12. PHYSICAL AND CHEMICAL PROPERTIES</p> <p>12.1 Physical State at 15°C and 1 atm: Liquid</p> <p>12.2 Molecular Weight: 106.16</p> <p>12.3 Boiling Point at 1 atm: 280.9°F = 138.3°C = 411.5°K</p> <p>12.4 Freezing Point: 56.9°F = 13.3°C = 286.5°K</p> <p>12.5 Critical Temperature: 649.4°F = 343.0°C = 816.2°K</p> <p>12.6 Critical Pressure: 506.4 atm = 34.85 psia = 3.510 MN/m²</p> <p>12.7 Specific Gravity: 0.861 at 20°C (liquid)</p> <p>12.8 Liquid Surface Tension: 29.3 dynes/cm = 0.0283 N/m at 20°C</p> <p>12.9 Liquid Water Interfacial Tension: 37.8 dynes/cm = 0.0378 N/m at 20°C</p> <p>12.10 Vapor (Gas) Specific Gravity: Not pertinent</p> <p>12.11 Ratio of Specific Heats of Vapor (Gas): 1.071</p> <p>12.12 Latent Heat of Vaporization: 150 Btu/lb = 81 cal/g = 3.4 X 10⁴ J/kg</p> <p>12.13 Heat of Combustion: -17,550 Btu/lb = -8754.7 cal/g = -408.41 X 10⁴ J/kg</p> <p>12.14 Heat of Decomposition: Not pertinent</p> <p>12.15 Heat of Solution: Not pertinent</p> <p>12.16 Heat of Polymerization: Not pertinent</p> <p>12.20 Heat of Fusion: 37.83 cal/g</p> <p>12.26 Limiting Value: Data not available</p> <p>12.27 Reid Vapor Pressure: 0.34 psia</p>																																				
<p>9. SHIPPING INFORMATION</p> <p>9.1 Grades of Purity: Research: 99.99%; Pure: 99.8%; Technical: 99.0%</p> <p>9.2 Storage Temperature: Ambient</p> <p>9.3 Inert Atmosphere: No requirement</p> <p>9.4 Venting: Open (flame arrester) or pressure-vacuum</p>	<p>NOTES</p>																																				

ZINC CHLORIDE

ZCL

Common Synonyms	Solid	White solid	Odorless
Solid sinks and mixes with water.			
Keep people away. Avoid contact with solid and solution. Isolate and remove discharged material. Notify local health and pollution control agencies.			
Fire	Not flammable.		
Exposure	<p>CALL FOR MEDICAL AID</p> <p>SOLID OR SOLUTION Irritating to skin and eyes. If swallowed, will cause nausea or vomiting. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.</p>		
Water Pollution	<p>HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes.</p> <p>Notify local health and wildlife officials Notify operators of nearby water intakes.</p>		
<p>1. RESPONSE TO DISCHARGE (See Response Methods Handbook) Issue warning-water contaminant Disperse and flush</p>		<p>2. LABEL 2.1 Category: None 2.2 Class: Not pertinent</p>	
<p>3. CHEMICAL DESIGNATIONS 3.1 CG Compatibility Class: Not listed 3.2 Formula: ZnCl₂ 3.3 IMO/UN Designation: 8.0/1840 3.4 DOT ID No.: 1840 3.5 CAS Registry No.: 7646-85-7</p>		<p>4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White 4.3 Odor: Odorless</p>	
<p>5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles or face shield. 5.2 Symptoms Following Exposure: Solid or water solution is astringent and can irritate the eyes. When ingested, can cause intoxication, severe irritation of stomach, nausea, vomiting, and diarrhea. 5.3 Treatment of Exposure: INGESTION: give large volumes of water and induce vomiting; repeat process; call a doctor. EYES: wash with water for at least 15 min. 5.4 Threshold Limit Value: 1 mg/m³ (dust). 5.5 Short Term Inhalation Limits: Not pertinent 5.6 Toxicity by Ingestion: Grade 3, LD₅₀ = 50 to 500 mg/kg 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Non-volatile 5.9 Liquid or Solid Irritant Characteristics: Solid irritates skin on prolonged contact. 5.10 Odor Threshold: Not pertinent 5.11 IDLM Value: 2,000 mg/m³</p>			

<p>6. FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: Not flammable 6.8 Electrical Hazard: Not flammable 6.9 Burning Rate: Not flammable 6.10 Adiabatic Flame Temperature: Data not available 6.11 Stoichiometric Air to Fuel Ratio: Data not available 6.12 Flame Temperature: Data not available</p>	<p>10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook) SS</p>
<p>7. CHEMICAL REACTIVITY 7.1 Reactivity With Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent 7.7 Molar Ratio (Reactant to Product): Data not available 7.8 Reactivity Group: Data not available</p>	<p>11. HAZARD CLASSIFICATIONS 11.1 Code of Federal Regulations: ORM-E 11.2 NAB Hazard Rating for Bulk Water Transportation: Not listed 11.3 NFPA Hazard Classification: Not listed</p>
<p>8. WATER POLLUTION 8.1 Aquatic Toxicity: 7.2 ppm/96 hr/medium bluegill/TL₅₀/fresh water 28 ppm/48 hr/zebrafish/TL₅₀/salt water 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): None 8.4 Food Chain Concentration Potential: None</p>	<p>12. PHYSICAL AND CHEMICAL PROPERTIES 12.1 Physical State at 15°C and 1 atm: Solid 12.2 Molecular Weight: 136.28 12.3 Boiling Point at 1 atm: Very high 12.4 Freezing Point: 541°F = 283°C = 556°K 12.5 Critical Temperature: Not pertinent 12.6 Critical Pressure: Not pertinent 12.7 Specific Gravity: 2.91 at 25°C (solid) 12.8 Liquid Surface Tension: Not pertinent 12.9 Liquid Water Interfacial Tension: Not pertinent 12.10 Vapor (Gas) Specific Gravity: Not pertinent 12.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 12.12 Latent Heat of Vaporization: Not pertinent 12.13 Heat of Combustion: Not pertinent 12.14 Heat of Decomposition: Not pertinent 12.15 Heat of Solution: Not pertinent 12.16 Heat of Polymerization: Not pertinent 12.18 Heat of Fusion: 40.6 cal/g 12.26 Limiting Value: Data not available 12.27 Reid Vapor Pressure: Data not available</p>
<p>9. SHIPPING INFORMATION 9.1 Grades of Purity: Reagent; USP; technical; 50% solution in water 9.2 Storage Temperature: Ambient 9.3 Inert Atmosphere: No requirement 9.4 Venting: Data not available</p>	
NOTES	

JOB SAFETY & HEALTH PROTECTION

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

Employers

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

Employees

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

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

Inspection

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

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

Complaint

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

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

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

Citation

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

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

Proposed Penalty

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

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

Voluntary Activity

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

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

Consultation

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

POSTING INSTRUCTIONS

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

More Information

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

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

Washington, D.C.
1989 (Revised)
OSHA 2203

Elizabeth Dole, Secretary of Labor
U.S. Department of Labor
Occupational Safety and Health Administration

Under provisions of Title 29, Code of Federal Regulations, Part 1903.2(a)(1) employers must post this notice (or a facsimile) in a conspicuous place where notices to employees are customarily posted.

APPENDIX O

RESPIRATORY PROTECTION PROGRAM

APPENDIX O

0.1 INTRODUCTION

This program was developed to govern the selection and use of respiratory protective devices by ABB Environmental personnel. The program is intended to comply with 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.

0.2 PERSONNEL REQUIREMENTS

All personnel assigned to field activities at hazardous or potentially hazardous locations are currently required by ABB Environmental's health and safety policies to be enrolled in the corporate health monitoring program. Part of this program involves spirometry, a measure of the respiratory system status. No personnel may be assigned to the use of or may withdraw from stock any respiratory protective device without a physician's certification that use of the 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.

Personnel will not be assigned duties that require a respirator when facial hair, skullcaps, or eyeglasses will interfere with a proper fit. Contact lenses may not be worn with any respiratory protective device. Eyeglass frames that fit inside the respirator facepiece are provided as necessary.

0.3 APPLICABLE EQUIPMENT

ABB Environmental maintains the following respiratory protective equipment:

- full-face chemical/mechanical air-purifying respirators
- SCBA
- full-face airline-supplied breathing apparatus
- 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 ABB Environmental personnel. Selection criteria are presented separately; training is required in the use of each type of equipment before drawing from stock.

O.4 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 the following topics:

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

Information regarding each topic is presented as standard respiratory protection procedures in the corporate health and safety program manual.

O.5 PROGRAM ADMINISTRATION AND DOCUMENTATION

Administration of the ABB Environmental Respiratory Protection Program is the responsibility of the HSM, and includes the following:

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

Fit testing and respirator maintenance is performed by the equipment manager of ABB Environmental's Sample Control and Staging Center in Portland, Maine, and designated, trained employees at the other offices. All fit-testing and respirator maintenance is conducted under the administration of the HSM. Major maintenance is performed by manufacturer-certified technicians only. Personnel training in respiratory protection is one aspect of the HSM's ongoing personnel training programs. Program evaluation is a dynamic process, occurring each time a project HASP is prepared.

Medical supervision of personnel occurs as part of the ABB Environmental health monitoring program, also administered by the HSM. Medical surveillance is required for all personnel assigned to hazardous or potentially hazardous site activities.

Documentation of the various elements of the ABB Environmental respiratory protection program is achieved through several media, as follows:

- Documentation of respirator selection is included in the hazard assessment of each site's HASP.
- Documentation of personnel training is maintained in both hardcopy and computerized files.
- 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.
- Using the appropriate form, documentation of fit-testing is maintained on file with the equipment manager of the Sample Control and Staging Center and with the HSM or designee.
- Documentation of site surveillance is required both by this program and by the HASP for each site. Records of site surveillance are created by the HSO and maintained in project files.
- Respirator inspection and maintenance records are created and maintained by the equipment manager for each respirator, SCBA, and escape respirator.

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

0.6 INSPECTION, MAINTENANCE, AND STORAGE

0.6.1 Introduction

Respirator maintenance is an integral part of the overall respirator program. Wearing a poorly maintained or malfunctioning respirator, in one sense, is 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 because 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 an emergency escape or rescue. The respirator program includes the following components:

- inspection for defects (including a leak check)
- cleaning and disinfecting
- repair as required
- proper and sanitary storage of equipment

0.6.2 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, and (2) while it is being cleaned. Because the use and cleaning will be performed primarily by the same personnel, these inspections may become concurrent.

0.6.3 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 monthly...." Obviously, emergency escape and rescue devices do not require inspection before each use.

0.6.4 Inspection Procedures

Respirator inspection will include checking of the following:

- tightness of the connections
- facepiece
- valves
- connecting tubes
- canisters, filters, or cartridges

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

0.6.5 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:
 - excessive dirt
 - cracks, tears, holes, or physical distortion of shape from improper storage
 - inflexibility of rubber facepiece (stretch and knead to restore flexibility)
 - cracked or badly scratched lenses in full facepieces
 - incorrectly mounted full facepiece lenses, or broken or missing mounting clips
 - cracked or broken air-purifying element holder(s), badly worn threads, or missing gasket(s)
2. Examine the head straps or head harness for:
 - breaks
 - loss of elasticity
 - broken or malfunctioning buckles and attachments
 - excessively worn serrations on head harness, which might permit slippage (full facepieces only)
3. Examine the exhalation valve for the following after removing the cover:
 - foreign material (e.g., detergent residue, dust particles, or human hair under valve seat)
 - cracks, tears, or distortion in the valve material
 - improper insertion of the valve body in the facepiece
 - cracks, breaks, or chips in the valve body, particularly the sealing surface
 - missing or defective valve cover
 - improper installation of the valve in the valve body

4. Examine the air-purifying element(s) for:
 - incorrect cartridge, canister, or filter for the hazard
 - incorrect installation, loose connections, missing or worn gasket, or cross-threading in the holder
 - expired shelf-life date on the cartridge or canister
 - cracks or dents in the outside case of the filter, cartridge, or canister indicated by the absence of sealing material, tape, or foil over the inlet
 - identical cartridges if more than one are used

0.6.6 Care and Cleaning of Self-contained Breathing Apparatus

The proper care of SCBAs involves the following:

- inspection for defects
- cleaning and disinfecting
- repair
- storage

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

1. Preliminary Inspection. Check to ensure that:
 - high-pressure hose connector is tight on cylinder fitting
 - bypass valve is closed
 - mainline valve is closed
 - there is no cover or obstruction on regulator outlet
 - pressure in the tank is at least 1,800 psi
2. Backpack and Harness Assembly.
 - Straps
 - visually inspect for complete set
 - visually inspect for frayed or damaged straps that may break during use
 - Buckles

- visually inspect for mating ends
 - check locking function
 - Backplate and Cylinder Lock
 - visually inspect backplate for cracks and for missing rivets or screws
 - visually inspect cylinder hold-down strap and physically check strap tightener and lock to ensure that it is fully engaged
3. Cylinder and Cylinder Valve Assembly.
- Cylinder
 - physically check cylinder to ensure that it is tightly fastened to backplate
 - check hydrostatic test date to ensure that it is current
 - visually inspect cylinder for large dents or gouges in metal
 - Head and Valve Assembly
 - visually inspect cylinder for presence of valve lock
 - visually inspect cylinder gauge for condition of face, needle, and lens
 - 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.
- 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.)
 - Regulator and Low-pressure Alarm
 - Cover outlet of regulator with palm of hand. Open mainline valve and read regulator gauge (must read at least 1,800 psi and not more than rated cylinder pressure).

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- 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.
 - 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 seconds. 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.
 - Open cylinder valve.
 - 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.
 - 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.
- Facepiece
 - Visually inspect head harness for damaged serrations and deteriorated rubber. Visually inspect rubber facepiece body for signs of deterioration or extreme distortion.
 - Retaining clamp properly in place, visually inspect lens for proper seal in rubber facepiece, and for cracks or large scratches.
 - Visually inspect exhalation valve for visible deterioration or foreign materials buildup.

- Breathing Tube and Connector
 - Stretch breathing tube and visually inspect for deterioration and holes.
 - Visually inspect connector to ensure good condition of threads and for presence and proper condition of "O" ring or rubber gasket seal.
 - Perform a negative pressure test on facepiece.
 - 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 seconds. If negative pressure leaks down, the facepiece assembly is not adequate and should not be worn.
- 6. Storage of Units. Check that:
 - cylinder is refilled as necessary and unit is cleaned and inspected
 - cylinder valve is closed
 - high-pressure hose connector is tight on cylinder
 - pressure is bled off high-pressure hose and regulator
 - bypass valve is closed
 - mainline valve is closed
 - all straps are completely loosened and laid straight
 - facepiece is properly stored to protect against dust, sunlight, heat, extreme cold, excess moisture, and damaging chemicals

0.6.7 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 can be made from readily available household solutions, including the following:

- Hypochlorite solution (50 ppm of chlorine) can be made by adding approximately 2 milliliters of bleach (e.g., Clorox) to 1 liter of water, or 2 tablespoons of bleach per gallon of water. A 2-minute immersion disinfects the respirators.
- Aqueous solution of iodine (50 ppm of iodine) can be made by adding approximately 0.8 milliliter of tincture of iodine per liter of water, or 1 teaspoon of tincture of iodine per gallon of water. A 2-minute immersion is sufficient to disinfect the respirators.

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

0.6.8 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 important for preventing dermatitis.

0.6.9 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; however, care must be taken not to damage or distort the facepieces.

0.6.10 Reassembly and Inspection

To avoid contamination, the clean, dry respirator facepieces should be reassembled and inspected in an area separate from the disassembly area. The inspection procedures were discussed previously; 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 should be performed.

O.6.11 Maintenance and Repair

Replacement or repair should be done only by trained, experienced persons using 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.

O.6.12 Respirator Storage

Respirators must be stored properly to protect against the following:

- dust
- sunlight
- heat
- extreme cold
- excessive moisture
- damaging chemicals
- mechanical damage

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

APPENDIX P

OTHER

APPENDIX P

P.1 ILLUMINATION

Site operations will not be permitted without adequate lighting. Therefore, unless provisions are made for artificial light, downrange operations must halt in time to permit personnel and equipment to exit the Exclusion Zone and proceed through decontamination before dusk. Conversely, operations will not be permitted to begin until lighting is adequate.

P.2 SANITATION

Provisions must be made for sanitation facilities for the site work force. At a minimum, the provision of toilet facilities must meet the requirements of 29 CFR 1910.120(n), which includes one facility for less than 20 employees, or one toilet and one urinal for every 40 employees, up to 200; then one of each for every 50 employees. If it is a mobile crew and they have transport readily available, the requirements do not apply.

P.3 HEALTH AND SAFETY AUDIT PROCEDURES

Regular health and safety audits will be conducted to ensure compliance with health and safety policy and procedures. The HSO will perform periodic audits, with the goal of one audit per shift, using the health and safety audit form (see Appendix N). Auditing may be performed on any ABB Environmental site by the HSS or the HSM, and will include health and safety evaluations of all work activities. The audits will be an unannounced evaluation of sites selected at the discretion of the HSM or HSS, with the goal of 10 percent of active sites being subject to audits each quarter.

Results of each site health and safety audit will be summarized in an audit report provided to the site HSO, the Project Manager, and the Operational Group Manager charged with responsibility for the project. Where the audit report identifies deficiencies, it will be the Project Manager's responsibility to promptly implement corrective action. The corrective action undertaken will be outlined in a written report submitted to the HSS and the HSM. The HSM or the HSS will retain the original audit report that has been signed by the Project Manager and the HSO to acknowledge receipt of the audit's findings. Any mitigating comments submitted to the HSM or the HSS will be appended to the original report.

APPENDIX Q

STANDARD OPERATING PROCEDURES

APPENDIX QQ.1 STANDARD OPERATING PROCEDURES FOR THE USE OF EXPLOSIVES IN SEISMIC REFRACTION SURVEYSQ.1.1 Introduction

This appendix lists some of the more important aspects of the purchase, transport, storage, handling, and use of explosives. It is intended as a general guide for ABB Environmental personnel who may be involved in conducting seismic surveys or who may be overseeing or auditing such surveys. It is not intended as a stand-alone reference replacing appropriate federal and/or state regulations, which can be very specific about certain aspects regarding explosives.

Many recent advances in computer software and hardware and hardware technology have revolutionized data processing and interpreting in the seismic industry. Likewise, the recent development of sophisticated (and very expensive) truck-mounted energy sources that can scan a large range of frequencies for optimum response from deep reflecting horizons has made possible reflection surveys for hydrocarbon deposits to depths of up to 20 kilometers. However, for shallow (i.e., the upper several hundred feet) seismic refraction surveys, the best and most economical energy source continues to be small explosive charges detonated with electric blasting caps.

A small explosive charge, as defined herein, consists of the equivalent of from 1/8 to 1 pound of dynamite which is primed for detonation with one or more electric blasting caps. The "dynamite" that ABB Environmental generally uses is KINESTIK 1/3, which consists of a powder and liquid, mixed on-site to form an explosive similar in performance to dynamite. Each stick (86 to a case) is equivalent to 1/3 pound of dynamite. Before mixing, the two parts are not considered by the DOT to be explosive; therefore, they can be shipped, transported, and stored with no special precautions. In practice, ABB Environmental personnel should take every precaution to ensure that the powder and liquid are separated while being stored for any length of time to prevent unauthorized access to potentially explosive materials.

Electric blasting caps come in two configurations acceptable for seismographic work. The "seismograph" variety is best because of its repeatability with regard to delay time (i.e., the time that elapses between when the "fire" button on the blaster is depressed

and when the blasting cap actually detonates). The other type is known as "instantaneous," and it has acceptable delay time characteristics. Blasting caps are graded by the federal government (and all states) a Class A explosive and must be handled and stored accordingly. Requirements for Class A explosive are discussed in the following subsection.

Q.1.2 Purchase, Transport, and Storage

The federal government has specific guidelines regarding the purchase, transport, and storage of explosives, particularly regarding interstate commerce. In addition, each state has developed regulations that supersede federal regulations if they are more restrictive. Therefore, the user must become familiar with federal as well as state regulations. In practice, it is unlikely that ABB Environmental would ever become involved in interstate activities regarding explosives. In fact, it has been ABB Environmental's practice to subcontract out-of-state blasting activities to a local blaster to minimize expenses that would otherwise be incurred in obtaining necessary permits, and to eliminate time expended to purchase, transport, and store explosives. The following subsections pertain to State of Maine requirements. Other states can be and are different from Maine, and requirements vary widely.

Q.1.2.1 Purchase.

In the State of Maine, a blasting license for an individual is not required. Such a license is required in Massachusetts (a competency license) and New York (an explosives license). However, the State of Maine does require a written permit, issued by the Commissioner of Public Safety, for the transport of explosives in intrastate commerce in quantities larger than 200 pounds of dynamite, or more than 500 electric blasting caps. Although ABB Environmental never transport quantities exceeding these amounts, it has been company policy to obtain the State Permit to Transport Explosives, because it provides additional creditability to explosives vendors and local officials.

Before purchasing explosives in Maine, the user must obtain a permit from the fire marshal or appropriate local official in the town in which the explosives are to be used and/or stored. The local official must first establish the identity of the applicant, verify that he or she is older than 21 years of age and is a U.S. citizen, and inquire about the intended use of the explosives. Permitting through local officials can be as easy as a courtesy telephone call from the official notifying the local fire

department or police chief (every town or city handles explosives permitting a little differently).

Before selling explosives, the state requires the vendor to verify that a valid permit has been issued to the buyer by the appropriate local town official. In addition, the vendor should ascertain whether the buyer can comply with the rules and regulations relative to the transport of explosives.

Q.1.2.2 Transport.

Before issuing the State Permit to Transport Explosives, officials from the Department of Public Safety in Augusta, Maine, inspect the vehicle driven by the applicant to ensure that it is roadworthy. They also inspect the explosives magazine in which the explosives will be locked while in transit. State regulations require that the magazine be constructed of 1-and-1/2-inch-thick planking with no exposed metal on the inside (to eliminate sparks) and sheathed with NO. 24-gauge galvanized sheet steel. The magazine should have a strong hasp and padlock and be locked at all times when explosives are being transported. The magazine should also be chained and locked within the vehicle to prevent removal or shifting while under way. In addition, the vehicle should be equipped front and rear with two 1-quart (minimum) fire extinguishers suitable to extinguish electrical fires, and four diamond-shaped Class "A" explosives signs mounted on the front and rear and both sides of the vehicle. ABB Environmental owns a "day" magazine and other equipment that meets these requirements.

Q.1.2.3 Storage.

Regulations are very specific regarding storage. All that ABB Environmental personnel need to remember is Class "A" explosives must be returned for storage to a permanent or temporary magazine before sunset on each day of usage. The ABB Environmental day magazine is not a permanent or temporary magazine. A permanent magazine is a substantial structure located well away from dwellings and buildings where people work or congregate. It has was 4 to 8 inches thick (depending on method of construction), strong doors with interior hinges, and double-shielded locks specially designed for storage magazines. The roof is constructed to be bullet-proof, and foundation requirements are also specified. A temporary magazine is usually a rather massive steel box (i.e., 350 to 500 pounds or more) on casters, lined with thick wood planking, with double-shielded locks. It should be securely fastened to the ground.

Q.1.3 Handling and Use

Safety should be the foremost consideration whenever explosives are being used. Seismic surveys routinely expend 20 to 30 sticks of dynamite (and an equal number of electric blasting caps) during a single field day. To mix the KINESTIK, mix one "tube" of the KINESTICK liquid (a clear red liquid composed of nitromethane) with one "stick" of white powder (ammonium nitrate), and allow to stand until the powder is thoroughly saturated with the liquid (it becomes pink); this takes 5 to 10 minutes. If the upper 4 feet of overburden are wet or saturated, it is a good idea to seal the stick (equated with a screw cap) with tape to prevent contamination by groundwater. If groundwater enters the stick, it can cause the KINESTIK to misfire.

While the KINESTIK is being mixed, a series of shotholes (usually five) are prepared by driving a pointed 1-and-3/4-inch steel bar to the desired depth (from 2 to 4 or 5 feet) with a sledgehammer. The shothole depth depends on soil conditions and the anticipated size of the charge. Only when the explosives are ready to be placed at the bottom of a shothole, a blasting cap is placed in a molded cavity at the base of each stick. The blasting cap has two lead wires, usually 8 or 12 feet long, which are grounded together with a removable metal shield that should be left in place until the primed shot is ready to be fired. This prevents the induction of elect[^]Rc charge, which could accidentally fire the cap. The lead wires are used to connect the blasting cap to a double conductor (i.e., "shot") wire leading to the blaster. The cap is secured to the KINESTIK by two or more half-hitches with the two cap lead wires.

The explosive is not "primed" for detonation. After the primed shot is placed at the bottom of the shothole, a small amount of native soil (preferably sand) is placed in the hole and gently tamped with a tamping stick into the base of the hole over the primed explosive charge. A proper tamping stick is wooden (non-sparking), about 6 feet long and 1 to 1-1/4 inches in diameter (Note: dowel stock works well). The tamping procedure continues until a uniform column of native soil completely fills the shothole. One should be careful not to damage the cap lead wires during the tamping process.

The removal metal shield grounding the two cap lead wires together is removed only when the shot is ready to fire. Prior to making the connection between the cap lead wire and the shot wire leading to the blaster, the person making the connection should ascertain that the shot wire has been sorted out as the blaster by the party

chief (operating the blaster) so that inadvertent detonation is not possible). While making the connection, the lead wires should be extended as far from the shothole as possible. The person making the connection should turn his or her back to the shothole, remove the metal grounding shield, and attach the shot wire leads (no polarity) to the cap wire leads.

As each shot is detonated, one person (usually the one making the connection) should be assigned to verify that no one is near the shot. The party chief should then call out, "Are you clear (of the shot)?" The response, "all clear" indicates that everything is ready and no one is close enough to be in any danger when the shot is detonated. A "safe" distance varies with soil conditions and the depth of the shot; 75 to 100 feet is generally adequate. The party chief then calls out to everyone in the area, "Fire in the hole," and the charge is detonated.

If a misfire occurs (extremely rare), it is the responsibility of the party chief to remove the undetonated charge from the ground with a nonsparking shovel of wood or brass. The party chief is responsible for maintaining an explosives log that documents all explosives purchased, expended, stored, and destroyed. This log is subject to inspection at any time by local, state, and federal officials. It provides a record detailing the disposition of every cap and stick of dynamite (or KINESTIK) that comes under the control of ABB Environmental personnel.

The amount of explosives that can be loaded into a shothole depends on the nature of the surface materials and the depth of the water table. Some general rules follow:

- use as few explosives as necessary to produce good quality data
- the more granular the soils, the more explosives will be required (to produce good data); the finer the soils, the fewer will be required
- the deeper the water table, the more explosives required, and vice versa
- the deeper the bedrock, the more explosives will be required, and vice versa

When ascertaining the proper explosive charge to produce good data at a new site, it is good practice to start with a single shothole well away from any buildings and power lines, and perform a test

shot to determine local soil (an energy transmission) characteristics. Start with a small charge (e.g., half a stock of KINESTIK, obtained by mixing half the liquid from one tube with half the powder from one stick) buried to moderate depth (e.g., 3 feet) and increase (or decrease) the amount of the charge (and the depth of the shothole) as necessary.