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ABB ENVIRONMENTAL SERVICES

RCRA FACILITY INVESTIGATION WORKPLAN

VOLUME III. HEALTH AND SAFETY PLAN
U.S. NAVAL STATION
MAYPORT, FLORIDA

Unit Identification Code: N60201

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Mayport, Florida

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GLOSSARY

FIT	Field Investigation Team
HASP	Health and Safety Plan
HSC	Health and Safety Committee
HSM	Health and Safety Manager
HSO	Health and Safety Officer
LEL	lower explosive level
RAMP	Remedial Action Master Plan
SCBA	self-contained breathing apparatus

1.0 INTRODUCTION

The ABB Environmental Services, Inc. (ABB-ES), began a formal program of site risk assessment and implementation of mitigative health and safety programs in March 1981. At that time, existing departmental policies and practices were collected and reviewed, additional needs identified, and a corporate personnel health and safety plan drafted.

Currently, ABB-ES' Health and Safety Manager (HSM), with the aid of the 10-member Health and Safety Committee (HSC) regularly reviews health and safety issues, updates practices as new information becomes available, oversees administration of the Health Monitoring Program, and provides guidance for personnel training as appropriate. The HSC is a corporate entity, effectively precluding any departmental and contract pressures on health and safety policy decisions.

Each project site is classified hazardous or non-hazardous by the HSM after a review of available data. Prior to onsite activities at those sites classified as hazardous, a site-specific health and safety plan (HASP) must be completed by the project engineer or scientist. This is accomplished by a review of available information on the site to assess the potential risks and provide an initial determination of personal protection requirements. The HASP is subsequently reviewed and must be approved by the HSM. The designated Site Safety Officer monitors actual site conditions and may alter these requirements as needed. In all cases, personnel safety is the paramount factor in decision making.

2.0 HEALTH MONITORING AND SAFETY PROGRAM

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

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

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

Appendices A and B of this report include the Chemical Hazard Data Sheets for potential contaminants and miscellaneous safety reports. A Heat Stress Casualty Prevention Plan and information concerning level B protection are included in Appendices C and D, respectively. Vital information on the respiratory protection program is contained in Appendix E and a Vapor Emission Response Plan is included as Appendix F.

The site-specific information required to address the areas noted above is presented in summary safety plans prepared for this investigation. The plans are intended to provide a framework within which information may be updated and ongoing decisions made regarding actual health and safety concerns at the site.

The summary site safety plan format is presented as Appendix G. After reviewing Appendix G, all field personnel should sign the field team review sheet in Appendix H.

3.0 MEDICAL SURVEILLANCE PROCEDURES

3.1 HEALTH MONITORING PROGRAM. All onsite ABB-ES personnel and laboratory staff must be enrolled in the Health Monitoring Program, which is implemented through Environmental Medicine Resources (EMR), Atlanta, Georgia. EMR consists of a team of physicians and support personnel who specialize in occupational medicine. This program consists of an initial medical examination to establish the employee's general health profile and provides important baseline laboratory data for later comparative study. The contents of the initial comprehensive physical examination and laboratory testing routine is given in Table 3-1. Follow up examinations are completed for all personnel enrolled in the health monitoring program on an annual basis, or more frequently if project assignments warrant testing following specific field activities. Follow-up examinations are tailored to the exposures recorded by the individual.

3.2 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 Health and Safety Officer (HSO) will be watchful for outward evidences of changes in worker health. These outward symptoms may include skin irritations, skin discoloration, eye irritation, muscular soreness, fatigue, nervousness or irritability, intolerance to heat or cold, or loss of appetite. Employees will routinely be asked to assess their general state of health during the project.

Special medical monitoring may be identified for certain sites.

Table 3-1
Baseline Health Monitoring Program

RCRA Facility Investigation
Mayport, Florida

Activity		Description
Physical Examination	a.	Medical history
	b.	Medical examination
	c.	Vision • near and distant • color
	d.	Audiometry
	e.	Radiology: • posterior, anterior/lateral
	f.	Spirometry
	g.	Electrocardiogram
Laboratory Analysis	a.	Complete blood counts and chemistries • white blood count • differential cell counts • methemoglobin • uric acid • lactic dehydrogenase (LDH) • alkaline phosphatase • calcium • phosphorous • cholesterol • urea nitrogen (BUN) • glucose • albumin • globulin • total protein • total bilirubin • serum glutamic oxalacetic transaminase SGOT • hemoglobin and/or hematocrit
	b.	Urinanalysis • color and character • specific gravity • pH • protein • acetone • glucose • microscopic examination

4.0 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 onsite are unknown, the hazards are not clearly established, or the situation changes during onsite activities, the HSO must make a reasonable determination of the level of protection that will assure the safety of investigators and response personnel until the potential hazards have been determined through monitoring, sampling, informational assessment, laboratory analyses, or other reliable methods. When 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.

Preparation of site-specific plans will be based on the site-specific information made available through site files, the Remedial Action Master Plan (RAMP), and Field Investigation Team (FIT) reports, as well as any other sources identified. The levels of protection used by ABB-ES are presented below.

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

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

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

Level D. Level D is the basic work uniform, and is selected when site hazards are judged to be minimal. Investigators and response personnel, however, must not be permitted to work in civilian clothes. Level D often requires carrying an escape respirator. Fit testing of safety equipment is an important part of establishing adequate respiratory protection (see also Appendix E). Fit testing is accomplished prior to site explorations and each individual is assigned a fitted respirator for the duration of the project. These are tagged for identification. The equipment used for each level of protection is shown in Table 4-1. It should be recognized that situations exist where different combinations of respiratory and dermal protective gear are appropriate, such as where splash protection is required but no respiratory hazard exists. The HSO may elect a modification of the above-specified combinations.

Table 4-1
Protective Gear

RCRA Facility Investigation
Mayport, Florida

Respirator Type[1]	Level D Escape	Level C Full Face	Level B SCBA	Level A SCBA
Clothing				
Boots	X	X	X	X
Safety glasses or equivalent	X	X	X	
Hard Hart	X	X	X	
Gloves, inner and outer	X	X	X	X
Booties		X	X	X
Coveralls	X	X	X	
Chemical protective coveralls		X	X	
Total encapsulated suit				X

[1] Use of an air purifying respirator is allowed only where identification of constituents has occurred and appropriate respirator cartridges have been obtained (refer to Figure 4-1).

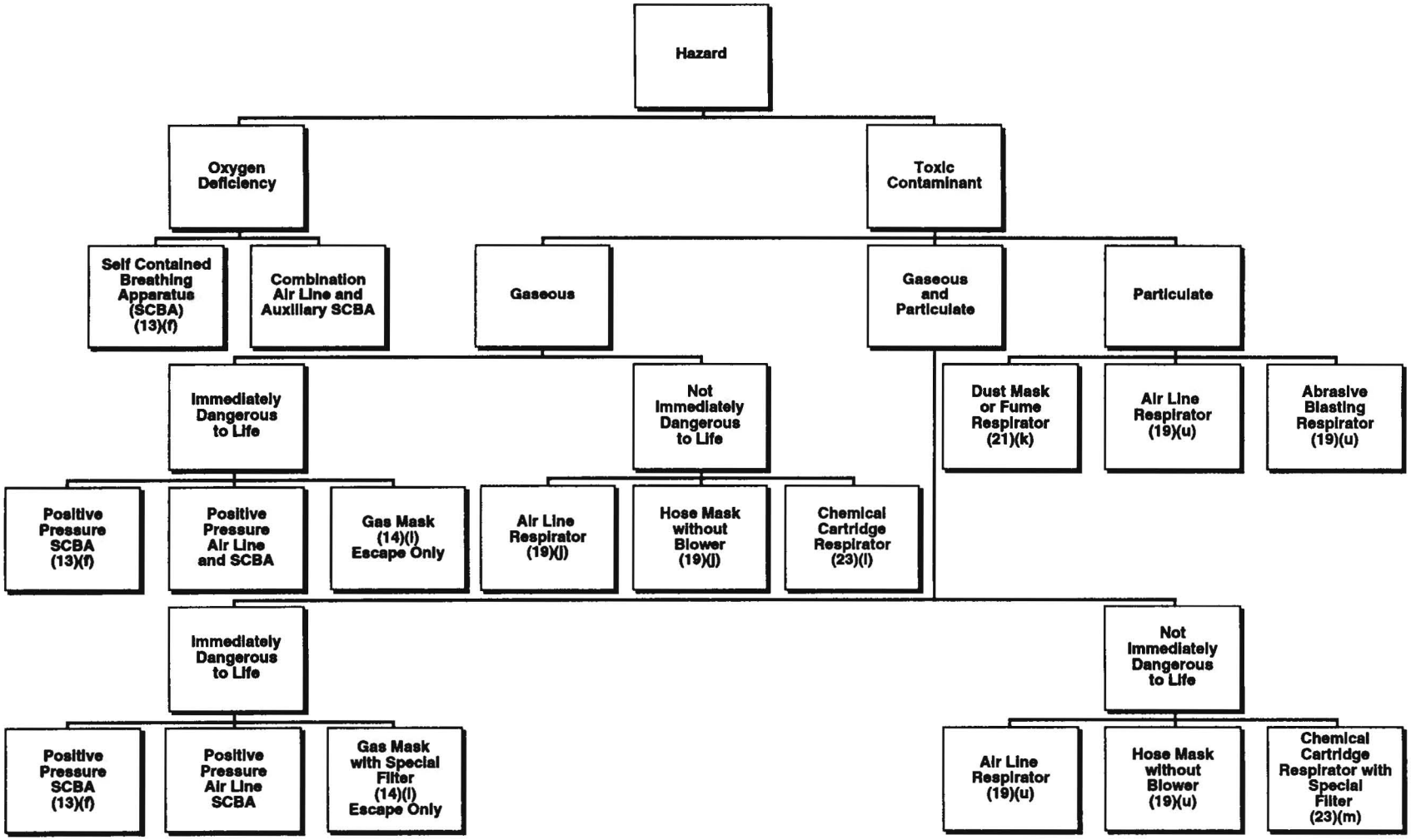
Note: SCBA = self-contained breathing apparatus.

Appendix A includes Chemical Hazard Data Sheets that summarize toxicity and properties of chemicals that may be found in soil and water onsite.

A review of physical hazards must also be performed.

The chemical hazard data sheets include the following information:

- emergency response procedures for fire, exposure, and water pollution;
- response to discharge;
- label category and class;
- chemical designations;
- observable characteristics;
- health hazards;
- fire hazards;
- chemical reactivity;
- water pollution;
- shipping information;
- hazard assessment code;
- hazard classification; and
- physical and chemical properties.



Based on Bureau of Mines Information Circular 7792
Numbers in Parenthesis Refer to Bureau of Mines Schedule
Numbers in Parenthesis Refer to Subpart of NIOSH/NESA 30 CFR Part II

SOURCE: LUNDIN, 1979

FIGURE 4-1

SELECTION OF RESPIRATORY EQUIPMENT

RCRA FACILITY INVESTIGATION
HEALTH AND SAFETY PLAN

U.S. NAVAL STATION
MAYPORT, FLORIDA

8533-03 940526WEM

5.0 WORKER SAFETY PROCEDURES

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

1. In any unknown situation, always assume the worst conditions and plan responses accordingly.

2. Employ the buddy system. Establish and maintain communication. In addition to radio communications, it is advisable to develop a set of hand signals as conditions may greatly impair verbal communications.

3. Minimize contact with excavated or contaminated materials. Plan work areas, decontamination areas, and procedures to accomplish this. Do not place equipment on drums or on the ground. Do not sit on drums or other materials.

4. Employ disposable items when possible to minimize risks during decontamination and possible cross contamination during handling of samples. This will require a common sense approach to potential risks and costs.

5. Smoking, eating, or drinking after entering the work zone and before decontamination will not be allowed. Oral ingestion of contaminants is probably the second most likely means of introduction of the toxic substances into the body (inhalation being first).

6. Avoid heat and other work stresses related to wearing the protective gear. Work breaks should be planned to prevent stress related accidents or fatigue. Appendix C provides a summary heat stress casualty prevention plan.

7. Maintain monitoring systems. Conditions can change quickly if subsurface areas of contamination are penetrated.

8. Conflicting situations that may arise concerning safety requirements and working conditions must be addressed and resolved rapidly by the HSO to relieve any motivations or pressures to circumvent established safety policy.

9. Unauthorized breaches of specified safety protocol will not be allowed. Personnel unwilling or unable to comply with the established procedures will be replaced. Any changes in established procedure should be documented on the form provided. The change should have a very specific, valid basis and must be approved by the HSO.

10. Be observant of not only one's own immediate surroundings but also that of others. Everyone will be working under constraints to awareness, and it is a team effort to notice and warn of impending dangerous situations. Extra precautions are necessary when working near heavy equipment while using personal protective gear. Vision, hearing, and communication are restricted by the protective gear.

11. Use of contact lenses will not be allowed onsite. These prevent proper flushing should corrosive or lachrymose substances enter the eyes.

12. Sites potentially requiring Level C or B protection will require the removal of facial hair (except moustaches) to allow a proper facepiece fit.

13. Rigorous contingency planning and dissemination of plans to all personnel minimizes the impact of rapidly changing safety protocols in response to changing site conditions.

14. Withdrawal from a hazardous situation to reassess procedures is the preferred course of action.

15. Be aware that chemical contaminants may mimic or enhance symptoms of other illnesses or intoxication. Avoid excess after hours use of alcohol and working with an illness during field investigative assignments.

16. The site leader, the HSO, and sampling personnel shall maintain records in a bound notebook recording daily activities, meetings, facts, incidents, data, etc., relating to the project. These record books will remain on the site during the full duration of the project so that replacement personnel may add information in the same record book, maintaining continuity. These notebooks and daily records will become part of the permanent project file. Examples of forms, records, and logs to be used at each site are given in Appendix B.

5.2 SITE ENTRY PROCEDURES. In most cases, ABB-ES teams are not the first onsite investigators. Considerable knowledge of site history and current status allows the 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 steps below.

1. Recognize that ABB-ES' presence onsite implies a perceived contamination potential by the client.

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

   - Establish a contamination reduction zone (decontamination area).

- At the highest level of protection practicable, survey site beginning with a perimeter survey and gradually covering all areas of proposed activity with (as appropriate):

  - photoionization meter,
  - organic vapor analyzer,
  - radiation survey meter,
  - personal air sampling pumps,
  - chemically reactive indicating tubes,
  - oxygen deficiency meter, and
  - explosive mixture meter.

- Establish a "hot zone."

- Review data, assess risk, and select the appropriate level of protection.

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

6.0 SITE SAFETY EQUIPMENT

In addition to personal protective gear designated for the assigned level, various monitoring and safety equipment is maintained onsite. Minimum onsite equipment will generally include:

- photoionization meter,
- combustible gas indicator (explosimeter),
- oxygen meter or oxygen deficiency alarm,
- chemically reactive indicating tubes (specific to the site hazards),
- fire extinguishers,
- first aid kits,
- eye wash station,
- radiation survey meter or radiation alert,
- transportation suitable for emergency response, and
- organic vapor analyzer (optional).

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

7.0 EMERGENCY PLANNING

7.1 EMERGENCY MEDICAL SERVICES. Prior to site investigation or activity on hazardous sites, nearby health facilities will be evaluated to determine their capabilities in relation to the needs of onsite project staff. Criteria such as emergency department physician coverage, decontamination, capabilities, and available medical specialists are evaluated.

- Onsite First Aid:

  - An industrial first-aid kit will be provided at the work site, and contents of the kit will be checked weekly and restocked as necessary. 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 onsite 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 an equivalent session.

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

- Transportation to Emergency Treatment:

  - A vehicle will be available at all times for use in transporting personnel to the hospital (in the event an ambulance is unnecessary or unavailable).

  - Personnel stretchers will be located at the work site for use in transporting personnel to the vehicle. Alternate transportation on routes to area hospitals will be established prior to onsite activity.

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

All onsite personnel will be familiar with both the primary and secondary route to the nearest hospital (which may be shown on a Figure or local map) as well as the location of the nearest working telephone or radio communication device. Each will receive a list of emergency phone numbers as shown in Appendix G.

The local hospital and emergency response team will be advised in advance by the HSO of the work to be performed. The hospital will also be briefed on the availability of personnel health data and technical support through Executive Health Examiners.

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

- The communication will be coordinated with local agencies, fire department, police, ambulance, and hospital emergency room.

- Two-way radio communication may need to be established in the field, and a site alarm capable of warning site personnel and summoning assistance will be maintained (air horns).

- Emergency evacuation for residents of nearby homes is an unlikely event, but a person will be designated onsite to be responsible for implementing the contingency plan. The person will be made aware of the total number of households within a radius of 2,000 feet. Appendix G will provide the emergency contacts required and an additional table will provide a list of residences and identifiable operations in the area in the event that evacuation is judged to be a possibility for a particular site.

- Prior to any activity, personnel will investigate possible routes of evacuation.

A copy of an accident report form is provided in Appendix B. It should be filled out by the HSO and filed with the individual's supervisor and a copy retained in the project records if an accident occurs.

7.3 POTENTIAL HAZARDS FOR MONITORING PROGRAM. The most common hazards associated with hazardous waste site investigation include: (1) accidents, (2) contact or ingestion of hazardous materials, (3) explosion, and (4) fire.

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

7.3.2 Contact and/or Ingestion of Hazardous Materials Properly prescribed and maintained protective clothing and adherence to established safety procedures are designed to minimize this hazard. However, it is still a possibility that contact or ingestion of materials may occur. One possibility for exposure is the puncture of a buried drum of liquid during drilling operations, which 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 off any exposed skin areas. A sufficient supply of eye wash bottles will also be maintained at the site in case of emergencies. In cases of ingestion or other than minor contact with

known substances, the local Poison Control Center and hospital should be contacted and the victim taken there immediately for further treatment and observation.

7.3.3 **Explosion** The drilling crew should be keenly aware of combustible gas meter readings and withdraw at any indication of imminently hazardous conditions (greater than 20 percent lower explosive level [LEL]). At LEL readings of 10 percent or greater work can only continue if proper precautions are taken (e.g., non-sparking tools and spark arresters). The detection of such conditions will be reported to local agencies for potential execution of the evacuation plan should the situation be assessed as warranting such response.

7.3.4 **Fire** The combustible gas meter also warns of imminent fire hazards at borings. The greatest fire hazard at the site should be recognized as handling the fluids (e.g., methanol or acetone) used for certain decontamination procedures. No smoking or open flames are allowed onsite. Carbon dioxide fire extinguishers will be kept at the drilling rig and the decontamination area or field office. The Fire Department, previously informed of site activities, will be called as needed.

7.4 **EVACUATION RESPONSE LEVELS**. Evacuation responses will occur at three levels: (1) withdraw from immediate work area (100+ feet upwind), (2) site evacuation, and (3) evacuation of surrounding area. Anticipated conditions that might require these responses are described below.

Withdraw Upwind (100 or more feet)

- If ambient air conditions are sensed as containing greater contaminant concentrations than guidelines allow for the type of respiratory protection being worn, personnel will withdraw upwind. The work party may return upon donning greater respiratory protection and/or assessing the situation as transient and past.

- Personnel will withdraw if there is a breach in protective clothing or a minor accident. The party may return when tear or other malfunction is repaired and first aid or decontamination has been administered.

- If a respirator malfunctions and must be replaced, the party will withdraw upwind.

Site Evacuation

- Sensing ambient air conditions as containing explosive and persistent levels of combustible gas or excessive levels of toxic gases will require site evacuation.

- Fire or major accident will require site evacuation.

- Imminent explosion or explosion will require site evacuation.

Surrounding Area Evacuation

- Persistent, unsuppressible release of toxic or explosive vapors from test pits or borings (possible pressure release from punctured drum) will require surrounding area evacuation. Air quality should be monitored at several distances downwind to assess danger to surrounding area before initiating this response.

7.5 EVACUATION PROCEDURES

7.5.1 Withdrawal Upwind The work party will continually note general wind directions while onsite. (A simple wind sock may be set up near the work site for visual determinations.) Upon noting conditions warranting movement away from the work site, the crew will move upwind a distance of approximately 100 feet or farther as indicated by the site monitoring instruments. Donning self-contained breathing apparatus (SCBA) and a safety harness and line, the HSO and a member of the crew may return to the work site to determine if the condition noted was transient or persistent. If persistent, then an alarm should be raised to notify onsite 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 and client will be notified of conditions. When access to the site is restricted and escape may thus be 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.

7.5.2 Site Evacuation 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 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.

7.5.3 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 onsite personnel will initiate evacuation of the immediate offsite area without delay.

7.6 TRAINING. The following matrix (Figure 7-1) will be completed and included with each site safety plan, thus indicating the training received by onsite personnel. All personnel must become familiar with the capabilities of each team member as displayed by the matrix to minimize response times in the event emergency action is required.

TOPIC / PERSONNEL	REFRESHER / SUPERVISORY 8 HOUR	OSHA OR EQUIVALENT 40 HOURS	HEALTH MONITORING	FIRST AID 8 HOUR	CPR 8 HOUR	PASSED RESP. FIT TEST	MEETS REQ. FOR HSO/FOL	MEETS REQ. FOR FIELD WORK
L. SMITH	■	■	■	■	■	■	■	■
M. JAYNES	■	■	■	■	■	■	■	■
F. RIZK	■	■	■	■	■	■	■	■
P. CRAINE	■	■	■	■	■	■	■	■
J. KOCH	■	■	■	■	■	■	■	■
P. WAGNER	■	■	■	■	■	■	■	■
M. PIJNENBURG	■	■	■	■	■	■	■	■
G. BROWN	■	■	■	■	■	■	■	■
F. LESESNE	■	■	■	■	■	■	■	■
P. LAYNE	■	■	■	■	■	■	■	■
D. LONERGAN	■	■	■	■	■		■	■

■ INDICATES REQUIRED TRAINING COMPLETED

CERTIFIED BY _____

FIGURE 7-1

ONSITE PERSONNEL TRAINING

RCRA FACILITY INVESTIGATION
HEALTH AND SAFETY PLAN

U.S. NAVAL STATION
MAYPORT, FLORIDA

8.0 DECONTAMINATION

8.1 PERSONNEL DECONTAMINATION PROCEDURE. Decontamination procedures are carried out by all personnel leaving hazardous waste sites. Under no circumstances (except emergency evacuation) will personnel be allowed to leave the site prior to decontamination. 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 decontamination solution or detergent and water. Rinse with water.

4. Remove tape from outer boots and remove boots; discard in disposal container.

5. Remove tape from outer gloves and remove gloves; discard in disposal container.

6. If the worker has left the exclusion zone to change the air tank on his/her SCBA, or the canister on his/her air purifying respirator, this is the last step in the decontamination procedure. The tank or cartridge should be exchanged, new outer gloves and boot covers donned, the joints taped, and the worker returns to duty.

7. Remove outer garments and discard in disposal container.

8. Remove respirator and place or hang in the designated area.

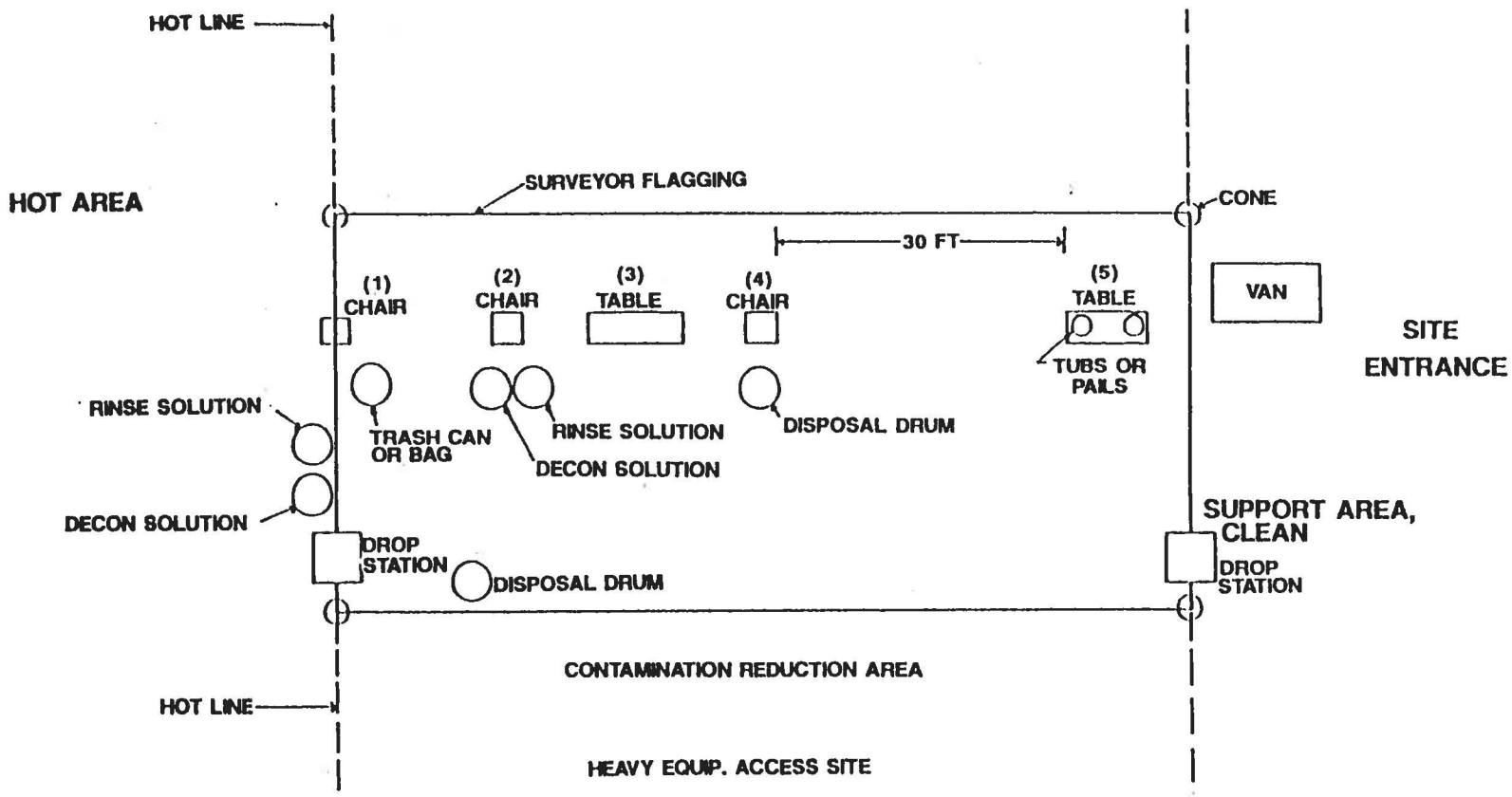
9. Remove inner gloves and discard in disposal container.

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.

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

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

A schematic of a typical decontamination area is shown in Figure 8-1.



TASK

(1) WASH BOOTS

(2) WASH GLOVES - RINSE GLOVES

(3) SCBA TANK CHANGE OVER TABLE WITH SPARE TANKS

(4) REMOVE BOOTS, GLOVES

(5) REMOVE SCBA, WASH MASK IN PAILS OR TUBS

NOT TO SCALE

FIGURE 8-1

TYPICAL PERSONNEL DECONTAMINATION STATION

RCRA FACILITY INVESTIGATION HEALTH AND SAFETY PLAN U.S. NAVAL STATION MAYPORT, FLORIDA

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

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

Miscellaneous tools and samplers will be dropped into a plastic pail, tub, or other container. They will be brushed off and rinsed (outside if possible) and transferred to a second pail to be carried to further decontamination sections. They will be washed with a detergent solution, rinsed with methanol or acetone (if required), rinsed with a detergent solution, and finally rinsed with clean water.

8.2.1 Drilling Rig and Tools It is anticipated that the drill rigs will be contaminated during test pit and borehole activities. They will be cleaned with high pressure water or portable high pressure steam followed by soap and water wash and rinse. Loose material will be removed by brush. The person performing this activity will usually be at the level of protection used during the personnel and monitoring equipment decontamination.

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

8.2.3 Monitoring Equipment Monitoring equipment will be protected as such as possible from contamination by draping, masking, or otherwise covering as much of the instruments as possible with plastic without hindering the operation of the unit. Meters, for example, can be placed in a clear plastic bag that allows reading of the scale and operation of the knobs. Sensors 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 removed and disposed in the appropriate containers. Any dirt or obvious contamination will be brushed or wiped with a disposable paper wipe. The units can then be taken inside in a clean plastic tub, wiped off with damp disposable wipes, and dried. The units will be checked, standardized, and recharged as necessary for the next day's operation. They will then be prepared with new protective coverings.

8.2.4 Respirators Respirators will be decontaminated daily. Taken from the drop area, the masks will be disassembled, the cartridges set aside, and the rest placed in a cleansing solution. (Parts will be precoded, e.g., No. 1 on all parts

of mask No. 1). After an appropriate time within the solution, the parts will be removed and rinsed with tap water. The old cartridges will be discarded into the contaminated trash container for disposal. In the morning, the masks will be re-assembled and new cartridges installed if appropriate. Personnel will inspect their own masks to be sure of proper readjustment of straps for proper fit (see also Appendix G).

8.2.5 Decontamination Trailer or Truck and Staging Area The decontamination trailer or truck, if used, will be cleaned daily. This will include vacuuming with a vacuum having a water filter to capture dust particles. The area will be wet mopped with cleanser and clean water. Workbench areas will be wiped down. Wash buckets and the cleaning area will be decontaminated and made ready for the next day's use.

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

9.0 DOCUMENTATION AND RECORDKEEPING

Samples of field activity documentation forms are attached (see Appendix B). Minimum documentation consists of:

- daily field records kept by the site technical leader or designee,
- site surveillance record kept by the Site Safety Officer,
- sampling-related records kept by sample collection team, and
- chain-of-custody records for each sample collected.

10.0 UPDATING OF HEALTH AND SAFETY PLAN

The HSO is responsible for maintaining proper documentation regarding the daily safety log. If any deficiency is encountered in the HASP, a report will be prepared and forwarded to the HSM at ABB-ES and copies sent to the project manager and technical director. The HSO will immediately initiate necessary changes to improve protection of field staff.

During the remedial investigation process or after initial field investigation, any new chemical hazard encountered will be evaluated and safety plans modified to reflect the effect of that chemical hazard. Similarly, any physical hazards that are discovered will be addressed by the HSO and reported.

11.0 REFERENCE GUIDES FOR HAZARDOUS MATERIALS

Reference guides for material classification determinations are listed below.

1. Chris Hazardous Chemical Data, Manual II, U.S. Department of Transportation and U.S. Coast Guard, 1985.

2. Dangerous Properties of Industrial Materials, Sax, N.I., Sixth edition, Van Nostrand Reinhold Co., 1984.

3. Documentation of TLV's and BEI's, 5th Edition, American Conference of Governmental Hygienists, 1986.

4. Guidelines for the Selection of Chemical Protective Clothing, 3rd Edition, American Conference of Governmental Industrial Hygienists, Inc., 1987.

5. Guide to Portable Instrumentation for Assessing Airborne Pollutants Arising from Hazardous Wastes, Draft International Document in, International Organization of Legal Metrology.

6. Handbook of Chemistry & Physics, 64th Edition, CRC Press, 1984.

7. Hazardous Waste Operations and Emergency Response, Occupational Safety and Health Administration, 29 CFR 1910.120, 1986.

8. The Merck Index, 9th Edition, Merck, Sharp & Dohme Ltd., 1980.

9. NIOSH/OSHA/OSCG/EPA Occupational SafetY and Health Guidance Manual for Hazardous Waste Site Activities, U.S. Department of Health and Human Services, Public Health Services, Centers for Disease Control, National Institute for Occupational Safety and Health, 1985.

10. Pocket Guide to Chemical Hazards, 1980 Edition, NIOSH/OSHA, DHEW (NIOSH) Publication No. 78-120.

11. Registry of Toxic Effects of Chemical Substances, 8th edition NIOSH, 1978.

12. Threshold Limit Values and Biological Exposure Indices for 1987-1988. American Conference of Governmental Industrial Hygienists, 1987.

13. Bureau of Mines Approval Systems for Respiratory Protective Devices, Pearce, S.J., Bureau of Mines Information Circular 7792, U.S. Dept. of Interior, (Revision of Information Circular 7600), 128.27 Item 627/A, June 1957.

APPENDIX A

CHEMICAL HAZARD DATA SHEETS

ACETIC ACID

AAC

Common Synonyms

Glacial acetic acid
Ethanoic acid
Vinegar acid

Watery liquid · Colorless · Strong vinegar odor

Sinks and mixes with water. Irritating vapor is produced. Freezing point is 62°F.

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.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Combustible.
Vapor may explode if ignited in an enclosed area.
Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves).
Extinguish with water, dry chemical, alcohol foam, or carbon dioxide.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID.

VAPOR
Irritating to nose and throat.
If inhaled, will cause coughing, nausea, vomiting, or difficult breathing.

Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

LIQUID OR 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.

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-corrosive
Disperse and flush

2. LABEL

2.1 Category: Corrosive
2.2 Class: 8

3. CHEMICAL DESIGNATIONS

3.1 CG Compatibility Class: Organic acid
3.2 Formula: CH_3COOH
3.3 IMO/UN Designation: 8.3/1842
3.4 DOT ID No.: 1842
3.5 CAS Registry No.: 64-19-7

4. OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped): Liquid
4.2 Color: Colorless
4.3 Odor: Characteristic vinegar; pungent; vinegar-like; sharp

5. HEALTH HAZARDS

5.1 Personal Protective Equipment: Protective clothing should be worn when skin contact might occur. Respiratory protection necessary when exposed to vapor. Complete eye protection.
5.2 Symptoms Following Exposure: Breathing of vapors causes coughing, chest pain, and irritation of nose and throat; may cause nausea and vomiting. Contact with skin and eye causes burns.
5.3 Treatment of Exposure: INHALATION: move victim at once to fresh air; if breathing becomes difficult, give oxygen; get medical care quickly. INGESTION: if victim is conscious, have him drink water or milk; do NOT induce vomiting. SKIN OR EYE CONTACT: flush immediately with plenty of clean running water; wash eyes for at least 15 min. and get medical care as quickly as possible; remove contaminated clothing and launder before wearing again.
5.4 Threshold Limit Value: 10 ppm
5.5 Short Term Inhalation Limits: 40 ppm for 5 min.
5.6 Toxicity by Ingestion: Grade 2; LD_{50} = 0.5 to 5.0 g/kg (rat)
5.7 Late Toxicity: Data not available
5.8 Vapor (Gas) Irritant Characteristics: Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.
5.9 Liquid or Solid Irritant Characteristics: Fairly severe skin irritant; may cause pain and second-degree burns after a few minutes of contact.
5.10 Odor Threshold: 1.0 ppm
5.11 IDLH Value: 1000 ppm

6. FIRE HAZARDS

6.1 Flash Point: 112°F O.C.; 104°F C.C.
6.2 Flammable Limits in Air: 5.4%-16.0%
6.3 Fire Extinguishing Agents: Water, alcohol foam, dry chemical or carbon dioxide
6.4 Fire Extinguishing Agents Not to be Used: None
6.5 Special Hazards of Combustion Products: Irritating vapor generated when heated.
6.6 Behavior in Fire: Not pertinent
6.7 Ignition Temperature: 800°F
6.8 Electrical Hazard: Not pertinent
6.9 Burning Rate: 1.6 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: Corrosive, particularly when diluted. Attacks most common metals, including most stainless steels. Excellent solvent for many synthetic resins or rubber.
7.3 Stability During Transport: Stable
7.4 Neutralizing Agents for Acids and Caustics: Dilute 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: 4

8. WATER POLLUTION

8.1 Aquatic Toxicity:
75 ppm/96 hr/bluegill/TL_m/fresh water
100 ppm/96 hr/goldfish/TL_m/fresh water
100-330 ppm/48 hr/shrimp/LC_{50}/aerated water
8.2 Waterfowl Toxicity: Not pertinent
8.3 Biological Oxygen Demand (BOD): 52-62%, 5 days
8.4 Food Chain Concentration Potential: None noted

9. SHIPPING INFORMATION

9.1 Grades of Purity: Commercial; USP; CP
9.2 Storage Temperature: Ambient
9.3 Inert Atmosphere: No requirement
9.4 Venting: Open

10. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook)
A-P-Q

11. HAZARD CLASSIFICATIONS

11.1 Code of Federal Regulations: Corrosive material
11.2 NAS Hazard Rating for Bulk Water Transportation:

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

11.3 NFPA Hazard Classification:

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

12. PHYSICAL AND CHEMICAL PROPERTIES

12.1 Physical State at 15°C and 1 atm: Liquid
12.2 Molecular Weight: 60.05
12.3 Boiling Point at 1 atm: 244°F = 117.9°C = 391.1°K
12.4 Freezing Point: 62.1°F = 16.7°C = 290°K
12.5 Critical Temperature: 611°F = 321.6°C = 594.6°K
12.6 Critical Pressure: 839 psia = 57.1 atm = 5.78 MN/m²
12.7 Specific Gravity: 1.051 at 20°C (liquid)
12.8 Liquid Surface Tension: Not pertinent
12.9 Liquid Water Interfacial Tension: Not pertinent
12.10 Vapor (Gas) Specific Gravity: Not pertinent
12.11 Ratio of Specific Heats of Vapor (Gas): 1.145
12.12 Latent Heat of Vaporization: 17.1 Btu/lb = 98.7 cal/g = 4.05 X 10⁵ J/kg
12.13 Heat of Combustion: −6649 Btu/lb = −3136 cal/g = −131.3 X 10⁵ 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: 45.91 cal/g
12.26 Limiting Value: Data not available
12.27 Reid Vapor Pressure: 0.60 psia

NOTES

ACETONE

ACT

Common Synonyms	Watery liquid · Colorless · Sweet odor
Dimethyl ketone Propanone 2-Propanone	Floats and mixes with water. Flammable, irritating vapor is produced.

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.

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, 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. LIQUID Irritating to eyes. Not irritating to skin. IF IN EYES, hold eyelids open and flush with plenty of water.
Water Pollution	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.

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_3
3.3 IMO/UN Designation: 3.1/1090
3.4 DOT ID No.: 1090
3.5 CAS Registry No.: 67-64-1

4. OBSERVABLE CHARACTERISTICS

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; hotonic, pleasant, non-residual

5. HEALTH HAZARDS

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; LD_{50} = 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 IDLH Value: 20000 ppm

6. FIRE HAZARDS

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

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: 16

8. WATER POLLUTION

8.1 Aquatic Toxicity:
14,250 ppm/24 hr/sunfish/filled/tap water
13,000 ppm/48 hr/mosquito fish/TL_m/ 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

9. SHIPPING INFORMATION

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

10. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook)

A-P-Q-R-S

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	0
Poisons	0
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	1
Aesthetic Effect	1
Reactivity	
Other Chemicals	1
Water	2
Self Reaction	0

11.3 NFPA Hazard Classification:

Category	Classification
Health Hazard (Blue)	1
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: 58.08
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 10⁵ J/kg
12.13 Heat of Combustion: −12,290 Btu/lb = −6806 cal/g = −285.0 X 10⁵ 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: 23.42 cal/g
12.26 Limiting Value: Data not available
12.27 Reid Vapor Pressure: 7.25 psia

NOTES

ANILINE

ANL

Common Synonyms	Oily liquid	Colorless to yellowish-brown	Amine odor
Aminobenzene Aniline oil Phenylamine Blue oil	Sinks slowly in water.		

AVOID CONTACT WITH LIQUID AND VAPOR. KEEP PEOPLE AWAY.
Wear chemical protective suit with self-contained breathing apparatus.
Stop discharge if possible.
Stay upwind and use water spray to "knock down" vapor.
Call fire department.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Combustible.
POISONOUS GAS IS PRODUCED WHEN HEATED.
Vapor may explode if ignited in an enclosed area.

Wear chemical protective suit with self-contained breathing apparatus.
Extinguish with water, dry chemical, foam, or carbon dioxide.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID.

LIQUID
POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED.
Irritating to 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.

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-poison, water contaminant
Restrict access
Should be removed
Chemical and physical treatment

2. LABEL

2.1 Category: Poison
2.2 Class: 6

3. CHEMICAL DESIGNATIONS

3.1 CG Compatibility Class: Aromatic amine
3.2 Formula: $C_6H_5NH_2$
3.3 IMO/UN Designation: 6.1/1547
3.4 DOT ID No.: 1547
3.5 CAS Registry No.: 62-53-3

4. OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped): Liquid
4.2 Color: Colorless to pale brown
4.3 Odor: Aromatic amine-like; characteristic, peculiar; strongly amine-like

5. HEALTH HAZARDS

5.1 Personal Protective Equipment: Respirator for organic vapors, splashproof goggles, rubber gloves, boots.
5.2 Symptoms Following Exposure: ACUTE EXPOSURE: Blue discoloration of finger-tips, cheeks, lips and nose; nausea, vomiting, headache and drowsiness followed by delirium, coma and shock. CHRONIC EXPOSURE: Loss of appetite, loss of weight, headaches, visual disturbances; skin lesions.
5.3 Treatment of Exposure: Remove victim to fresh air and call a physician at once. SKIN, EYE CONTACT: Immediately flush skin or eyes with plenty of water for at least 15 min. If cyanosis is present, cleanse with soap and water [illegible], with special attention to scalp and fingernails. Administer oxygen until physician arrives.
5.4 Threshold Limit Value: 2 ppm
5.5 Short Term Inhalation Limits: 50 ppm for 30 min.; 5 ppm for 8 hr.
5.6 Toxicity by Ingestion: Grade 2; LD_{50} = 50 to 500 mg/kg
5.7 Late Toxicity: None recognized
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: 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: 100 ppm

6. FIRE HAZARDS

6.1 Flash Point: 165°F O.C., 156°F C.C.
6.2 Flammable Limits in Air: 1.3%-11%
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 vapors are generated when heated.
6.6 Behavior in Fire: Not pertinent
6.7 Ignition Temperature: 1418°F
6.8 Electrical Hazard: Not pertinent
6.9 Burning Rate: 3.0 mm/min.
6.10 Adiabatic Flame Temperature: Data not available
6.11 Stoichiometric Air to Fuel Ratio: Data not available
6.12 Flame Temperature: Data not available

7. CHEMICAL REACTIVITY

7.1 Reactivity With Water: No reaction
7.2 Reactivity with Common Materials: No reaction
7.3 Stability During Transport: Stable
7.4 Neutralizing Agents for Acids and Caustics: Flush with water and rinse with dilute acetic acid
7.5 Polymerization: Not pertinent
7.6 Inhibitor of Polymerization: Not pertinent
7.7 Water Ratio (Reactant to Product): Data not available
7.8 Reactivity Group: 9

8. WATER POLLUTION

8.1 Aquatic Toxicity:
1020 ppm/1 hr/sunfish/filled/fresh water
10 ppm/96 hr/scenedesmus/TL_m/fresh water
8.2 Waterfowl Toxicity: Data not available
8.3 Biological Oxygen Demand (BOD): 150%, 5 days
8.4 Food Chain Concentration Potential: None

9. SHIPPING INFORMATION

9.1 Grades of Purity: Commercial: 99.5%
9.2 Storage Temperature: Ambient
9.3 Inert Atmosphere: No requirement
9.4 Venting: Pressure-vacuum

10. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook)

A-P-O-T-U-X-Y

11. HAZARD CLASSIFICATIONS

11.1 Code of Federal Regulations:
Poison, B

11.2 NAS Hazard Rating for Bulk Water Transportation:

Category	Rating
Fire	1
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	3
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	3
Aesthetic Effect	2
Reactivity	
Other Chemicals	4
Water	3
Self Reaction	0

11.3 NFPA Hazard Classification:

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

12. PHYSICAL AND CHEMICAL PROPERTIES

12.1 Physical State at 15°C and 1 atm: Liquid
12.2 Molecular Weight: 93.13
12.3 Boiling Point at 1 atm: 363.6°F = 184.2°C = 457.4°K
12.4 Freezing Point: 21°F = -6.1°C = 267.1°K
12.5 Critical Temperature: 796.1°F = 425.6°C = 698.8°K
12.6 Critical Pressure: 770 psia = 52.4 atm = 5.31 MN/m²
12.7 Specific Gravity: 1.022 at 20°C (liquid)
12.8 Liquid Surface Tension: 45.5 dynes/cm = .0455 N/m at 20°C
12.9 Liquid Water Interfacial Tension: 5.8 dynes/cm = 0.0058 N/m at 20°C
12.10 Vapor (Gas) Specific Gravity: Not pertinent
12.11 Ratio of Specific Heats of Vapor (Gas): 1.1
12.12 Latent Heat of Vaporization: 198 Btu/lb = 110 cal/g = 4.61 X 10⁵ J/kg
12.13 Heat of Combustion: -14,980 Btu/lb = -8320 cal/g = -348.3 X 10⁵ 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: 0.02 psia

NOTES

ARSENIC DISULFIDE

ARD

Common Synonyms			
Realgar Red arsenic glass Red arsenic sulfide Red orpiment Ruby arsenic	Solid Sinks in water.	Red-brown	Odorless

AVOID CONTACT WITH SOLID AND DUST. Keep people away.
Wear chemical protective suit with self-contained breathing apparatus.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Not flammable.
Wear chemical protective suit with self-contained breathing apparatus.

Exposure

CALL FOR MEDICAL AID.

DUST
POISONOUS IF INHALED.
Harmful to skin.

Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

SOLID
POISONOUS IF SWALLOWED.
Will burn eyes and skin.

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

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-poison, water contaminant
Restrict access
Should be removed
Chemical and physical treatment

2. LABEL

2.1 Category: Poison
2.2 Class: 6

3. CHEMICAL DESIGNATIONS

3.1 CG Compatibility Class: Not listed
3.2 Formula: As_2S_2
3.3 IMO/UN Designation: 6.1/1557
3.4 DOT ID No.: 1557
3.5 CAS Registry No.: 1303-32-8

4. OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped): Solid
4.2 Color: Red-brown
4.3 Odor: None

5. HEALTH HAZARDS

5.1 Personal Protective Equipment: Approved respirator; goggles; rubber gloves; clean protective clothing
5.2 Symptoms Following Exposure: (Acute and sub-acute poisoning are not common.) Repeated inhalation causes irritation of nose, larynx, and bronchia. Ingestion causes weakness, loss of appetite, gastrointestinal disturbances, peripheral neuritis, occasional hepatitis. Contact with eyes causes irritation. Irritates skin, especially where moist; if not treated, may cause ulceration.
5.3 Treatment of Exposure: Consult physician after all overexposure to this compound. INHALATION: move to fresh air. INGESTION: Induce vomiting by giving warm salt water; repeat until vomit is clear. EYES: flush with water for at least 15 min. SKIN: wash well with water.
5.4 Threshold Limit Value: 0.2 mg/m³ (as arsenic)
5.5 Short Term Inhalation Limits: Data not available
5.6 Toxicity by Ingestion: Grade 4; LD_{50}<50 mg/kg
5.7 Late Toxicity: Possible skin and 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: Odorless
5.11 IDLH Value: Data not available

6. FIRE HAZARDS

6.1 Flash Point: Not flammable
6.2 Flammable Limits in Air: Not pertinent
6.3 Fire Extinguishing Agents: Water
6.4 Fire Extinguishing Agents Not to be Used: Not pertinent
6.5 Special Hazards of Combustion Products: Poisonous fumes of the compound may be formed in fires. If ignited, will form sulfur dioxide gas.
6.6 Behavior in Fire: May ignite at very high temperatures
6.7 Ignition Temperature: Not pertinent
6.8 Electrical Hazard: Not pertinent
6.9 Burning Rate: Not pertinent
6.10 Adiabatic Flame Temperature: Not pertinent
6.11 Stoichiometric Air to Fuel Ratio: Not pertinent
6.12 Flame Temperature: Not pertinent

7. CHEMICAL REACTIVITY

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 Groups: Data not available

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

9. SHIPPING INFORMATION

9.1 Grades of Purity: 99+%; Technical
9.2 Storage Temperature: Ambient
9.3 Inert Atmosphere: No requirement
9.4 Venting: Open

10. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook)

II

11. HAZARD CLASSIFICATIONS

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

12. PHYSICAL AND CHEMICAL PROPERTIES

12.1 Physical State at 15°C and 1 atm: Solid
12.2 Molecular Weight: 214
12.3 Boiling Point at 1 atm: 1,049°F = 565°C = 838°K
12.4 Freezing Point: 585°F = 307°C = 580°K
12.5 Critical Temperature: Not pertinent
12.6 Critical Pressure: Not pertinent
12.7 Specific Gravity: 3.5 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: Data not available
12.26 Limiting Value: Data not available
12.27 Reid Vapor Pressure: Data not available

NOTES

BENZENE

BNZ

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

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

Fire

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

Exposure

CALL FOR MEDICAL AID.

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

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

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.
May be dangerous if it enters water intakes.

Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook)
Issue warning-high flammability
Restrict access

2. LABEL

2.1 Category: Flammable liquid
2.2 Class: 3

3. CHEMICAL DESIGNATIONS

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

4. OBSERVABLE CHARACTERISTICS

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

5. HEALTH HAZARDS

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

6. FIRE HAZARDS

6.1 Flash Point: 12°F C.C.
6.2 Flammable Limits in Air: 1.3%-7.9%
6.3 Fire Extinguishing Agents: Dry chemical, foam, or carbon dioxide
6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective
6.5 Special Hazards of Combustion Products: Not pertinent
6.6 Behavior in Fire: Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back
6.7 Ignition Temperature: 1087°F
6.8 Electrical Hazard: Class I, Group D
6.9 Burning Rate: 6.0 mm/min.
6.10 Adiabatic Flame Temperature: Data not available
6.11 Stoichiometric Air to Fuel Ratio: Data not available
6.12 Flame Temperature: Data not available

7. CHEMICAL REACTIVITY

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

8. WATER POLLUTION

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

9. SHIPPING INFORMATION

9.1 Grades of Purity:
Industrial pure ____99+%
Thiophene-free ____99+%
Nitration ____99+%
Industrial 90% ____95+%
Reagent ____99+%
9.2 Storage Temperature: Open
9.3 Inert Atmosphere: No requirement
9.4 Venting: Pressure-vacuum

10. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook)
A-T-U-V-W

11. HAZARD CLASSIFICATIONS

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

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

11.3 NFPA Hazard Classification:

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

12. PHYSICAL AND CHEMICAL PROPERTIES

12.1 Physical State at 15°C and 1 atm: Liquid
12.2 Molecular Weight: 78.11
12.3 Boiling Point at 1 atm: 176°F = 80.1°C = 353.3°K
12.4 Freezing Point: 42.0°F = 5.5°C = 278.7°K
12.5 Critical Temperature: 552.0°F = 288.9°C = 562.1°K
12.6 Critical Pressure: 710 psia = 48.3 atm = 4.89 MN/m²
12.7 Specific Gravity: 0.879 at 20°C (liquid)
12.8 Liquid Surface Tension: 28.9 dynes/cm = 0.0289 N/m at 20°C
12.9 Liquid Water Interfacial Tension: 35.0 dynes/cm = 0.035 N/m at 20°C
12.10 Vapor (Gas) Specific Gravity: 2.7
12.11 Ratio of Specific Heats of Vapor (Gas): 1.081
12.12 Latent Heat of Vaporization: 169 Btu/lb = 94.1 cal/g = 3.94 X 10⁵ J/kg
12.13 Heat of Combustion: −17,480 Btu/lb = −9696 cal/g = −406.0 X 10⁵ J/kg
12.14 Heat of Decomposition: Not pertinent
12.15 Heat of Solution: Not pertinent
12.16 Heat of Polymerization: Not pertinent
12.25 Heat of Fusion: 30.45 cal/g
12.26 Limiting Value: Data not available
12.27 Reid Vapor Pressure: 3.22 psia

NOTES

n-BUTYL ALCOHOL

BAN

Common Synonyms

Butanol
Butyl alcohol
1-Butanol
1-Hydroxybutane
n-Propylcarbinol

Watery liquid — Colorless — Alcohol odor

Floats and mixes slowly with water. Flammable, irritating vapor is produced.

Stop discharge if possible. Keep people away.
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.

Fire

FLAMMABLE
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
Extinguish with dry chemical or carbon dioxide.
Water and alcohol foam 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, headache, dizziness.
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

Dangerous to aquatic life at high concentrations.
May be dangerous if it enters water intakes.

Notify local health and pollution control officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook)

Restrict access
Disperse and flush

2. LABEL

2.1 Category: Flammable liquid
2.2 Class: 3

3. CHEMICAL DESIGNATIONS

3.1 CG Compatibility Class: Alcohols, glycols
3.2 Formula: $CH_3(CH_2)_3CH_2OH$
3.3 IMO/UN Designation: 3.3/1120
3.4 DOT ID No.: 1120
3.5 CAS Registry No.: 71-36-3

4. OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped): Liquid
4.2 Color: Colorless
4.3 Odor: Alcohol-like; pungent; strong; characteristic; mildly alcoholic, non residual

5. HEALTH HAZARDS

5.1 Personal Protective Equipment: Organic vapor canister or air-supplied mask; chemical goggles or face splash shield.
5.2 Symptoms Following Exposure: Anesthesia, nausea, headache, dizziness, irritation of respiratory passages. Mildly irritating to the skin and eyes.
5.3 Treatment of Exposure: INHALATION: remove from exposure immediately; call a physician; if breathing is irregular or has stopped, start resuscitation and administer oxygen. INGESTION: induce vomiting and call a physician. EYES: flush with water for at least 15 minutes.
5.4 Threshold Limit Value: 50 ppm
5.5 Short Term Inhalation Limits: 400 ppm for 30 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: 2.5 ppm
5.11 IDLH Value: 8,000 ppm

6. FIRE HAZARDS

6.1 Flash Point: 84°F C.C.; 97°F O.C.
6.2 Flammable Limits in Air: 1.4%-11.2%
6.3 Fire Extinguishing Agents: Carbon dioxide, 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: 650°F
6.8 Electrical Hazard: Class I, Group D
6.9 Burning Rate: 3.2 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: 20

8. WATER POLLUTION

8.1 Aquatic Toxicity: 1000 ppm/24 hr/goldfish/dod/fresh water
8.2 Waterfowl Toxicity: Data not available
8.3 Biological Oxygen Demand (BOD): 1.1-1.92 lb/lb, 5 days; 157%, 5 days
8.4 Food Chain Concentration Potential: None

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)

10. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook)

A-P-Q

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	2
Aquatic Toxicity	2
Aesthetic Effect	2
Reactivity	
Other Chemicals	2
Water	2
Self Reaction	0

11.3 NFPA Hazard Classification:

Category	Classification
Health Hazard (Blue)	1
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: 74.12
12.3 Boiling Point at 1 atm: 243.9°F = 117.7°C = 390.9°K
12.4 Freezing Point: −129°F = −89.3°C = 183.9°K
12.5 Critical Temperature: 553.6°F = 289.8°C = 563.0°K
12.6 Critical Pressure: 640.2 psia = 43.56 atm = 4.412 MN/m²
12.7 Specific Gravity: 0.810 at 20°C (liquid)
12.8 Liquid Surface Tension: 24.6 dynes/cm = .0246 N/m at 20°C
12.9 Liquid Water Interfacial Tension: (est.) 58 dynes/cm = 0.058 N/m at 27°C
12.10 Vapor (Gas) Specific Gravity: Not pertinent
12.11 Ratio of Specific Heats of Vapor (Gas): 1.083
12.12 Latent Heat of Vaporization: 256 Btu/lb = 142 cal/g = 5.95 X 10⁵ J/kg
12.13 Heat of Combustion: −14,230 Btu/lb = −7906 cal/g = −331.0 X 10⁵ J/kg
12.14 Heat of Decomposition: Not pertinent
12.15 Heat of Solution: Data not available
12.16 Heat of Polymerization: Not pertinent
12.25 Heat of Fusion: 20.83 cal/g
12.26 Limiting Value: Data not available
12.27 Reid Vapor Pressure: 0.3 psia

NOTES

CADMIUM SULFATE

CMS

Common Synonyms	Solid	White	Odorless
	Sinks and mixes slowly with water.		

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.

Fire

Not flammable.
POISONOUS GASES MAY BE PRODUCED IN FIRE.
Wear goggles and self-contained breathing apparatus.

Exposure

CALL FOR MEDICAL AID.

DUST
POISONOUS IF INHALED.
If inhaled will cause headache, 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.

SOLID
POISONOUS IF SWALLOWED.
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.

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-water contaminant
Disperse and flush

2. LABEL

2.1 Category: None
2.2 Class: Not pertinent

3. CHEMICAL DESIGNATIONS

3.1 CG Compatibility Class: Not listed
3.2 Formula: $CdSO_4$
3.3 IMO/UN Designation: Not listed
3.4 DOT ID No.: 2570
3.5 CAS Registry No.: 10124-36-4

4. OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped): Solid
4.2 Color: White
4.3 Odor: None

5. HEALTH HAZARDS

5.1 Personal Protective Equipment: Su. Mines approved respirator; rubber gloves; safety goggles
5.2 Symptoms Following Exposure: Inhalation may cause dryness of throat, coughing, constriction in chest, and headache. Ingestion may cause salivation, vomiting, abdominal pains, or diarrhea. Contact with eyes causes irritation.
5.3 Treatment of Exposure: INHALATION: remove victim from exposure and consult a physician. INGESTION: induce vomiting, then allay irritation with milk or egg whites given at frequent intervals; perform gastric lavage; seek medical attention. EYES: flush with water for at least 15 min; consult a physician. SKIN: wash with soap and water.
5.4 Threshold Limit Value: 0.05 mg/m³ (as cadmium)
5.5 Short Term Inhalation Limits: Data not available
5.6 Toxicity by Ingestion: Grade 3; oral mouse LD_{50} = 88 mg/kg
5.7 Late Toxicity: Delayed liver, kidney, and lung 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

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: Toxic cadmium oxide fume may form in fires.
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

7. CHEMICAL REACTIVITY

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 Groups: Data not available

8. WATER POLLUTION

8.1 Aquatic Toxicity: 1000 ppm/*/fish/LC_{50}/fresh water
*Time period not specified
8.2 Waterfowl Toxicity: Not pertinent
8.3 Biological Oxygen Demand (BOD): None
8.4 Food Chain Concentration Potential: Shellfish concentrate cadmium 900-1600 times

9. SHIPPING INFORMATION

9.1 Grades of Purity: Technical; 8/3 Hydrate grade; Reagent
9.2 Storage Temperature: Ambient
9.3 Inert Atmosphere: No requirement
9.4 Venting: Open

10. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook)
SS

11. HAZARD CLASSIFICATIONS

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

12. PHYSICAL AND CHEMICAL PROPERTIES

12.1 Physical State at 15°C and 1 atm: Solid
12.2 Molecular Weight: 208.46
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: 4.7 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: −62 Btu/lb = −51.3 cal/g = -2.15×10^5 J/kg
12.16 Heat of Polymerization: Not pertinent
12.25 Heat of Fusion: 22.9 cal/g
12.26 Limiting Value: Data not available
12.27 Reid Vapor Pressure: Data not available

NOTES

CARBON DISULFIDE

CBB

Common Synonyms	Watery liquid	Colorless to yellow	Rotten egg to sweet odor
Carbon bisulfide	Sinks in water. Flammable, irritating vapor is produced.		

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

Fire

FLAMMABLE.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves).
Extinguish with dry chemical or carbon dioxide.
Water and foam 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, 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 skin and eyes.
Harmful if swallowed.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting.
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.
May be dangerous if it enters water intakes.

Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook)

Issue warning-high flammability
Restrict access
Evacuate area

2. LABEL

2.1 Category: Flammable liquid
2.2 Class: 3

3. CHEMICAL DESIGNATIONS

3.1 CG Compatibility Class: Carbon disulfide
3.2 Formula: CS_2
3.3 IMO/UN Designation: 3.1/1131
3.4 DOT ID No.: 1131
3.5 CAS Registry No.: 75-15-0

4. OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped): Liquid
4.2 Color: Colorless
4.3 Odor: Faint sweetish; disagreeable; offensive, like that of decaying cabbage

5. HEALTH HAZARDS

5.1 Personal Protective Equipment: Only self-contained breathing mask with full face, approved by the United States Bureau of Mines, is recommended. If the vapor concentration exceeds 2% by volume or is unknown, supplied-air respiratory equipment of appropriate design with full face mask should be used by all persons entering contaminated area. Masks should be used only for emergency situations and should be located accordingly. Almost any type of industrial clothing is satisfactory. Splashes of small quantity are not harmful to fabrics, and evaporation from clothing is quite rapid. Clothing should, however, be removed and the skin washed with water. Goggles should be used when there is any danger of CS_2 splashes or spray.

5.2 Symptoms Following Exposure: ACUTE EXPOSURE: mild to moderate irritation of skin, eyes, and mucous membranes from liquid or concentrated vapors; headache, garlicky breath, nausea, vomiting, diarrhea (even after vapor exposures), and occasionally abdominal pain; weak pulse, palpitations; fatigue, weakness in the legs, unsteady gait, vertigo; manus, hallucinations of sight, hearing, taste, and smell in acute, massive vapor exposures; central nervous depression with respiratory paralysis; death may occur during coma or after a convulsion.

5.3 Treatment of Exposure: INHALATION: remove victim promptly from contaminated area. Administer oxygen and artificial respiration if needed. SKIN CONTACT: wash affected areas with copious quantities of water. INGESTION: induce vomiting and follow with gastric lavage and saline cathartics.

5.4 Threshold Limit Value: 10 ppm

5.5 Short Term Inhalation Limits: 200 ppm for 10 minutes, 100 ppm for 30 minutes and 50 ppm for 60 minutes.

5.6 Toxicity by Ingestion: Grade 2; rat LD_{50} = 0.1 - 0.99 g/kg

5.7 Late Toxicity: Non-specific liver cell damage in rats; higher incidence of upper respiratory disease in humans.

5.8 Vapor (Gas) Irritant Characteristics: Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.

(Continued)

6. FIRE HAZARDS

6.1 Flash Point: —22°F C.C.
6.2 Flammable Limits in Air: 1.3%-50%
6.3 Fire Extinguishing Agents: Dry chemical, carbon dioxide
6.4 Fire Extinguishing Agents Not to be Used: Water and foam may be ineffective on fire.
6.5 Special Hazards of Combustion Products: Toxic gases are generated; wear self- contained breathing apparatus.
6.6 Behavior in Fire: Not pertinent
6.7 Ignition Temperature: 212°F
6.8 Electrical Hazard: Contact of the liquid or vapor with the surface of a lighted electric light bulb could result in ignition.
6.9 Burning Rate: 2.7 mm/min.
6.10 Adiabatic Flame Temperature: Data not available

(Continued)

7. CHEMICAL REACTIVITY

7.1 Reactivity With Water: No reaction
7.2 Reactivity with Common Materials: No reaction
7.3 Stability During Transport: Stable
7.4 Neutralizing Agents for Acids and Caustics: Not pertinent
7.5 Polymerization: Not pertinent
7.6 Inhibitor of Polymerization: Not pertinent
7.7 Molar Ratio (Reactant to Product): Data not available
7.8 Reactivity Group: 38

8. WATER POLLUTION

8.1 Aquatic Toxicity: 35 ppm/48 hr/mosquito fish/TL_m/fresh water
8.2 Waterfowl Toxicity: Data not available
8.3 Biological Oxygen Demand (BOD): Data not available
8.4 Food Chain Concentration Potential: None

9. SHIPPING INFORMATION

9.1 Grades of Purity: Commercial; technical; USP
9.2 Storage Temperature: Ambient
9.3 Inert Atmosphere: Inerted
9.4 Venting: Pressure-vacuum

10. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook)

A-X-Y

11. HAZARD CLASSIFICATIONS

11.1 Code of Federal Regulations: Flammable liquid

11.2 NAS Hazard Rating for Bulk Water

Transportation: Category	Rating
Fire	4
Health	
Vapor Irritant	2
Liquid or Solid Irritant	2
Poisons	3
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	2
Aesthetic Effect	3
Reactivity	
Other Chemicals	2
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: 76.14
12.3 Boiling Point at 1 atm: 115°F = 46.3°C = 319.5°K
12.4 Freezing Point: —168.9°F = —111.6°C = 161.6°K
12.5 Critical Temperature: 523°F = 273°C = 546°K
12.6 Critical Pressure: 1100 psia = 76 atm = 7.7 MN/m²
12.7 Specific Gravity: 1.26 at 20°C (liquid)
12.8 Liquid Surface Tension: 32 dynes/cm = .032 N/m at 20°C
12.9 Liquid Water Interfacial Tension: 48.4 dynes/cm = .0484 N/m at 20°C
12.10 Vapor (Gas) Specific Gravity: 2.6
12.11 Ratio of Specific Heats of Vapor (Gas): 1.292
12.12 Latent Heat of Vaporization: 153 Btu/lb = 85 cal/g = 3.559 X 10⁵ J/kg
12.13 Heat of Combustion: —6014 Btu/lb = —3230 cal/g = —135.2 X 10⁵ 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: 13.80 cal/g
12.26 Limiting Value: Data not available
12.27 Reid Vapor Pressure: 10.3 psia

5. HEALTH HAZARDS (Continued)

5.9 Liquid or Solid Irritant Characteristics: Causes smarting of the skin and first-degree burns on short exposure and may cause secondary burns on long exposure.
5.10 Odor Threshold: 0.21 ppm
5.11 IDLH Value: 500 ppm

6. FIRE HAZARDS (Continued)

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

CARBON TETRACHLORIDE

CBT

Common Synonyms

Carbon Tet
Tetrachloromethane
Benzinoform
Necasonna
Perchloromethane

Watery liquid Colorless Sweet odor

Sinks in water. Poisonous vapor is produced.

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

Fire

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

Exposure

CALL FOR MEDICAL AID.

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

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

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.

Notify local health and pollution control officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook)

Issue warning-poison
Restrict access
Should be removed

2. LABEL

2.1 Category: None
2.2 Class: Not pertinent

3. CHEMICAL DESIGNATIONS

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

4. OBSERVABLE CHARACTERISTICS

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

5. HEALTH HAZARDS

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

6. FIRE HAZARDS

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

7. CHEMICAL REACTIVITY

7.1 Reactivity With Water: No reaction
7.2 Reactivity with Common Materials: No reaction
7.3 Stability During Transport: Stable
7.4 Neutralizing Agents for Acids and Caustics: Not pertinent
7.5 Polymerization: Not pertinent
7.6 Inhibitor of Polymerization: Not pertinent
7.7 Molar Ratio (Reactant to Product): Data not available
7.8 Reactivity Group: 38

8. WATER POLLUTION

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

9. SHIPPING INFORMATION

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

10. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook)

A-X

11. HAZARD CLASSIFICATIONS

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

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

11.3 NFPA Hazard Classification:

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

12. PHYSICAL AND CHEMICAL PROPERTIES

12.1 Physical State at 15°C and 1 atm: Liquid
12.2 Molecular Weight: 153.83
12.3 Boiling Point at 1 atm: 170°F = 76.5°C = 349.7°K
12.4 Freezing Point: −0.4°F = −23.0°C = 250.2°K
12.5 Critical Temperature: 541°F = 283°C = 556°K
12.6 Critical Pressure: 660 psia = 45 atm = 4.6 MN/m²
12.7 Specific Gravity: 1.59 at 20°C (liquid)
12.8 Liquid Surface Tension: 27.0 dynes/cm = 0.027 N/m at 20°C
12.9 Liquid Water Interfacial Tension: 45.0 dynes/cm = 0.045 N/m at 20°C
12.10 Vapor (Gas) Specific Gravity: 5.3
12.11 Ratio of Specific Heats of Vapor (Gas): 1.111
12.12 Latent Heat of Vaporization: 84.2 Btu/lb = 46.8 cal/g = 1.959 X 10⁵ J/kg
12.13 Heat of Combustion: Not pertinent
12.14 Heat of Decomposition: Not pertinent
12.15 Heat of Solution: Not pertinent
12.16 Heat of Polymerization: Not pertinent
12.25 Heat of Fusion: 5.08 cal/g
12.26 Limiting Value: Data not available
12.27 Reid Vapor Pressure: 3.0 psia

NOTES

CHLOROBENZENE

CRB

Common Synonyms	Watery liquid	Colorless	Sweet, almond odor
Monochlorobenzene Phenyl chloride Benzene chloride MCB	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_6H_5Cl
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: 1184°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)

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: 38

8. WATER POLLUTION

8.1 Aquatic Toxicity: 20 ppm/96 hr/bluegill/TL_m/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

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:

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
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: 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/m²
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 10⁵ J/kg
12.13 Heat of Combustion (est.) 12,000 Btu/lb = 6700 cal/g = 280 X 10⁵ 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: 20.40 cal/g
12.26 Limiting Value: Data not available
12.27 Reid Vapor Pressure: 0.5 psia

6. FIRE HAZARDS (Continued)

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

CHROMIC SULFATE

CHS

Common Synonyms			
Chromium sulfate Dichromium sulfate Chromium III sulfate Dichromium trisulfate Sulfuric acid, Chromium (3+) salt (3-2)	Solid	Peach, Violet, Dark green	Odorless
	Sinks and mixes with water.		

Avoid contact with solid and solution. Keep people away.
Wear goggles, self-contained breathing apparatus, and rubber gloves.
Stop discharge if possible.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Fire data not available.

Exposure

CALL FOR MEDICAL AID.

DUST
Harmful if inhaled.
Move to fresh air.
If breathing has stopped, give artificial respiration.

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

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.
May be dangerous if it enters water intakes.

Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook)
Issue warning-water contaminant.
Chemical and physical treatment.
Disperse and flush.

2. LABEL

2.1 Category: None
2.2 Class: Not listed

3. CHEMICAL DESIGNATIONS

3.1 CG Compatibility Class: Not listed
3.2 Formula: $Cr_2(SO_4)_3$
$Cr_2(SO_4)_3 \cdot 18H_2O$ (hydrated)
3.3 IMO/UN Designation: Not listed
3.4 DOT ID No.: 9109
3.5 CAS Registry No.: 10101-53-8

4. OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped): Solid
4.2 Color: Peach-anhydrous, green and violet-hydrated forms, technical product-dark green
4.3 Odor: None

5. HEALTH HAZARDS

5.1 Personal Protective Equipment: Rubber gloves, safety glasses, laboratory coat, dust mask.
5.2 Symptoms Following Exposure: INHALATION: Corrosive action on mucous membranes. SKIN: May elicit an allergic reaction. Corrosive action on skin. Lesions confined to exposed parts.
5.3 Treatment of Exposure: Call a physician. EYES: Wash with plenty of water. SKIN: Wash exposed parts well with water.
5.4 Threshold Limit Value: 0.5 mg/m³ as Cr.
5.5 Short Term Inhalation Limits: 0.5 mg/m³
5.6 Toxicity by Ingestion: Grade 2; LD_{50} = 0.5 to 5 mg/kg
5.7 Late Toxicity: A potential carcinogen for man.
5.8 Vapor (Gas) Irritant Characteristics: Data not available
5.9 Liquid or Solid Irritant Characteristics: Data not available
5.10 Odor Threshold: Not pertinent
5.11 IDLH Value: 250 mg/m³

6. FIRE HAZARDS

6.1 Flash Point: Data not available
6.2 Flammable Limits in Air: Data not available
6.3 Fire Extinguishing Agents: Any media suitable for the surrounding fire.
6.4 Fire Extinguishing Agents Not to be Used: Not pertinent
6.5 Special Hazards of Combustion Products: Decomposes to chromic acid when heated.
6.6 Behavior in Fire: Data not available
6.7 Ignition Temperature: Data not available
6.8 Electrical Hazard: Data not available
6.9 Burning Rate: Data not available
6.10 Adiabatic Flame Temperature: Data not available
6.11 Stoichiometric Air to Fuel Ratio: Data not available
6.12 Flame Temperature: Data not available

7. CHEMICAL REACTIVITY

7.1 Reactivity With Water: No reaction
7.2 Reactivity with Common Materials: Data not available
7.3 Stability During Transport: Stable
7.4 Neutralizing Agents for Acids and Caustics: Add water slowly, stir in slight excess of soda ash. Let stand 24 hours. Neutralize with 6m HCl. Flush with large excess of water.
7.5 Polymerization: Will not occur.
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:
Lethal concentration to alcohfacts 1.2 mg/L
Fish critical concentration 1 mg/L
8.2 Waterfowl Toxicity: Data not available
8.3 Biological Oxygen Demand (BOD):
Cr^{+3} lowers 5-day BOD 50% at concentrations from 62.5 to 117 mg/L
8.4 Food Chain Concentration Potential: Data not available

9. SHIPPING INFORMATION

9.1 Grades of Purity: Data not available
9.2 Storage Temperature: Store in cool, dry place.
9.3 Inert Atmosphere: Data not available
9.4 Venting: Data not available

10. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook)
II (anhydrous salt) SS (hydrated forms)

11. HAZARD CLASSIFICATIONS

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

12. PHYSICAL AND CHEMICAL PROPERTIES

12.1 Physical State at 15°C and 1 atm: Solid
12.2 Molecular Weight: 392.20
12.3 Boiling Point at 1 atm: Loses water of hydration
$Cr_2(SO_4)_3 \cdot 18$ loses 12
$Cr_2(SO_4)_3 \cdot 15$ loses 10
12.4 Freezing Point:
212°F = 100°C = 373.1°K
12.5 Critical Temperature: Data not available
12.6 Critical Pressure: Data not available
12.7 Specific Gravity:
3.012 at room temperature for anhydrous salt.
Hydrated: 1.867 at 17°C for 15 H_2O
Hydrated: 1.7 at 22°C for 18 H_2O
12.8 Liquid Surface Tension: Data not available
12.9 Liquid Water Interfacial Tension: Data not available
12.10 Vapor (Gas) Specific Gravity: Data not available
12.11 Ratio of Specific Heats of Vapor (Gas): Data not available
12.12 Latent Heat of Vaporization: Data not available
12.13 Heat of Combustion: Data not available
12.14 Heat of Decomposition: Data not available
12.15 Heat of Solution: Data not available
12.16 Heat of Polymerization: Data not available
12.23 Heat of Fusion: Data not available
12.26 Limiting Value: Data not available
12.27 Reid Vapor Pressure: Data not available

NOTES

CRESOLS

CRS

Common Synonyms

Cresylic acids
Hydroxytoluenes
Methylphenols
Oxytoluenes
Tar acids

Watery liquid, or solid crystals — Colorless or yellow — Sweet tarry odor

Sinks in water.

Avoid contact with liquid. Keep people away.
Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves).
Stop discharge if possible.
Call fire department.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Combustible.
POISONOUS GASES MAY BE PRODUCED IN FIRE.
Wear goggles and self-contained breathing apparatus.
Extinguish with water, dry chemical, foam or carbon dioxide.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID.

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

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.
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, poison
Restrict access
Should be removed
Chemical and physical treatment

2. LABEL

2.1 Category: Corrosive
2.2 Class: 8

3. CHEMICAL DESIGNATIONS

3.1 CG Compatibility Class: Phenols, Cresols
3.2 Formula: $CH_3C_6H_4OH$
3.3 IMO/UN Designation: 6.1/2076
3.4 DOT ID No.: 2076
3.5 CAS Registry No.: 1319-77-3

4. OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped): Liquid or solid
4.2 Color: Colorless to dark yellow
4.3 Odor: Sweet, tarry

5. HEALTH HAZARDS

5.1 Personal Protective Equipment: Organic vapor canister unit (USBM Type 8) approved by U.S. Bureau of Mines. Rubber gloves; chemical safety goggles; face shield; coveralls and/or rubber apron; rubber shoes or boots.
5.2 Symptoms Following Exposure: Vapors cause irritation of eyes, nose, and throat. Contact with skin or eyes causes severe burns. Chemical is rapidly absorbed through skin.
5.3 Treatment of Exposure: Call a physician. INHALATION: remove to fresh air. INGESTION: have victim drink water or milk; do NOT induce vomiting. SKIN OR EYES: flush immediately with plenty of water for at least 15 min; remove contaminated clothing immediately and wash before reuse; discard contaminated shoes.
5.4 Threshold Limit Value: 5 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 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: 5 ppm
5.11 IDLH Value: 250 ppm

6. FIRE HAZARDS

6.1 Flash Point: 175-185°F O.C.; 178°F C.C.
6.2 Flammable Limits in Air: LEL: 1.4% (ortho); 1.1% (meta or para)
6.3 Fire Extinguishing Agents: Water, dry chemical, carbon dioxide, and foam
6.4 Fire Extinguishing Agents Not to be Used: Not pertinent
6.5 Special Hazards of Combustion Products: Flammable toxic vapors given off in a fire.
6.6 Behavior in Fire: Sealed closed containers can build up pressure if exposed to heat
6.7 Ignition Temperature: 1110°F (o-cresol) 1038°F (m- or p-cresol)
6.8 Electrical Hazard: Data not available
6.9 Burning Rate: Data not available
6.10 Adiabatic Flame Temperature: Data not available

(Continued)

7. CHEMICAL REACTIVITY

7.1 Reactivity With Water: No reaction
7.2 Reactivity with Common Materials: 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

8. WATER POLLUTION

8.1 Aquatic Toxicity: 24 mg/l/96 hr/bluegill/TL_m/fresh water 10-100 ppm/48 hr/shrimp/LC_{50}/salt water
8.2 Waterfowl Toxicity: Data not available
8.3 Biological Oxygen Demand (BOD): m-cresol: 170%, 5 days o-cresol: 184%, 5 days p-cresol: 144%, 5 days
8.4 Food Chain Concentration Potential: None

9. SHIPPING INFORMATION

9.1 Grades of Purity: USP Liquid (mixed isomers) Phenol-cresol mixtures Ortho-cresol 60 to 66% containing phenol Meta-cresol 60 to 98% containing other cresols and xylenols Para-cresol 62 to 69% containing meta-cresol Meta-para-cresol containing ortho- cresol and xylenols "Resin" cresols containing phenols and xylenols Cresylic acids containing xylenols, cresols and phenols
9.2 Storage Temperature: Ambient
9.3 Inert Atmosphere: No requirement
9.4 Venting: Open

10. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook)

A-P-Q-T-U-X-Y

11. HAZARD CLASSIFICATIONS

11.1 Code of Federal Regulations: Corrosive material
11.2 NAS Hazard Rating for Bulk Water

Transportation: Category	Rating
Fire	1
Health	
Vapor Irritant	2
Liquid or Solid Irritant	3
Poisons	2
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	3
Aesthetic Effect	4
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	0

11.3 NFPA Hazard Classification:

Category	Classification ortho	Classification meta and para
Health Hazard (Blue)	3	3
Flammability (Red)	2	1
Reactivity (Yellow)	0	0

12. PHYSICAL AND CHEMICAL PROPERTIES

12.1 Physical State at 15°C and 1 atm: Liquid
12.2 Molecular Weight: 108.13
12.3 Boiling Point at 1 atm: >350°F = >177°C = >450°K
12.4 Freezing Point: Not pertinent
12.5 Critical Temperature: Not pertinent
12.6 Critical Pressure: Not pertinent
12.7 Specific Gravity: 1.03-1.07 at 20°C (liquid)
12.8 Liquid Surface Tension: 37 dynes/cm = 0.037 N/m at 20°C
12.9 Liquid Water Interfacial Tension: Data not available
12.10 Vapor (Gas) Specific Gravity: Not pertinent
12.11 Ratio of Specific Heats of Vapor (Gas): 1.073
12.12 Latent Heat of Vaporization: (est.) 200 Btu/lb = 110 cal/g = 4.6 X 10^5 J/kg
12.13 Heat of Combustion: —14,720 to —14,740 Btu/lb = —8180 to —8190 cal/g = —342.5 to —342.9 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: 28.28 cal/g (p-Cresol)
12.26 Limiting Value: Data not available
12.27 Reid Vapor Pressure: 0.03 psia

6. FIRE HAZARDS (Continued)

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

CYCLOHEXANONE

CCH

Common Synonyms			
Cyclohexyl Ketone Anone Hyrol O Nadone Pimelic ketone Sextone	Watery liquid Floats and mixes slowly with water.	Colorless to light yellow	Sweet, peppermint odor

Avoid contact with liquid. Keep people away.
Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves).
Stop discharge if possible.
Call fire department.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Combustible.
Extinguish with dry chemicals, foam, or carbon dioxide.

Exposure

CALL FOR MEDICAL AID.

LIQUID
Will burn skin and eyes.
Harmful if swallowed.

Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED, and victim is CONSCIOUS, have victim drink water or milk.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.

Notify local health and pollution control officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook)

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: $(CH_2)_5CO$
3.3 IMO/UN Designation: 3.3/1915
3.4 DOT ID No.: 1915
3.5 CAS Registry No.: 108-94-1

4. OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped): Liquid
4.2 Color: Colorless to slightly yellow
4.3 Odor: Like peppermint and acetone

5. HEALTH HAZARDS

5.1 Personal Protective Equipment: Chemical goggles.
5.2 Symptoms Following Exposure: Inhalation of vapors from hot material can cause narcosis. The liquid may cause dermatitis.
5.3 Treatment of Exposure: Immediately flush eyes with plenty of water; call a physician.
5.4 Threshold Limit Value: 25 ppm
5.5 Short Term Inhalation Limits: Data not available
5.6 Toxicity by Ingestion: Grade 3; LD_{50} = 0.5 g/kg
5.7 Late Toxicity: Data not available
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: Causes smarting of the skin and first-degree burns on short exposure and may cause secondary burns on long exposure.
5.10 Odor Threshold: 0.12 ppm
5.11 IDLH Value: 5,000 ppm

6. FIRE HAZARDS

6.1 Flash Point: 129°F O.C.; 111°F C.C.
6.2 Flammable Limits in Air: 1.1%-9.4%
6.3 Fire Extinguishing Agents: Water, dry chemical or carbon dioxide
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: 788°F
6.8 Electrical Hazard: Not pertinent
6.9 Burning Rate: 4.2 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: 16

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: None

9. SHIPPING INFORMATION

9.1 Grades of Purity: Technical: 99.97%
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-P-Q-T-U

11. HAZARD CLASSIFICATIONS

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

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

11.3 NFPA Hazard Classification:

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

12. PHYSICAL AND CHEMICAL PROPERTIES

12.1 Physical State at 18°C and 1 atm: Liquid
12.2 Molecular Weight: 98.15
12.3 Boiling Point at 1 atm: 312.4°F = 156.8°C = 429.0°K
12.4 Freezing Point: −34.3°F = −31.3°C = 242.0°K
12.5 Critical Temperature: 673°F = 356°C = 629°K
12.6 Critical Pressure: 560 psia = 38 atm = 3.8 MN/m²
12.7 Specific Gravity: 0.945 at 20°C (liquid)
12.8 Liquid Surface Tension: 34 dynes/cm = 0.034 N/m at 20°C
12.9 Liquid Water Interfacial Tension: 90 dynes/cm = 0.090 N/m at 22.7°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: 160 Btu/lb = 91 cal/g = 3.8 X 10⁵ J/kg
12.13 Heat of Combustion: −15,430 Btu/lb = −8570 cal/g = −358.8 X 10⁵ 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: 0.5 psia

NOTES

o-DICHLOROBENZENE

DBO

Common Synonyms			
1, 2-Dichlorobenzene Orthodichlorobenzene Dowtherm E	Liquid Sinks in water.	Colorless	Pleasant odor

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.

Fire

Combustible
POISONOUS GASES ARE PRODUCED IN FIRE.
Wear goggles and self-contained breathing apparatus.
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 and have victim induce vomiting.
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.

Notify local health and pollution control officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook)

Issue warning-water contaminant
Should be removed
Chemical and physical treatment

2. LABEL

2.1 Category: None
2.2 Class: Not pertinent

3. CHEMICAL DESIGNATIONS

3.1 CG Compatibility Class: Halogenated hydrocarbon
3.2 Formula: $o\text{-}C_6H_4Cl_2$
3.3 IMO/UN Designation: 6.1/1591
3.4 DOT ID No.: 1591
3.5 CAS Registry No.: 95-50-1

4. OBSERVABLE CHARACTERISTICS

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

5. HEALTH HAZARDS

5.1 Personal Protective Equipment: Organic vapor-acid gas respirator; neoprene or vinyl gloves; chemical safety spectacles, face shield, rubber footwear, apron, protective clothing.
5.2 Symptoms Following Exposure: Chronic inhalation of mist or vapors may result in damage to lungs, liver, and kidneys. Acute vapor exposure can cause symptoms ranging from coughing to central nervous system depression and transient anesthesia. Irritating to skin, eyes, and mucous membranes. May cause dermatitis.
5.3 Treatment of Exposure: INHALATION: remove victim to fresh air, keep him quiet and warm, and call a physician promptly. INGESTION: induce emesis; 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.
5.4 Threshold Limit Value: 50 ppm
5.5 Short Term Inhalation Limits: 50 ppm for 15 min.
5.6 Toxicity by Ingestion: Grade 2; LD_{50} = 0.5 to 5 g/kg
5.7 Late Toxicity: Causes kidney and liver damage in rats. Effects unknown in humans.
5.8 Vapor (Gas) Irritant Characteristics: Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.
5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
5.10 Odor Threshold: 4.0 ppm; 50 ppm
5.11 IDLH Value: 1,700 ppm

6. FIRE HAZARDS

6.1 Flash Point: 165°F O.C.; 150°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: 1198°F
6.8 Electrical Hazard: Not pertinent
6.9 Burning Rate: 1.3 mm/min.
6.10 Adiabatic Flame Temperature: Data not available
6.11 Stoichiometric Air to Fuel Ratio: Data not available
6.12 Flame Temperature: Data not available

7. CHEMICAL REACTIVITY

7.1 Reactivity With Water: No reaction
7.2 Reactivity with Common Materials: No reaction
7.3 Stability During Transport: Stable
7.4 Neutralizing Agents for Acids and Caustics: Not pertinent
7.5 Polymerization: Not pertinent
7.6 Inhibitor of Polymerization: Not pertinent
7.7 Water Ratio (Reactant to Product): Data not available
7.8 Reactivity Group: 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: 98.5% 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 99.8% ortho, not more than 0.0% 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 Classifications:

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 = 17.9°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 = 0.037 N/m at 20°C
12.9 Liquid Water Interfacial Tension: (est.) 40 dynes/cm = 0.04 N/m at 20°C
12.10 Vapor (Gas) Specific Gravity: Not pertinent
12.11 Ratio of Specific Heats of Vapor (Gas): 1.080
12.12 Latent Heat of Vaporization: 115 Btu/lb = 63.8 cal/g = 2.66 X 10^5 J/kg
12.13 Heat of Combustion: −7680 Btu/lb = −4427 cal/g = −185.4 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: 21.02 cal/g
12.26 Limiting Value: Data not available
12.27 Reid Vapor Pressure: 0.05 psia

NOTES

ETHYL ACETATE

ETA

Common Synonyms			
Acetic acid, ethyl ester Acetic ester Vinegar naphtha Acetic ether Ethyl ethanoate	Watery liquid	Colorless	Pleasant fruity 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. 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 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.
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)

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 CG Compatibility Class: Ester
3.2 Formula: $CH_3COOCH_2CH_3$
3.3 IMO/UN Designation: 3.2/1173
3.4 DOT ID No.: 1173
3.5 CAS Registry No.: 141-78-6

4. OBSERVABLE CHARACTERISTICS

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

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: 4000 ppm for 15 min.
5.6 Toxicity by Ingestion: Grade 2; LD_{50} = 6.5 to 8 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

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 I, 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

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

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

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

10. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook)

A-P-Q

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

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: 568 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 = 87.8 cal/g = 3.67 X 10⁵ J/kg
12.13 Heat of Combustion: −10,110 Btu/lb = −5616 cal/g = −235.1 X 10⁵ 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

NOTES

ETHYLBENZENE

ETB

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

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

Fire

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

Exposure

CALL FOR MEDICAL AID.

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

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

Water Pollution

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

1. RESPONSE TO DISCHARGE

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

2. LABEL

2.1 Category: Flammable liquid
2.2 Class: 3

3. CHEMICAL DESIGNATIONS

3.1 CG Compatibility Class: Aromatic hydrocarbon
3.2 Formula: $C_6H_5CH_2CH_3$
3.3 IMO/UN Designations: 3.3/1175
3.4 DOT ID No.: 1175
3.5 CAS Registry No.: 100-41-4

4. OBSERVABLE CHARACTERISTICS

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

5. HEALTH HAZARDS

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

6. FIRE HAZARDS

6.1 Flash Point: 55°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: 810°F
6.8 Electrical Hazard: Not pertinent
6.9 Burning Rate: 5.8 mm/min.
6.10 Adiabatic Flame Temperature: Data Not Available

(Continued)

7. CHEMICAL REACTIVITY

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

8. WATER POLLUTION

8.1 Aquatic Toxicity: 29 ppm/96 hr/bluegill/TL$_m$/fresh water
8.2 Waterfowl Toxicity: Data not available
8.3 Biological Oxygen Demand (BOD): 2.6% (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

10. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook)
A-T-U

11. HAZARD CLASSIFICATIONS

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

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

11.3 NFPA Hazard Classification:

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

12. PHYSICAL AND CHEMICAL PROPERTIES

12.1 Physical State at 15°C and 1 atm: Liquid
12.2 Molecular Weight: 106.17
12.3 Boiling Point at 1 atm: 277.2°F = 136.2°C = 409.4°K
12.4 Freezing Point: −139°F = −95°C = 178°K
12.5 Critical Temperature: 651.0°F = 343.8°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 = 3.35 X 10⁴ J/kg
12.13 Heat of Combustion: −17,780 Btu/lb = −9877 cal/g = −413.5 X 10⁶ 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: Data Not Available
12.18 Limiting Value: Data Not Available
12.19 Reid Vapor Pressure: 0.3 psia

6. FIRE HAZARDS (Continued)

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

ETHYL ETHER

EET

Common Synonyms	Watery liquid	Colorless	Sweet odor
Anesthesic ether Ether Diethyl ether Diethyl oxide Anesthesia ether Ethoxyethane	Floats on water. Flammable, irritating vapor is produced. Boiling point is 94°F.		

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

Fire

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

Exposure

CALL FOR MEDICAL AID

VAPOR
Irritating to eyes, nose and throat.
If inhaled, will cause nausea, vomiting, headache, 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.
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.
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
Evacuate area

2. LABEL

2.1 Category: Flammable liquid
2.2 Class: 3

3. CHEMICAL DESIGNATIONS

3.1 CG Compatibility Class: Ether
3.2 Formula: $C_2H_5OC_2H_5$
3.3 IMO/UN Designation: 3.1/1155
3.4 DOT ID No.: 1155
3.5 CAS Registry No.: 60-29-7

4. OBSERVABLE CHARACTERISTICS

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

5. HEALTH HAZARDS

5.1 Personal Protective Equipment: Approved organic vapor canister mask; chemical goggles; synthetic rubber or plastic gloves.
5.2 Symptoms Following Exposure: Vapor inhalation may cause headache, nausea, vomiting, and loss of consciousness. Contact with eyes will be irritating. Skin contact from clothing wet with the chemical may cause burns.
5.3 Treatment of Exposure: INHALATION: remove victim to fresh air; if breathing has stopped, apply artificial respiration; if breathing is irregular, give oxygen; call a physician. EYES: flush immediately with water for 15 min.
5.4 Threshold Limit Value: 400 ppm
5.5 Short Term Inhalation Limits: 1000 ppm for 30 min.
5.6 Toxicity by Ingestion: Grade 2; LD_{50} = 0.5 to 5 g/kg
5.7 Late Toxicity: None
5.8 Vapor (Gas) Irritant Characteristics: Vapors cause 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: No appreciable hazard. Practically harmless to the skin because it is very volatile and evaporates quickly.
5.10 Odor Threshold: 0.83 ppm
5.11 IDLH Value: 19000 ppm

6. FIRE HAZARDS

6.1 Flash Point: -40°F O.C.; -49°F C.C.
6.2 Flammable Limits in Air: 1.85%-36.5%
6.3 Fire Extinguishing Agents: Dry chemical, carbon dioxide or foam
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: Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back. Decomposes violently when heated.
6.7 Ignition Temperature: 356°F
6.8 Electrical Hazard: Class I, group C
6.9 Burning Rate: 6.7 mm/min.
6.10 Adiabatic Flame Temperature: Data Not Available

(Continued)

7. CHEMICAL REACTIVITY

7.1 Reactivity With Water: No reaction
7.2 Reactivity with Common Materials: No reaction
7.3 Stability During Transport: Stable
7.4 Neutralizing Agents for Acids and Caustics: Not pertinent
7.5 Polymerization: Not pertinent
7.6 Inhibitor of Polymerization: Not pertinent
7.7 Motor Ratio (Reactant to Product): Data Not Available
7.8 Reactivity Group: 41

8. WATER POLLUTION

8.1 Aquatic Toxicity: Data not available
8.2 Waterfowl Toxicity: Data not available
8.3 Biological Oxygen Demand (BOD): 3%, 5 days
8.4 Food Chain Concentration Potential: None

9. SHIPPING INFORMATION

9.1 Grades of Purity: Reagent; absolute; purified; anesthesia; USP; concentrated
9.2 Storage Temperature: Ambient
9.3 Inert Atmosphere: Inerted
9.4 Ventings: Pressure-vacuum

[illegible]

10. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook)

A-P-Q-T-U-V-W

11. HAZARD CLASSIFICATIONS

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

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

11.3 NFPA Hazard Classification:

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	4
Reactivity (Yellow)	1

12. PHYSICAL AND CHEMICAL PROPERTIES

12.1 Physical State at 15°C and 1 atm: Liquid
12.2 Molecular Weight: 74.12
12.3 Boiling Point at 1 atm: 94.3°F = 34.6°C = 307.8°K
12.4 Freezing Point: −177.3°F = −116.3°C = 156.9°K
12.5 Critical Temperature: 380.3°F = 193.5°C = 466.7°K
12.6 Critical Pressure: 527 psia = 35.9 atm = 3.64 MN/m²
12.7 Specific Gravity: 0.714 at 20°C (liquid)
12.8 Liquid Surface Tension: 17.0 dynes/cm = 0.0170 N/m at 20°C
12.9 Liquid Water Interfacial Tension: Not pertinent
12.10 Vapor (Gas) Specific Gravity: 2.6
12.11 Ratio of Specific Heats of Vapor (Gas): 1.081
12.12 Latent Heat of Vaporization: 153 Btu/lb = 84.9 cal/g = 3.56 X 10⁵ J/kg
12.13 Heat of Combustion: −14,550 Btu/lb = −8082 cal/g = −338.4 X 10⁵ 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: 23.45 cal/g
12.26 Limiting Value: Data Not Available
12.27 Reid Vapor Pressure: 16.0 psia

[illegible]

6. FIRE HAZARDS (Continued)

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

GASOLINES: STRAIGHT RUN

GSR

Common Synonyms	Watery liquid	Colorless	Gasoline odor
	Floats on water. Flammable, irritating vapor is produced.		

Fire	FLAMMABLE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area.
Exposure	VAPOR Irritating to eyes, nose and throat. If inhaled, will cause dizziness, headache, difficult breathing or loss of consciousness. LIQUID Irritating to skin and eyes. If swallowed, will cause nausea or vomiting.
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. Fouling to shoreline. May be dangerous if it enters water intakes.

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 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

4. OBSERVABLE CHARACTERISTICS

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

5. HEALTH HAZARDS

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 pneumonitis; acute onset of central nervous system involvement 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; LD_{50} = 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

6. FIRE HAZARDS

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

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:
90 ppm/24 hr/juvenile American shad/TL_m/fresh water
91 ppm/24 hr/juvenile American shad/TL_m/salt water
8.2 Waterfowl Toxicity: Data not available
8.3 Biological Oxygen Demand (BOD): 6%, 5 days
8.4 Food Chain Concentration Potential: None

9. SHIPPING INFORMATION

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

10. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook)

A-T-U-V-W

11. HAZARD CLASSIFICATIONS

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

Category	Rating
Fire	3
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	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

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: 58-275°F = 14—135°C = 287—408°K
12.4 Freezing Point: Not pertinent
12.5 Critical Temperature: Not pertinent
12.6 Critical Pressure: Not pertinent
12.7 Specific Gravity: 0.71-0.747 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: 40-51 dynes/cm = 0.040-0.051 N/m at 20°C
12.10 Vapor (Gas) Specific Gravity: 3.4
12.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
12.12 Latent Heat of Vaporization: 130—150 Btu/lb = 71—81 cal/g = 3.0—3.4 X 10^5 J/kg
12.13 Heat of Combustion: —18,730 Btu/lb = —10,400 cal/g = —435.4 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: Data not available

NOTES

LEAD SULFIDE

LSU

Common Synonyms	Solid, powder or crystal	Black, silver
Galena Plumbous sulfide	Sinks in water.	

AVOID CONTACT WITH POWDER OR 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 and irritating gases produced when heated.
Wear goggles and self-contained breathing apparatus.

Exposure

CALL FOR MEDICAL AID.

DUST.
POISONOUS IF INHALED.
Irritating to skin and eyes.
Move to fresh air.
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.

SOLID.
POISONOUS IF SWALLOWED.
Flush affected areas with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting.
IF SWALLOWED and victim is UNCONSCIOUS or having CONVULSIONS, do nothing except keep victim warm.

Water Pollution

Dangerous to aquatic life in high concentrations.
May be dangerous if it enters water intakes.

Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook)

Issue warning-Water pollutant.
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: PbS
3.3 IMO/UN Designation: Not listed
3.4 DOT ID No.: 2611
3.5 CAS Registry No.: 1314-87-0

4. OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped): Solid
4.2 Color: Black powder or silver gray metallic crystals.
4.3 Odor: Data not available

5. HEALTH HAZARDS

5.1 Personal Protective Equipment: Protective clothing, rubber gloves, safety goggles, or face mask and an approved respirator.
5.2 Symptoms Following Exposure: INHALATION OR INGESTION: Abdominal pain, loss of appetite, weight loss, constipation, apathy or irritability, vomiting, fatigue, headache, weakness, metallic taste and muscle incoordination. Lead line on gums. EYES: Irritation. May cause corneal destruction. SKIN: Pain and severe burns.
5.3 Treatment of Exposure: Call a doctor. INHALATION: Remove from exposure. EYES: Flush with running water. SKIN: Wash with soap and water. INGESTION: Gastric lavage if vomiting is not extensive. Give egg white or milk as demulcent.
5.4 Threshold Limit Value: 0.15 mg/m³.
5.5 Short Term Inhalation Limits: 0.45 mg/m³.
5.6 Toxicity by Ingestion: Grade 1, LD_{50} 5-15 g/kg.
5.7 Late Toxicity: Accumulative poison; repeated exposure can lead to damage to the liver, kidney, blood and nervous system. A suspected carcinogen of the lungs and kidney. Some evidence of teratogenic effects in laboratory animals.
5.8 Vapor (Gas) Irritant Characteristics: Not pertinent
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: Use appropriate media to suppress exposure fire.
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: At fire temperatures emits highly toxic and irritating sulfur oxides.
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

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 Groups: Data not available

8. WATER POLLUTION

8.1 Aquatic Toxicity: > 1000 ppm/96 hr/fin fish/TL_m
8.2 Waterfowl Toxicity: Data not available
8.3 Biological Oxygen Demand (BOD): Data not available
8.4 Food Chain Concentration Potential: Positive, is concentrated in the food chain.

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

10. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook)

II

11. HAZARD CLASSIFICATIONS

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

12. PHYSICAL AND CHEMICAL PROPERTIES

12.1 Physical State at 15°C and 1 atm: Solid
12.2 Molecular Weight: 239.27.
12.3 Boiling Point at 1 atm: 2337.6°F = 1281°C = 1554.2°K.
12.4 Freezing Point: 2037.2°F = 1114°C = 1387.2°K.
12.5 Critical Temperature: Not pertinent
12.6 Critical Pressure: Not pertinent
12.7 Specific Gravity: 7.5 at 20°C.
12.8 Liquid Surface Tension: Not pertinent
12.9 Liquid Water Interfacial Tension: Not pertinent
12.10 Vapor (Gas) Specific Gravity: 8.25 (calculated).
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: 17.3 cal/g
12.26 Limiting Value: Data not available
12.27 Reid Vapor Pressure: Data not available

NOTES

MERCURIC SULFATE

MRS

Common Synonyms	Solid	White	Odorless
Mercury bisulfate Mercury persulfate Mercury (II) sulfate (1:1)	Sinks in water.		

Avoid contact with dust or solid. Keep people away.
Wear goggles, self-contained breathing apparatus and rubber overclothing (including gloves).
Stop discharge if possible.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Not flammable.

Exposure

CALL FOR MEDICAL AID.

DUST
Irritating to skin, eyes, and nose.
If inhaled, will cause coughing, pain, and breathing difficulty.
Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

SOLID
POISONOUS IF SWALLOWED.
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 and have victim induce vomiting.
IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, 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, poison.
Restrict access.
Should be removed.
Chemical and physical treatment.

2. LABEL

2.1 Category: Poison
2.2 Class: 6

3. CHEMICAL DESIGNATIONS

3.1 CG Compatibility Class: Not listed
3.2 Formula: $HgSO_4$
3.3 IMO/UN Designation: 6.1/1645
3.4 DOT ID No.: 1645
3.5 CAS Registry No.: 7783-35-9

4. OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped): Solid
4.2 Color: White
4.3 Odor: Odorless

5. HEALTH HAZARDS

5.1 Personal Protective Equipment: Self-contained breathing apparatus, rubber gloves, protective clothing, rubber apron, and safety goggles.
5.2 Symptoms Following Exposure: INHALATION: Acute poisoning: Tightness in chest, breathing difficulty, coughing, and pain. EYES: Ulceration of conjunctiva and cornea. SKIN: Irritation; may cause sensitization dermatitis. INGESTION: Nausea, pain, vomiting, severe purging. Patient may die within a few hours from peripheral vascular collapse.
5.3 Treatment of Exposure: Get medical attention. INHALATION: Remove from exposure. EYES: Flush with water. SKIN: Flush with water. INGESTION: Give egg whites, milk, or activated charcoal, then induce vomiting. Consult physician.
5.4 Threshold Limit Value: 0.1 mg/m³ as Hg.
5.5 Short Term Inhalation Limits: 0.15 mg/m³ as Hg.
5.6 Toxicity by Ingestion: Grade 4: LD_{50} = 50 mg/kg.
5.7 Late Toxicity: Damaged kidney, heart, lung, and brain. Psychic and emotional disturbances; fine tremors of hands, head, lips, tongue, or jaw. Salivation, gingivitis, and digestive disturbances are common. Stomatitis is sometimes severe.
5.8 Vapor (Gas) Irritant Characteristics: Data not available
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: Odorless.
5.11 IDLH Value: Data not available

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: None
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 flammable
6.10 Adiabatic Flame Temperature: Data not available
6.11 Stoichiometric Air to Fuel Ratio: Data not available
6.12 Flame Temperature: Data not available

7. CHEMICAL REACTIVITY

7.1 Reactivity With Water: Decomposes into yellow insoluble basic sulfate and H_2SO_4.
7.2 Reactivity with Common Materials: No reaction
7.3 Stability During Transport: Stable
7.4 Neutralizing Agents for Acids and Caustics: Data not available
7.5 Polymerization: Will not occur
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: Mercuric ions are considered highly toxic to aquatic life. 0.004 to 0.02 mg/l Hg have been reported harmful to freshwater fish. 0.01 mg/l $HgSO_4$ has killed minnows in 80 to 92 days.
8.2 Waterfowl Toxicity: Data not available
8.3 Biological Oxygen Demand (BOD): Data not available
8.4 Food Chain Concentration Potential: Many organisms can accumulate mercury from water. Bioconcentrates up to 10,000 fold.

9. SHIPPING INFORMATION

9.1 Grades of Purity: 100%
9.2 Storage Temperature: Cool
9.3 Inert Atmosphere: Data not available
9.4 Venting: Data not available

10. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook)
SS

11. HAZARD CLASSIFICATIONS

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

12. PHYSICAL AND CHEMICAL PROPERTIES

12.1 Physical State at 15°C and 1 atm: Solid
12.2 Molecular Weight: 296.68
12.3 Boiling Point at 1 atm: Not pertinent - decomposes
12.4 Freezing Point: Not pertinent
12.5 Critical Temperature: Data not available
12.6 Critical Pressure: Data not available
12.7 Specific Gravity: 6.47 at room temperature
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): Data not available
12.12 Latent Heat of Vaporization: Data not available
12.13 Heat of Combustion: Not pertinent
12.14 Heat of Decomposition: Data not available
12.15 Heat of Solution: Not pertinent
12.16 Heat of Polymerization: Not pertinent
12.26 Heat of Fusion: 4.8 cal/g
12.26 Limiting Value: Data not available
12.27 Reid Vapor Pressure: Data not available

NOTES

MERCURY

MCR

Common Synonyms	Liquid	Silver	Odorless
Quicksilver	Sinks in water.		

AVOID CONTACT WITH LIQUID. Keep people away.
Stop discharge if possible.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Not flammable.

Exposure

CALL FOR MEDICAL AID.

LIQUID
Effects of exposure may be delayed.

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: None

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

4. OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped): Liquid
4.2 Color: Silvery
4.3 Odor: None

5. HEALTH HAZARDS

5.1 Personal Protective Equipment: Avoid contact of liquid with skin. For vapor use chemical cartridge (Hopcalite) respirator.
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.
5.3 Treatment of Exposure: Consult a doctor.
5.4 Threshold Limit Value: 0.05 mg/m³
5.5 Short Term Inhalation Limits: Data not available
5.6 Toxicity by Ingestion: No immediate toxicity
5.7 Late Toxicity: Development of mercury poisoning
5.8 Vapor (Gas) Irritant Characteristics: None
5.9 Liquid or Solid Irritant Characteristics: None
5.10 Odor Threshold: Not pertinent
5.11 IDLH Value: 28 mg/m³

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 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

7. CHEMICAL REACTIVITY

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

8. WATER POLLUTION

8.1 Aquatic Toxicity:
0.5-1 ppm/48 hr/carassius arduum/TL_m/fresh water
0.29 ppm/48 hr/marine fish/TL_m/salt water
8.2 Waterfowl Toxicity: Data not available
8.3 Biological Oxygen Demand (BOD): None
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.

9. SHIPPING INFORMATION

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

10. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook)

A-X

11. HAZARD CLASSIFICATIONS

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

12. PHYSICAL AND CHEMICAL PROPERTIES

12.1 Physical State at 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: 2684°F = 1462°C = 1735°K
12.6 Critical Pressure: 22,300 psia = 1517 atm = 150.8 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 Interfacial 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
12.25 Heat of Fusion: 2.7 cal/g
12.26 Limiting Value: Data not available
12.27 Reid Vapor Pressure: Data not available

NOTES

METHYL ALCOHOL

MAL

Common Synonyms	Watery liquid	Colorless	Alcohol odor
Methanol Wood alcohol Wood spirit Pyroxylic spirit Colonial spirit Columbian spirit	Floats and mixes 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.** Vapor may explode if ignited in an enclosed area. Flashback along vapor trail may occur. 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, 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** **POISONOUS IF SWALLOWED.** Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
Water Pollution	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
Evacuate area
Disperse and flush

2. LABEL

2.1 Category: Flammable liquid
2.2 Class: 3

3. CHEMICAL DESIGNATIONS

3.1 CG Compatibility Class: Alcohol, glycol
3.2 Formula: CH_3OH
3.3 IMO/UN Designation: 3.2/1230
3.4 DOT ID No.: 1230
3.5 CAS Registry No.: 67-56-1

4. OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped): Liquid
4.2 Color: Colorless
4.3 Odor: Faint alcohol; like ethyl alcohol; faintly sweet; characteristic pungent

5. HEALTH HAZARDS

5.1 Personal Protective Equipment: Supplied Air Respirator (Do not use organic canister mask); goggles, rubber gloves; protective clothing
5.2 Symptoms Following Exposure: Exposure to excessive vapor causes eye irritation, headache, fatigue and drowsiness. High concentrations can produce central nervous system depression and optic nerve damage. 50,000 ppm will probably cause death in 1 to 2 hrs. Can be absorbed through skin. Swallowing may cause depth or eye damage.
5.3 Treatment of Exposure: Remove victim from exposure and apply artificial respiration if breathing has ceased. INGESTION: Induce vomiting, then give 2 teaspoons of baking soda in glass of water; call a physician. SKIN OR EYES: flush with water for 15 min.
5.4 Threshold Limit Value: 200 ppm
5.5 Short Term Inhalation Limits: 250 mg/m³ for 60 min.
5.6 Toxicity by Ingestion: Grade 1; LD_{50} = 5 to 15 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: 100 ppm
5.11 IDLH Value: 25,000 ppm

6. FIRE HAZARDS

6.1 Flash Point: 54°F C.C.; 61°F O.C.
6.2 Flammable Limits in Air: 6.0%-36.5%
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: Containers may explode.
6.7 Ignition Temperature: 867°F
6.8 Electrical Hazard: Class I, Group D
6.9 Burning Rate: 1.7 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

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: 20

8. WATER POLLUTION

8.1 Aquatic Toxicity: 250 ppm/11 hr/goldfish/died/fresh water
8.2 Waterfowl Toxicity: Data not available
8.3 Biological Oxygen Demand (BOD): 0.6 to 1.12 lb/lb in 5 days
8.4 Food Chain Concentration Potential: None

9. SHIPPING INFORMATION

9.1 Grades of Purity: CP, Crude, ACS: all 99.9%
9.2 Storage Temperature: Ambient
9.3 Inert Atmosphere: No requirement
9.4 Venting: Open (flame arrester) or pressure-vacuum

10. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook)

A-P-Q-R-S

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	1
Aesthetic Effect	1
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	0

11.3 NFPA Hazard Classification:

Category	Classification
Health Hazard (Blue)	1
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: 32.04
12.3 Boiling Point at 1 atm: 148.1°F = 64.5°C = 337.7°K
12.4 Freezing Point: −144.0°F = −97.8°C = 175.4°K
12.5 Critical Temperature: 464°F = 240°C = 513°K
12.6 Critical Pressure: 1142.0 psia = 77.7 atm = 7.87 MN/m²
12.7 Specific Gravity: 0.792 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: 1.1
12.11 Ratio of Specific Heats of Vapor (Gas): 1.254
12.12 Latent Heat of Vaporization: 473.0 Btu/lb = 262.8 cal/g = 11.00 X 10³ J/kg
12.13 Heat of Combustion: −8419 Btu/lb = −4677 cal/g = −195.8 X 10³ J/kg
12.14 Heat of Decomposition: Not pertinent
12.15 Heat of Solution: (est.) −9 Btu/lb = −5 cal/g = −0.2 X 10³ J/kg
12.16 Heat of Polymerization: Not pertinent
12.25 Heat of Fusion: 23.70 cal/g
12.26 Limiting Value: Data not available
12.27 Reid Vapor Pressure: 4.6 psia

NOTES

METHYL CHLORIDE

MTC

Common Synonyms	Gas	Colorless	Odorless or sweet odor
Chloromethane Artic	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 shutoff 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_3Cl
3.3 IMO/UN Designation: 2.2/1063
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 Limits: 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 IDLH 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: 4.076 (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; "Artic" 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:

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

11.3 NFPA Hazard Classification:

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	4
Reactivity (Yellow)	0

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 = 416.6°K
12.6 Critical Pressure: 969 psia = 65.9 atm = 6.68 MN/m²
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 Interfacial 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): 1.258
12.12 Latent Heat of Vaporization: 182.3 Btu/lb = 101.3 cal/g = 4.241 X 10⁵ J/kg
12.13 Heat of Combustion: −5250 Btu/lb = −2920 cal/g = −122.1 X 10⁵ J/kg
12.14 Heat of Decomposition: Not pertinent
12.15 Heat of Solution: Not pertinent
12.16 Heat of Polymerization: Not pertinent
12.20 Heat of Fusion: Data not available
12.26 Limiting Value: Data not available
12.27 Reid Vapor Pressure: 110.7 psia

NOTES

METHYL ETHYL KETONE

MEK

Common Synonyms	Liquid	Colorless	Sweet odor
MEK 2-Butanone Ethyl methyl ketone	Floats and mixes 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. 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 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	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: 250 mg/m³ 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 IDLH 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

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

8. WATER POLLUTION

8.1 Aquatic Toxicity: 5640 mg/l/48 hr/bluegill/TL_m/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

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

10. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook)

A-P-Q-R-S

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	2
Aquatic Toxicity	1
Aesthetic Effect	1
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	0

11.3 NFPA Hazard Classification:

Category	Classification
Health Hazard (Blue)	1
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: 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 = 186.8°K

12.5 Critical Temperature: 504.8°F = 262.6°C = 535.7°K

12.6 Critical Pressure: 603 psia = 41.0 atm = 4.15 MN/m²

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 10⁵ J/kg

12.13 Heat of Combustion: −13,499 Btu/lb = −7491 cal/g = −313.6 X 10⁵ J/kg

12.14 Heat of Decomposition: Not pertinent

12.15 Heat of Solution (est.): −9 Btu/lb = −5 cal/g = −0.2 X 10⁵ 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

NOTES

MINERAL SPIRITS

MNS

Common Synonyms	Watery liquid	Colorless	Gasoline-like odor
Petroleum spirits Naphtha	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 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.
Foaming 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: extreme 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): 6%, 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 formulation but are usually [illegible]
9.2 [illegible]
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 NAS 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
12.17 Heat of Fusion: Data not available
12.18 Limiting Value: Data not available
12.19 Reid Vapor Pressure: 0.13 psia

NOTES

NITROBENZENE

NTB

Common Synonyms
Nitrobenzol
Essence of Mirbane
Oil of Mirbane

Oily liquid. Light yellow to brown. Almond or shoe polish odor.

Sinks in water. Freezing point is 41°F.

AVOID CONTACT WITH LIQUID. Keep people away.
Wear chemical protective suit with self-contained breathing apparatus.
Stop discharge if possible.
Call fire department.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Combustible.
POISONOUS VAPOR IS PRODUCED WHEN HEATED.
Wear chemical protective suit with self-contained breathing apparatus.
Extinguish with water, dry chemical, foam, or carbon dioxide.
Cool exposed containers in water.

Exposure

CALL FOR MEDICAL AID.

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.

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-poison
Restrict access
Should be removed
Chemical and physical treatment

2. LABEL

2.1 Category: Poison
2.2 Class: 6

3. CHEMICAL DESIGNATIONS

3.1 CG Compatibility Class: Nitrocompounds
3.2 Formula: $C_6H_5NO_2$
3.3 IMO/UN Designation: 6.1/1662
3.4 DOT ID No.: 1662
3.5 CAS Registry No.: 98-95-3

4. OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped): Liquid
4.2 Color: Light greenish-yellow
4.3 Odor: Like paste shoe polish

5. HEALTH HAZARDS

5.1 Personal Protective Equipment: Respirator approved by U.S. Bureau of Mines for organic vapors; rubber gloves; splashproof goggles; eyewash fountain, safety shower and medical oxygen supply.
5.2 Symptoms Following Exposure: Highly toxic when absorbed through the skin, inhaled as vapor, or swallowed. First symptoms are a blue discoloration of the lips, nails, and skin. Acute poisoning produces headache, giddiness, weakness, nausea, vomiting, and coma.
5.3 Treatment of Exposure: Remove to fresh air and call a physician at once. In case of contact, immediately flush skin or eyes with plenty of water for at least 15 min. If cyanosis (blue discoloration) is present, shower with soap and warm water, with special attention to nails and fingernails. Administer oxygen until physician arrives.
5.4 Threshold Limit Value: 1 ppm
5.5 Short Term Inhalation Limits: 10 ppm for 30 min.
5.6 Toxicity by Ingestion: Grade 3; LD_{50} = 50-500 mg/kg (dog)
5.7 Late Toxicity: Data not available
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: Causes smarting of the skin and first-degree burns on short exposure; may cause secondary burns on long exposure.
5.10 Odor Threshold: 5.94 ppm
5.11 IDLH Value: 200 ppm

6. FIRE HAZARDS

6.1 Flash Point: 171°F C.C.; 190°F O.C.
6.2 Flammable Limits in Air: 1.8% LEL (UEL not available)
6.3 Fire Extinguishing Agents: Water, foam, carbon dioxide, or dry chemical
6.4 Fire Extinguishing Agents Not to be Used: Not pertinent
6.5 Special Hazards of Combustion Products: Not pertinent
6.6 Behavior in Fire: Not pertinent
6.7 Ignition Temperature: 924°F
6.8 Electrical Hazard: Not pertinent
6.9 Burning Rate: 2.9 mm/min.
6.10 Adiabatic Flame Temperature: Data not available
6.11 Stoichiometric Air to Fuel Ratio: Data not available
6.12 Flame Temperature: Data not available

7. CHEMICAL REACTIVITY

7.1 Reactivity With Water: No reaction
7.2 Reactivity with Common Materials: No reaction
7.3 Stability During Transport: Stable
7.4 Neutralizing Agents for Acids and Caustics: Not pertinent
7.5 Polymerization: Not pertinent
7.6 Inhibitor of Polymerization: Not pertinent
7.7 Water Ratio (Reactant to Product): Data not available
7.8 Reactivity Groups: 42

8. WATER POLLUTION

8.1 Aquatic Toxicity: 20 ppm/6 hr/minnow/lethal/fresh water
8.2 Waterfowl Toxicity: Data not available
8.3 Biological Oxygen Demand (BOD): 0%, 5 days
8.4 Food Chain Concentration Potential: None

9. SHIPPING INFORMATION

9.1 Grades of Purity: Technical: 99.5-100%
9.2 Storage Temperature: Ambient
9.3 Inert Atmosphere: No requirement
9.4 Venting: Open (flame arrester)

10. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook)
A-X-Y

11. HAZARD CLASSIFICATIONS

11.1 Code of Federal Regulations: Poison, B
11.2 NAS Hazard Rating for Bulk Water Transportation:

Category	Rating
Fire	1
Health	
Vapor Irritant	3
Liquid or Solid Irritant	2
Poisons	4
Water Pollution	
Human Toxicity	3
Aquatic Toxicity	3
Aesthetic Effect	3
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	1

11.3 NFPA Hazard Classification:

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

12. PHYSICAL AND CHEMICAL PROPERTIES

12.1 Physical State at 15°C and 1 atm: Liquid
12.2 Molecular Weight: 123.11
12.3 Boiling Point at 1 atm: 411.8°F = 210.9°C = 484.1°K
12.4 Freezing Point: 41.2°F = 5.1°C = 278.3°K
12.5 Critical Temperature: 836°F = 447°C = 720°K
12.6 Critical Pressure: 700 psia = 47.62 atm = 4.824 MN/m²
12.7 Specific Gravity: 1.204 at 20°C (liquid)
12.8 Liquid Surface Tension: 43.9 dynes/cm = 0.0439 N/m at 20°C
12.9 Liquid Water Interfacial Tension: 25.88 dynes/cm = 0.02588 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: 160 Btu/lb = 88 cal/g = 3.8 X 10⁴ J/kg
12.13 Heat of Combustion: −16,420 Btu/lb = −5,791 cal/g = −242.5 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: 22.50 cal/g
12.26 Limiting Value: Data not available
12.27 Reid Vapor Pressure: 0.01 psia

NOTES

2-NITROPROPANE

NPP

Common Synonyms	Liquid	Colorless	Mild, fruity odor
Isonitropropane 2-NP sec-Nitropropane	May float or sink in water.		

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

Fire

Combustible.
Containers may explode in fire.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.
Extinguish with dry chemicals, foam or carbon dioxide.
Water may be ineffective on fire.
Cool exposed containers with water.

Exposure

CALL FOR MEDICAL AID.

VAPOR
Irritating to eyes, nose and throat.
If inhaled will cause headache, dizziness, 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.

LIQUID
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.

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
Restrict access
Disperse and flush

2. LABEL

2.1 Category: None
2.2 Class: Not pertinent

3. CHEMICAL DESIGNATIONS

3.1 CG Compatibility: Gases/Hydrocarbons
3.2 Formula: $CH_3CH(NO_2)CH_3$
3.3 IMO/UN Designation: Not listed
3.4 DOT ID No: 2608
3.5 CAS Registry No: 79-46-9

4. OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped): Liquid
4.2 Color: Colorless
4.3 Odor: Mild, fruity

5. HEALTH HAZARDS

5.1 Personal Protective Equipment: Self-contained breathing apparatus; goggles or face shield; rubber gloves
5.2 Symptoms Following Exposure: Inhalation causes respiratory tract irritation, headache, dizziness, nausea, and diarrhea. Ingestion causes irritation of mouth and stomach. Contact with liquid irritates eyes/skin. Contact with liquid irritates skin.
5.3 Treatment of Exposure: SIMULATION: In case of pulmonary symptoms, enforce bed rest and give oxygen. [illegible] give large amount of water and induce vomiting. [illegible]
5.4 Threshold Limit Value: 25 ppm
5.5 Short Term Inhalation Limits: Data not available
5.6 Toxicity by Ingestion: Grade 2; oral rat LD_{50} = 720 mg/kg
5.7 Late Toxicity: Causes liver cancer in rats
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: Moderate hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin.
5.10 Odor Threshold: 300 ppm
5.11 IDLH Value: 2,500 ppm

6. FIRE HAZARDS

6.1 Flash Point: 100°F C.C.; 82°F C.C.
6.2 Flammable Limits in Air: 2.6% (LFL)
6.3 Fire Extinguishing Agents: Foam, dry chemical, carbon dioxide
6.4 Fire Extinguishing Agents Not to be Used: "Alcohol" foam; water may be ineffective.
6.5 Special Hazards of Combustion Products: Toxic oxides of nitrogen may form in fire.
6.6 Behavior in Fire: Data not available
6.7 Ignition Temperature: 802°F
6.8 Electrical Hazard: Data not available
6.9 Burning Rate: Data not available
6.10 Adiabatic Flame Temperature: Data not available
6.11 Stoichiometric Air to Fuel Ratio: Data not available
6.12 Flame Temperature: Data not available

7. CHEMICAL REACTIVITY

7.1 Reactivity With Water: No reaction
7.2 Reactivity with Common Materials: 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: 42

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: None

9. SHIPPING INFORMATION

9.1 Grades of Purity: Technical, 94+%
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-P-O-T-U-X-Y

11. HAZARD CLASSIFICATIONS

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

Category	Rating
Fire	3
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	1
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	3
Aesthetic Effect	2
Reactivity	
Other Chemicals	3
Water	0
Self Reaction	4

11.3 NFPA Hazard Classification:

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

12. PHYSICAL AND CHEMICAL PROPERTIES

12.1 Physical State at 15°C and 1 atm: Liquid
12.2 Molecular Weight: 89.09
12.3 Boiling Point at 1 atm: 248.5°F = 120.3°C = 393.5°K
12.4 Freezing Point: −132°F = −91°C = 182°K
12.5 Critical Temperature: Data not available
12.6 Critical Pressure: Data not available
12.7 Specific Gravity: 0.99 at 20°C (liquid)
12.8 Liquid Surface Tension: 30 dynes/cm = 0.030 N/m at 20°C
12.9 Liquid Water Interfacial Tension: Data not available
12.10 Vapor (Gas) Specific Gravity: 3.06 at 16°C
12.11 Ratio of Specific Heats of Vapor (Gas): 1.080 at 20°C
12.12 Latent Heat of Vaporization: 176 Btu/lb = [illegible] cal/g = 4.1 X 10^5 J/kg
12.13 Heat of Combustion: [illegible] = −6,380 cal/g = [illegible] 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: Data not available

NOTES

OILS: DIESEL

ODS

Common Synonyms			
Fuel oil 1-D Fuel oil 2-D	Oily liquid Floats on water.	Yellow-brown	Lube or fuel oil 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 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 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 4; 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: 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: 1.3-6.0 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

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: 204 mg/l/24 hr/juvenile American shad/TL_m/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

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 Vent: 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 NAS 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: 550—640°F = 288—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 15°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: Value

NOTES

OILS, MISCELLANEOUS: LUBRICATING

OLB

Common Synonyms			
Crankcase oil Transmission oil Motor oil	Oily liquid Floats on water.	Yellow-brown	Lube oil 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 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

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.

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

2.1 CG Compatibility Class: Miscellaneous Hydrocarbon Mixtures
2.2 Formula: Not applicable
2.3 IMO/UN Designation: 6.9/1270
2.4 DOT ID No: 1270
2.5 CAS Registry No: Data not available

4. OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped): Liquid
4.2 Color: Yellow fluorescent
4.3 Odor: Characteristic

5. HEALTH HAZARDS

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 lavage or 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; 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: Data not available
5.11 IDLH Value: Data not available

6. FIRE HAZARDS

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 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: 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

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): Data not available
8.4 Food Chain Concentration Potential: None

9. SHIPPING INFORMATION

9.1 Grades of Purity: Various viscosities
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: Not listed
11.2 NAS 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

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: 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 = 0.036—0.0375 N/m at 20°C
12.9 Liquid Water Interfacial Tension: 33—54 dynes/cm = 0.033—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: —18,600 Btu/lb or —10,370 cal/g or —[illegible] 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

NOTES

OILS, MISCELLANEOUS: MINERAL

OMN

Common Synonyms	Oily Liquid	Colorless	Odorless
White oil Liquid Petroleum	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.
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: 3.3/1270
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: Colorless
4.3 Odor: Very faint

5. HEALTH HAZARDS

5.1 Personal Protective Equipment: Goggles or face shield.
5.2 Symptoms Following Exposure: Ingestion of liquid can cause very loose bowel movements.
5.3 Treatment of Exposure: EYES: wash with water.
5.4 Threshold Limit Value: 5 mg/m³ (mist)
5.5 Short Term Inhalation Limits: Not pertinent
5.6 Toxicity by Ingestion: Grade 1; LD_{50} = 5 to 15 g/kg
5.7 Late Toxicity: None
5.8 Vapor (Gas) Irritant Characteristics: None
5.9 Liquid or Solid Irritant Characteristics: None
5.10 Odor Threshold: Not pertinent
5.11 IDLH Value: Data not available

6. FIRE HAZARDS

6.1 Flash Point: 380°F O.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 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: 500—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

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): Data not available
8.4 Food Chain Concentration Potential: None

9. SHIPPING INFORMATION

9.1 Grades of Purity: Commercial; refined
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: Not listed
11.2 NAS Hazard Rating for Bulk Water Transportation: Not listed
11.3 NFPA Hazard Classification:

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

12. PHYSICAL AND CHEMICAL PROPERTIES

12.1 Physical State at 15°C and 1 atm: Liquid
12.2 Molecular Weight: 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: 0.822 at 20°C (liquid)
12.8 Liquid Surface Tension: 27 dynes/cm = 0.027 N/m at 20°C
12.9 Liquid Water Interfacial Tension: 47 dynes/cm = 0.047 N/m at 70°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: Data not available
12.14 Heat of Decomposition: Not pertinent
12.15 Heat of Solution: Not pertinent
12.16 Heat of Polymerization: Not pertinent
12.25 Heat of Fusion: Data not available
12.26 Limiting Value: Data not available
12.27 Reid Vapor Pressure: Data not available

NOTES

OILS, MISCELLANEOUS: PENETRATING

OPT

Common Synonyms			
Preservative oil Water displacing oil	Oily liquid Floats on water.	Yellow	Motor oil-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 foam, dry chemical, or carbon dioxide.
Water may be ineffective on fire.

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.
Floating 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: 3.3/1270
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: Yellowish
4.3 Odor: Like motor oil

5. HEALTH HAZARDS

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; 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 skin.
5.10 Odor Threshold: Data not available
5.11 IDLH Value: Data not available

6. FIRE HAZARDS

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

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): Data not available
8.4 Food Chain Concentration Potential: None

9. SHIPPING INFORMATION

9.1 Grades of Purity: Commercial
9.2 Storage Temperature: Ambient
9.3 Inert Atmosphere: No requirement
9.4 Venting: Open (flame arrester)

10. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook)

A-T-U

11. HAZARD CLASSIFICATIONS

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

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: Very high
12.4 Freezing Point: Not pertinent
12.5 Critical Temperature: Not pertinent
12.6 Critical Pressure: Not pertinent
12.7 Specific Gravity: 0.9981 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 (net): = —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
12.17 Heat of Pyrolysis: Data not available
12.18 Limiting Value: Data not available
12.19 Reid Vapor Pressure: Data not available

NOTES

OILS, MISCELLANEOUS: TRANSFORMER

OTF

Common Synonyms	Oily liquid	Colorless to light brown	Motor oil-like odor
Insulating oil Electrical insulating oil Petroleum insulating oil	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 foam, dry chemical, carbon dioxide. Water may be ineffective on fire.
Exposure	CALL FOR MEDICAL AID. 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. 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: 3.3/1270
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: Colorless to light brown
4.3 Odor: Like motor oil

5. HEALTH HAZARDS

5.1 Personal Protective Equipment: Protective gloves; goggles or face shield.
5.2 Symptoms Following Exposure: Ingestion of liquid may irritate stomach and cause increased frequency of bowel movements. If taken into lungs, delayed pulmonary irritation may occur.
5.3 Treatment of Exposure: INGESTION: do NOT induce vomiting. ASPIRATION: check for delayed irritation by serial X-rays. 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: Data not available
5.6 Toxicity by Ingestion: Grade 0; 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: Data not available
5.11 IDLH Value: Data not available

6. FIRE HAZARDS

6.1 Flash Point: 285°F C.C.
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 may be ineffective.
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

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): Data not available
8.4 Food Chain Concentration Potential: None

9. SHIPPING INFORMATION

9.1 Grades of Purity: Data not available
9.2 Storage Temperature: Ambient
9.3 Inert Atmosphere: No requirement
9.4 Venting: Open (flame arrester)

10. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook)
A-T-U

11. HAZARD CLASSIFICATIONS

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

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

12. PHYSICAL AND CHEMICAL PROPERTIES

12.1 Physical State at 15°C and 1 atm: Liquid
12.2 Molecular Weight: Not pertinent
12.3 Boiling Point at 1 atm: Very high
12.4 Freezing Point: −75°F = −59°C = 214°K
12.5 Critical Temperature: Not pertinent
12.6 Critical Pressure: Not pertinent
12.7 Specific Gravity: 0.891 at 15°C (liquid)
12.8 Liquid Surface Tension: Data not available
12.9 Liquid Water Interfacial Tension: 49 dynes/cm = 0.049 N/m at 25°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: Data not available
12.14 Heat of Decomposition: Not pertinent
12.15 Heat of Solution: Not pertinent
12.16 Heat of Polymerization: Not pertinent
12.25 Heat of Fusion: Data not available
12.26 Limiting Value: Data not available
12.27 Reid Vapor Pressure: Data not available

NOTES

PYRIDINE

PRD

Common Synonyms	Liquid	Colorless to yellow	Sharp, nauseating odor

Mixes with water. Poisonous, flammable vapor is produced.

AVOID CONTACT WITH LIQUID AND VAPOR. Keep people away.
Wear chemical protective suit with self-contained breathing apparatus.
Shut off ignition sources and call fire department.
Stop discharge if possible.
Stay upwind and use water spray to "knock down" vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

FLAMMABLE.
Flashback along vapor trail may occur.
Vapor may explode if ignited in an enclosed area.

Wear chemical protective suit with 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
Poisonous if inhaled or if skin is exposed.
Irritating to eyes, nose and throat.

Move to fresh air.
If breathing has stopped, give artificial respiration.
If breathing is difficult, give oxygen.

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.

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
Evacuate area
Disperse and flush

2. LABEL

2.1 Category: Flammable liquid
2.2 Class: 3

3. CHEMICAL DESIGNATIONS

3.1 CG Compatibility: Class Aromatic amine
3.2 Formula: C_5H_5N
3.3 IMO/IMDG Designation: 3.2/1282
3.4 DOT ID No.: 1282
3.5 CAS Registry No.: 110-86-1

4. OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped): Liquid
4.2 Color: Yellow or colorless
4.3 Odor: Disagreeable; strong unpleasant; characteristic unpleasant; sharp penetrating, unpleasant

5. HEALTH HAZARDS

5.1 Personal Protective Equipment: Air-supplied mask or organic canister; vapor-proof goggles; rubber gloves and protective clothing.
5.2 Symptoms Following Exposure: Vapor irritates eyes and nose. Liquid irritates skin and is absorbed through the skin. Overexposure causes nausea, headache, nervous symptoms, [illegible]
5.3 Treatment of Exposure: [illegible] Remove to fresh air and promptly move contaminated area; give artificial respiration and oxygen if necessary; treat symptomatically. INGESTION: Induce vomiting and follow with gastric lavage. SKIN: wash thoroughly with large amounts of water. EYES: Irrigate with water for at least 15 min.
5.4 Threshold Limit Value: 5 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)
5.7 Late Toxicity: Liver and kidney damage after ingestion.
5.8 Vapor (Gas) Irritant Characteristics: Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.
5.9 Liquid or Solid Irritant Characteristics: Causes smarting of the skin and first-degree burns on short exposure; may cause secondary burns on long exposure.
5.10 Odor Threshold: 0.021 ppm
5.11 IDLH Value: 3,600 ppm

6. FIRE HAZARDS

6.1 Flash Point: 68°F C.C.
6.2 Flammable Limits in Air: 1.8%-12.4%
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: Vapor is heavier than air and may travel considerable distance to source of ignition and flash back.
6.7 Ignition Temperature: 900°F
6.8 Electrical Hazard: Class I, Group D
6.9 Burning Rate: 4.2 mm/min.
6.10 Autoignition 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: None
7.3 Stability During Transport: Stable
7.4 Neutralizing Agents for Acids and Caustics: Flush with water.
7.5 Polymerization: Not pertinent
7.6 Inhibitor of Polymerization: Not pertinent
7.7 Water Ratio (Reactant to Product): Data not available
7.8 Reactivity Group: 9

8. WATER POLLUTION

8.1 Aquatic Toxicity: 1350 mg/l/96 hr/fish/TL_m/fresh water
8.2 Waterfowl Toxicity: Data not available
8.3 Biological Oxygen Demand (BOD): 1.15-1.47 lb/lb, 5 days
8.4 Food Chain Concentration Potential: None

9. SHIPPING INFORMATION

9.1 Grades of Purity: Technical; Pure
9.2 Storage Temperature: Ambient
9.3 Inert Atmosphere: No requirement
9.4 Venting: Pressure-vacuum
[illegible]

10. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook)

A-P-Q-R-S

11. HAZARD CLASSIFICATIONS

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

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

11.3 NFPA Hazard Classifications:

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: 79.10
12.3 Boiling Point at 1 atm: 239.5°F = 115.3°C = 388.5°K
12.4 Freezing Point: −44°F = −42°C = 231°K
12.5 Critical Temperature: 656.2°F = 346.8°C = 620°K
12.6 Critical Pressure: 817.3 psia = 55.6 atm = 5.63 MN/m²
12.7 Specific Gravity: 0.983 at 20°C (liquid)
12.8 Liquid Surface Tension: 38.0 dynes/cm = 0.038 N/m at 20°C
12.9 Liquid Water Interfacial Tension: Not pertinent
12.10 Vapor (Gas) Specific Gravity: 2.73
12.11 Ratio of Specific Heats of Vapor (Gas): 1.123
12.12 Latent Heat of [illegible]: 193 Btu/lb = 107 cal/g = 4.48 X 10⁵ J/kg
12.13 Heat of Combustion: −14,390 Btu/lb = −7992 cal/g = −334.6 X 10⁵ J/kg
12.14 Heat of Decomposition: Not pertinent
12.15 Heat of Solution (sat.) −13 Btu/lb = −7 cal/g = −0.3 X 10⁵ J/kg
12.16 Heat of Polymerization: Not pertinent
12.25 Heat of Fusion: Data not available
12.26 Limiting Oxygen Concentration: [illegible]
12.27 [illegible]

NOTES

SILVER SULFATE

SVS

Common Synonyms	Solid	White to grey	Odorless
	Sinks and mixes with water.		

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.

Fire	Not flammable.
Exposure	CALL FOR MEDICAL AID. **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. **SOLID** 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.
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: Ag_2SO_4
3.3 IMO/UN Designation: Not listed
3.4 DOT ID No.: Data not available
3.5 CAS Registry No.: Data not available

4. OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped): Solid
4.2 Color: White to grey
4.3 Odor: None

5. HEALTH HAZARDS

5.1 Personal Protective Equipment: Dust mask; goggles or face shield; protective gloves.
5.2 Symptoms Following Exposure: Contact with eyes causes irritation. If continued for a long period, ingestion or inhalation of silver compounds can cause permanent discoloration of the skin (argyria).
5.3 Treatment of Exposure: INHALATION: move to fresh air. INGESTION: give large amount of water, induce vomiting. EYES: flush with water for at least 15 min. SKIN: flush with water; wash with soap and water.
5.4 Threshold Limit Value: 0.01 mg/m³
5.5 Short Term Inhalation Limits: Data not available
5.6 Toxicity by Ingestion: Data not available
5.7 Late Toxicity: Data not available
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 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

7. CHEMICAL REACTIVITY

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

8. WATER POLLUTION

8.1 Aquatic Toxicity: 0.4 ppm/48 hr/barnacles/lethal 90%/salt water
8.2 Waterfowl Toxicity: Data not available
8.3 Biological Oxygen Demand (BOD): None
8.4 Food Chain Concentration Potential: None

9. SHIPPING INFORMATION

9.1 Grades of Purity: Reagent; Commercial
9.2 Storage Temperature: Ambient
9.3 Inert Atmosphere: No requirement
9.4 Venting: Open

10. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook)

II-SS

11. HAZARD CLASSIFICATIONS

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

12. PHYSICAL AND CHEMICAL PROPERTIES

12.1 Physical State at 15°C and 1 atm: Solid
12.2 Molecular Weight: 311.80
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: 5.45 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: 10.7 cal/g
12.26 Limiting Value: Data not available
12.27 Reid Vapor Pressure: Data not available

NOTES

SULFURIC ACID

SFA

Common Synonyms	Oily liquid	Colorless	Odorless
Oil of vitriol Battery acid Fertilizer acid Chamber acid	Sinks and mixes violently with water. Irritating mist is produced.		

AVOID CONTACT WITH LIQUID. Keep people away.
Wear goggles, self-contained breathing apparatus, and rubber overclothing.
Stop discharge if possible.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Not flammable.
May cause fire on contact with combustibles.
Flammable gas may be produced on contact with metals.
POISONOUS GAS MAY BE PRODUCED IN FIRE.
Wear goggles, self-contained breathing apparatus, and rubber overclothing.
DO NOT USE WATER ON ADJACENT FIRES.
Extinguish with dry chemical or carbon dioxide.

Exposure

CALL FOR MEDICAL AID.

MIST
Irritating to eyes, nose and throat.
If inhaled, will cause coughing, difficult breathing, or loss of consciousness.
Move to fresh air.
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.
LIQUID
Will burn skin and eyes.
Harmful if swallowed.
Remove contaminated clothing and shoes.
Flush affected areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
DO NOT INDUCE VOMITING.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.
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-corrosive
Restrict access
Disperse and flush with care

2. LABEL

2.1 Category: Corrosive
2.2 Class: 8

3. CHEMICAL DESIGNATIONS

3.1 CG Compatibility Class: Sulfuric acid
3.2 Formula: H_2SO_4
3.3 IMO/UN Designation: 8.0/1830
3.4 DOT ID No: 1830
3.5 CAS Registry No: 7664-93-9

4. OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped): Liquid
4.2 Color: Colorless (pure) to dark brown
4.3 Odor: Odorless unless hot, then choking

5. HEALTH HAZARDS

5.1 Personal Protective Equipment: Safety shower; eyewash fountain; safety goggles; face shield; approved respirator (self-contained or air-line); rubber safety shoes; rubber apron.
5.2 Symptoms Following Exposure: Inhalation of vapor from hot, concentrated acid may injure lungs. Swallowing may cause severe injury or death. Contact with skin or eyes causes severe burns.
5.3 Treatment of Exposure: Call a doctor. INHALATION: observe victim for delayed pulmonary reactions. INGESTION: have victim drink water if possible; do NOT induce vomiting. EYES AND SKIN: wash with large amounts of water for at least 15 min; do not use oils or ointments in eyes; treat skin burns.
5.4 Threshold Limit Value: 1 mg/m³
5.5 Short Term Inhalation Limits: 10 mg/m³ for 5 min; 5 mg/m³ for 10 min; 2 mg/m³ for 30 min; 1 mg/m³ for 60 min.
5.6 Toxicity by Ingestion: No effects except those secondary to tissue damage.
5.7 Late Toxicity: None
5.8 Vapor (Gas) Irritant Characteristics: Vapors from hot acid (77-98%) cause moderate irritation of eyes and respiratory system. Effect is temporary.
5.9 Liquid or Solid Irritant Characteristics: 77-98% acid causes severe second- and third-degree burns of skin on short contact and is very injurious to the eyes.
5.10 Odor Threshold: Greater than 1 mg/m³
5.11 IDLH Value: 60 mg/m³

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: Water used on adjacent fires should be carefully handled.
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: None
6.9 Burning Rate: Not flammable
6.10 Adiabatic Flame Temperature: Data not available
6.11 Stoichiometric Air to Fuel Ratio: Data not available
6.12 Flame Temperature: Data not available

7. CHEMICAL REACTIVITY

7.1 Reactivity With Water: Reacts violently with evolution of heat. Spattering occurs when water is added to the compound.
7.2 Reactivity with Common Materials: Extremely hazardous in contact with many materials, particularly metals and combustibles. Dilute acid reacts with most metals, releasing hydrogen which can form explosive mixtures with air in confined spaces.
7.3 Stability During Transport: Stable
7.4 Neutralizing Agents for Acids and Caustics: Dilute with water, then neutralize with lime, limestone, or soda ash.
7.5 Polymerization: Not pertinent
7.6 Inhibitor of Polymerization: Not pertinent

(Continued)

8. WATER POLLUTION

8.1 Aquatic Toxicity:
24.5 ppm/24 hr/bluegill/lethal/fresh water
42.5 ppm/48 hr/prawn/LC_{50}/salt water
8.2 Waterfowl Toxicity: Data not available
8.3 Biological Oxygen Demand (BOD): None
8.4 Food Chain Concentration Potential: None

9. SHIPPING INFORMATION

9.1 Grades of Purity: CP; USP; Technical, at 33% to 98% (50° Be to 66° Be).
9.2 Storage Temperature: Ambient
9.3 Inert Atmosphere: No requirement
9.4 Venting: Open

If materials involved may be above to [illegible] the [illegible] CMA [illegible]

10. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook)
A-P-O

11. HAZARD CLASSIFICATIONS

11.1 Code of Federal Regulations: Corrosive material
11.2 NAS Hazard Rating for Bulk Water Transportation:

Category	Rating
Fire	0
Health	
Vapor Irritant	2
Liquid or Solid Irritant	4
Poisons	2
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	3
Aesthetic Effect	2
Reactivity	
Other Chemicals	4
Water	3
Self Reaction	0

11.3 NFPA Hazard Classification:

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

12. PHYSICAL AND CHEMICAL PROPERTIES

12.1 Physical State at 15°C and 1 atm: Liquid
12.2 Molecular Weight: 98.08
12.3 Boiling Point at 1 atm: 644°F = 340°C = 613°K
12.4 Freezing Point: Not pertinent
12.5 Critical Temperature: Not pertinent
12.6 Critical Pressure: Not pertinent
12.7 Specific Gravity: 1.84 at 20°C (liquid)
12.8 Liquid Surface Tension: Not pertinent
12.9 Liquid Water Interfacial Tension: Not pertinent
12.10 Vapor (Gas) Specific Gravity: Not pertinent
12.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
12.12 Latent Heat of Vaporization: Not pertinent
12.13 Heat of Combustion: Not pertinent
12.14 Heat of Decomposition: Not pertinent
12.15 Heat of Solution in 419.0 [illegible] SO_2 = −232.2 cal/g = −0.715 X 10⁶ 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: Low

*Physical properties apply to concentrated (99%) acid unless otherwise [illegible] acid is more [illegible]

7. CHEMICAL REACTIVITY (Continued)

7.7 Molar Ratio (Reactant to Product): Data not available
7.8 Reactivity Group: 2

TETRACHLOROETHYLENE

TTE

Common Synonyms	Watery liquid · Colorless · Sweet odor
Tetracap Perclene Perchloroethylene Perk	Sinks in water. Irritating vapor is produced.

Stop discharge if possible.
Avoid contact with liquid and vapor.
Isolate and remove discharged material.
Notify local health and pollution control agencies.

Fire

Not flammable.
Poisonous gases are produced when heated.

Exposure

CALL FOR MEDICAL AID.

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

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.
May be dangerous if it enters water intakes.

Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook)

Should be removed
Chemical and physical treatment

2. LABEL

2.1 Category: None
2.2 Class: Not pertinent

3. CHEMICAL DESIGNATIONS

3.1 CG Compatibility Class: Not listed
3.2 Formula: $Cl_2C{=}CCl_2$
3.3 IMO/UN Designation: 6.1/1897
3.4 DOT ID No.: 1897
3.5 CAS Registry No.: 127-18-4

4. OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped): Liquid
4.2 Color: Colorless
4.3 Odor: Ethereal; like chloroform; mildly sweet

5. HEALTH HAZARDS

5.1 Personal Protective Equipment: For high vapor concentrations use approved canister or air-supplied mask; chemical goggles or face shield; plastic gloves.
5.2 Symptoms Following Exposure: Vapor can affect central nervous system and cause anesthesia. Liquid may irritate skin after prolonged contact. May irritate eyes but causes no injury.
5.3 Treatment of Exposure: INHALATION: If illness occurs, remove patient to fresh air, keep him warm and quiet, and get medical attention. INGESTION: Induce vomiting only on physician's recommendation. EYES AND SKIN: flush with plenty of water and get medical attention if irritation or injury occurs.
5.4 Threshold Limit Value: 50 ppm
5.5 Short Term Inhalation Limits: 100 ppm for 60 min.
5.6 Toxicity by Ingestion: Grade 2; LD_{50} = 0.5 to 5 g/kg
5.7 Late Toxicity: None
5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or throat 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: 5 ppm
5.11 IDLH Value: 500 ppm

6. FIRE HAZARDS

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

7. CHEMICAL REACTIVITY

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

8. WATER POLLUTION

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

9. SHIPPING INFORMATION

9.1 Grades of Purity: Dry cleaning and industrial grades: 99+%
9.2 Storage Temperature: Ambient
9.3 Inert Atmosphere: No requirement
9.4 Venting: Pressure-vacuum

10. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook)

A-X

11. HAZARD CLASSIFICATIONS

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

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

11.3 NFPA Hazard Classification: Not listed

12. PHYSICAL AND CHEMICAL PROPERTIES

12.1 Physical State at 15°C and 1 atm: Liquid
12.2 Molecular Weight: 165.83
12.3 Boiling Point at 1 atm: 250°F = 121°C = 394°K
12.4 Freezing Point: −5.3°F = −22.4°C = 250.8°K
12.5 Critical Temperature: 657°F = 347°C = 620°K
12.6 Critical Pressure: Not pertinent
12.7 Specific Gravity: 1.63 at 20°C (liquid)
12.8 Liquid Surface Tension: 31.3 dynes/cm = 0.0313 N/m at 20°C
12.9 Liquid Water Interfacial Tension: 44.4 dynes/cm = 0.0444 N/m at 20°C
12.10 Vapor (Gas) Specific Gravity: Not pertinent
12.11 Ratio of Specific Heats of Vapor (Gas): 1.116
12.12 Latent Heat of Vaporization: 90.2 Btu/lb = 50.1 cal/g = 2.10 X 10^5 J/kg
12.13 Heat of Combustion: Not pertinent
12.14 Heat of Decomposition: Not pertinent
12.15 Heat of Solution: Not pertinent
12.16 Heat of Polymerization: Not pertinent
12.25 Heat of Fusion: Data not available
12.26 Limiting Value: Data not available
12.27 Reid Vapor Pressure: Data not available

NOTES

TOLUENE

TOL

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

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

Fire

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

Exposure

CALL FOR MEDICAL AID.

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

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

Water Pollution

Dangerous to aquatic life in high concentrations.
Fouling to shoreline.
May be dangerous if it enters water intakes.

Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

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

2. LABEL

2.1 Category: Flammable liquid
2.2 Class: 3

3. CHEMICAL DESIGNATIONS

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

4. OBSERVABLE CHARACTERISTICS

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

5. HEALTH HAZARDS

5.1 Personal Protective Equipment: Air-supplied mask; goggles or face shield; plastic gloves.
5.2 Symptoms Following Exposure: Vapors irritate eyes and upper respiratory tract; cause dizziness, headache, anesthesia, respiratory arrest. Liquid irritates eyes and causes drying of skin. If aspirated, causes coughing, gagging, distress, and rapidly developing pulmonary edema. If ingested causes vomiting, gaping, diarrhea, depressed respiration.
5.3 Treatment of Exposure: [illegible] remove to fresh air, give artificial respiration and oxygen if needed; call a doctor. [illegible] vomiting; call a doctor. Flush skin with water for at least 10 min; [illegible] wash with soap and water.
5.4 Threshold Limit Value: 100 ppm
5.5 Short Term Inhalation Limits: 600 ppm for 30 min.
5.6 Toxicity by Ingestion: Grade 2; LD_{50} = 0.5 to 5 g/kg
5.7 Late Toxicity: Kidney and liver damage may follow ingestion.
5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
5.10 Odor Threshold: 0.17 ppm
5.11 IDLH Value: 2,000 ppm

6. FIRE HAZARDS

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

(Continued)

7. CHEMICAL REACTIVITY

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

8. WATER POLLUTION

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

9. SHIPPING INFORMATION

9.1 Grades of Purity: Research, reagent, nitration-all 99.8 + %; industrial: contains 94 + %, with 5% xylene and small amounts of benzene and aromatic hydrocarbons; 55/120: less pure, less industrial.
9.2 [illegible]
9.3 [illegible]
9.4 Venting: Open (flame arrester) or pressure-vacuum

10. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook)
A-T-U

11. HAZARD CLASSIFICATIONS

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

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

11.3 NFPA Hazard Classification:

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

12. PHYSICAL AND CHEMICAL PROPERTIES

12.1 Physical State at 15°C and 1 atm: Liquid
12.2 Molecular Weight: 92.14
12.3 Boiling Point at 1 atm: 231.1°F = 110.6°C = 383.8°K
12.4 Freezing Point: −139°F = −95.0°C = 178.2°K
12.5 Critical Temperature: 605.4°F = 318.6°C = 591.8°K
12.6 Critical Pressure: 596.1 psia = 40.55 atm = 4.108 MN/m²
12.7 Specific Gravity: 0.867 at 20°C (liquid)
12.8 Liquid Surface Tension: 29.0 dynes/cm = 0.0290 N/m at 20°C
12.9 Liquid-Water Interfacial Tension: 36.1 dynes/cm = 0.0361 N/m at 25°C
12.10 Vapor (Gas) Specific Gravity: Not pertinent
12.11 Ratio of Specific Heats of Vapor (Gas): 1.089
12.12 Latent Heat of Vaporization: 155 Btu/lb = 86.1 cal/g = 3.61 X 10⁵ J/kg
12.13 Heat of Combustion: −17,430 Btu/lb = −9686 cal/g = −405.5 X 10⁵ 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: 12.17 cal/g
12.26 Limiting Value: Data not available
12.27 Reid Vapor Pressure: [illegible]

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

4. OBSERVABLE CHARACTERISTICS

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

5. HEALTH HAZARDS

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

5.2 Symptoms Following Exposure: INHALATION: symptoms range from loss of equilibrium and incoordination to loss of consciousness; high concentration can be fatal due to simple asphyxiation combined with loss of consciousness. INGESTION: products irritant 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 Late Toxicity: Data not available
5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
5.10 Odor Threshold: 100 ppm
5.11 IDLH Value: 1,000 ppm

6. FIRE HAZARDS

6.1 Flash Point: Data not available
6.2 Flammable Limits in Air: 7%–16%
6.3 Fire Extinguishing Agents: Dry chemical, foam, or carbon dioxide
6.4 Fire Extinguishing Agents Not to be Used: Not pertinent
6.5 Special Hazards of Combustion Products: Toxic and irritating gases are generated in fires.
6.6 Behavior in Fire: Not pertinent
6.7 Ignition Temperature: 832°F
6.8 Electrical Hazard: Not pertinent
6.9 Burning Rate: (est.) 2.9 mm/min.
6.10 Adiabatic Flame Temperature: Data not available
6.11 Stoichiometric Air to Fuel Ratio: Data not available
6.12 Flame Temperature: Data not available

7. CHEMICAL REACTIVITY

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

8. WATER POLLUTION

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

9. SHIPPING INFORMATION

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

10. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook)
A-X-Y

11. HAZARD CLASSIFICATIONS

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

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

11.3 NFPA Hazard Classification:

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

12. PHYSICAL AND CHEMICAL PROPERTIES

12.1 Physical State at 15°C and 1 atm: Liquid
12.2 Molecular Weight: 133.41
12.3 Boiling Point at 1 atm: 165°F = 74°C = 347°K
12.4 Freezing Point: <−36°F = <−38°C = <234°K
12.5 Critical Temperature: Not pertinent
12.6 Critical Pressure: Not pertinent
12.7 Specific Gravity: 1.31 at 20°C (liquid)
12.8 Liquid Surface Tension: 25.4 dynes/cm = 0.0254 N/m at 20°C
12.9 Liquid Water Interfacial Tension: (est.) 45 dynes/cm = 0.045 N/m at 20°C
12.10 Vapor (Gas) Specific Gravity: 4.6
12.11 Ratio of Specific Heats of Vapor (Gas): 1.104
12.12 Latent Heat of Vaporization: 100 Btu/lb = 56 cal/g = 2.4 X 10^5 J/kg
12.13 Heat of Combustion (est): -4700 Btu/lb = -2600 cal/g = -110 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: 4.0 psia

NOTES

TRICHLOROETHYLENE

TCL

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

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

Fire

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

Exposure

CALL FOR MEDICAL AID.

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

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

Water Pollution

Effect of low concentrations on aquatic life is unknown.
May be dangerous if it enters water intakes.

Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

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

2. LABEL

2.1 Category: None
2.2 Class: Not pertinent

3. CHEMICAL DESIGNATIONS

3.1 CG Compatibility Class: Halogenated hydrocarbon
3.2 Formula: $CHCl{=}CCl_2$
3.3 IMO/UN Designation: 6.1/1710
3.4 DOT ID No.: 1710
3.5 CAS Registry No.: 79-01-6

4. OBSERVABLE CHARACTERISTICS

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

5. HEALTH HAZARDS

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

6. FIRE HAZARDS

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

7. CHEMICAL REACTIVITY

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

8. WATER POLLUTION

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

9. SHIPPING INFORMATION

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

10. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook)
A-X-Y

11. HAZARD CLASSIFICATIONS

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

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

11.3 NFPA Hazard Classification

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

12. PHYSICAL AND CHEMICAL PROPERTIES

12.1 Physical State at 16°C and 1 atm: Liquid
12.2 Molecular Weight: 131.39
12.3 Boiling Point at 1 atm: 189°F = 87°C = 360°K
12.4 Freezing Point: −123.5°F = −86.4°C = 186.8°K
12.5 Critical Temperature: Not pertinent
12.6 Critical Pressure: Not pertinent
12.7 Specific Gravity: 1.46 at 20°C (liquid)
12.8 Liquid Surface Tension: 29.3 dynes/cm = 0.0293 N/m at 20°C
12.9 Liquid Water Interfacial Tension: 34.5 dynes/cm = 0.0345 N/m at 24°C
12.10 Vapor (Gas) Specific Gravity: 4.5
12.11 Ratio of Specific Heats of Vapor (Gas): 1.116
12.12 Latent Heat of Vaporization: 103 Btu/lb = 57.2 cal/g = 2.4 X 10⁵ J/kg
12.13 Heat of Combustion: Not pertinent
12.14 Heat of Decomposition: Not pertinent
12.15 Heat of Solution: Not pertinent
12.16 Heat of Polymerization: Not pertinent
12.25 Heat of Fusion: Data not available
12.26 Limiting Value: Data not available
12.27 Reid Vapor Pressure: 3.5 psia

NOTES

TRICHLOROFLUOROMETHANE

TCF

Common Synonyms	Liquid	Colorless	Odorless
F-11; Freon 11 Genetron 11 Arcton 9 Isotron 11; Eskimon 11 Frigen 11 Isotron 11; Ucon 11	Sinks in water. Harmful vapor is produced. Boiling point is 75°F.		

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

Fire

Not flammable.
POISONOUS GASES MAY BE PRODUCED IN FIRE.
Wear goggles and self-contained breathing apparatus.

Exposure

CALL FOR MEDICAL AID.

VAPOR
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
Not harmful.

Water Pollution

Not harmful to aquatic life.
May be dangerous if it enters water intakes.

Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook)

Should be removed
Chemical and physical treatment

2. LABEL

2.1 Category: None
2.2 Class: Not pertinent

3. CHEMICAL DESIGNATIONS

3.1 CG Compatibility Class: Not listed
3.2 Formula: $CFCl_3$
3.3 IMO/UN Designation: Not listed
3.4 DOT ID No.: Data not available
3.5 CAS Registry No.: 75-69-4

4. OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped): Liquid
4.2 Color: Colorless
4.3 Odor: Odorless; weak chlorinated solvent

5. HEALTH HAZARDS

5.1 Personal Protective Equipment: Air line respirator; rubber gloves; monogoggles
5.2 Symptoms Following Exposure: Breathing concentrations approaching 10% in air will cause dizziness and drowsiness. Contact with tissues may cause frostbite.
5.3 Treatment of Exposure: INHALATION: remove victim to non-contaminated area and apply artificial respiration if breathing has stopped; call a physician immediately; oxygen inhalation may be utilized. SKIN: If frostbite has occurred, flush areas with warm water.
5.4 Threshold Limit Value: 1000 ppm
5.5 Short Term Inhalation Limits: Data not available
5.6 Toxicity by Ingestion: Data not available
5.7 Late Toxicity: Data not available
5.8 Vapor (Gas) Irritant Characteristics: Non-irritating
5.9 Liquid or Solid Irritant Characteristics: May cause frostbite.
5.10 Odor Threshold: Data not available
5.11 IDLH Value: Data not available

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: Produces irritating and toxic products when heated to decomposition temperatures.
6.6 Behavior in Fire: Not pertinent
6.7 Ignition Temperature: Not flammable
6.8 Electrical Hazard: Not pertinent
6.9 Burning Rate: Not flammable
6.10 Adiabatic Flame Temperature: Data not available
6.11 Stoichiometric Air to Fuel Ratio: Data not available
6.12 Flame Temperature: Data not available

7. CHEMICAL REACTIVITY

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

8. WATER POLLUTION

8.1 Aquatic Toxicity: 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
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-C-I-J

11. HAZARD CLASSIFICATIONS

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

12. PHYSICAL AND CHEMICAL PROPERTIES

12.1 Physical State at 15°C and 1 atm: Data not available
12.2 Molecular Weight: Data not available
12.3 Boiling Point at 1 atm: Data not available
12.4 Freezing Point: Data not available
12.5 Critical Temperature: Data not available
12.6 Critical Pressure: Data not available
12.7 Specific Gravity: Data not available
12.8 Liquid Surface Tension: Data not available
12.9 Liquid Water Interfacial Tension: Data not available
12.10 Vapor (Gas) Specific Gravity: Data not available
12.11 Ratio of Specific Heats of Vapor (Gas): Data not available
12.12 Latent Heat of Vaporization: Data not available
12.13 Heat of Combustion: Data not available
12.14 Heat of Decomposition: Not pertinent
12.15 Heat of Solution: Not pertinent
12.16 Heat of Polymerization: Not pertinent
12.25 Heat of Fusion: Data not available
12.26 Limiting Value: Data not available
12.27 Reid Vapor Pressure: Data not available

NOTES

m-XYLENE

XLM

Common Synonyms	Watery liquid . Colorless Sweet odor
1,3-Dimethylbenzene Xylol	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 areas with plenty of water.
IF IN EYES, hold eyelids open and flush with plenty of water.
IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
DO NOT INDUCE VOMITING.

Water Pollution

HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS.
Fouling to shoreline.
May be dangerous if it enters water intakes.

Notify local health and wildlife officials.
Notify operators of nearby water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook)

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: m-$C_6H_4(CH_3)_2$
3.3 IMO/UN Designation: 3.2/1307
3.4 DOT ID No.: 1307
3.5 CAS Registry No.: 108-38-3

4. OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped): Liquid
4.2 Color: Colorless
4.3 Odor: Like benzene; 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: [illegible] administer artificial respiration and oxygen if required; call a doctor. [illegible] 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 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

6. FIRE HAZARDS

6.1 Flash Point: 84°F C.C.
6.2 Flammable Limits in Air: 1.1%-6.4%
6.3 Fire Extinguishing Agents: Foam, dry chemical, or carbon dioxide
6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective.
6.5 Special Hazards of Combustion Products: Not pertinent
6.6 Behavior in Fire: Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back.
6.7 Ignition Temperature: 867°F
6.8 Electrical Hazard: Class I, Group D
6.9 Burning Rate: 6.6 mm/min.
6.10 Autoignition 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 Motor Fuels (Reactant to Product): Data not available
7.8 Reactivity Group: 32

8. WATER POLLUTION

8.1 Aquatic Toxicity: 22 ppm/96 hr/bluegill/TL_m/fresh water
8.2 Waterfowl Toxicity: Data not available
8.3 Biological Oxygen Demand (BOD): 0 lb/lb, 5 days; 0% (theor.), 5 days
8.4 Food Chain Concentration Potential: Data not available

9. SHIPPING INFORMATION

9.1 Grades of Purity: Research: 99.88%; Pure: 99.8%; Technical: 99.2%
9.2 Storage Temperature: Ambient
9.3 Inert Atmosphere: No requirement
9.4 Venting: Open (flame arresting) or pressure-vacuum

10. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook)

A-T-U

11. HAZARD CLASSIFICATIONS

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

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

11.3 NFPA Hazard Classification:

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

12. PHYSICAL AND CHEMICAL PROPERTIES

12.1 Physical State at 15°C and 1 atm: Liquid
12.2 Molecular Weight: 106.16
12.3 Boiling Point at 1 atm: 268.4°F = 131.9°C = 405.1°K
12.4 Freezing Point: −54.2°F = −47.9°C = 225.3°K
12.5 Critical Temperature: 650.6°F = 343.6°C = 617.0°K
12.6 Critical Pressure: 513.6 atm = 34.96 psia = 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 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: 147 Btu/lb = 81.9 cal/g = 3.43 X 10⁵ J/kg
12.13 Heat of Combustion: −17,554 Btu/lb = −9752.4 cal/g = −408.31 X 10⁵ 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: [illegible]
12.18 Limiting Value: [illegible]
12.19 Odor Threshold: [illegible]

NOTES

o-XYLENE

XLO

Common Synonyms	Watery liquid	Colorless	Sweet odor
1, 2-Dimethylbenzene Xylol	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 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
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: o-$C_6H_4(CH_3)_2$
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 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

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: 867°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

7. CHEMICAL REACTIVITY

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

8. WATER POLLUTION

8.1 Aquatic Toxicity: >100 mg/l/96 hr/D. magna/TL_m/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

9. SHIPPING INFORMATION

9.1 Grades of Purity: Research: 99.99%; Pure: 99.7%; Commercial: 98+%
9.2 Storage Temperature: Ambient
9.3 Inert Atmosphere: No reaction
9.4 Venting: Open (flame arrester) or pressure-vacuum

10. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook)

A-T-U

11. HAZARD CLASSIFICATIONS

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

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

11.3 NFPA Hazard Classification:

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

12. PHYSICAL AND CHEMICAL PROPERTIES

12.1 Physical State at 15°C and 1 atm: Liquid
12.2 Molecular Weight: 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: 674.6°F = 357.1°C = 630.3°K
12.6 Critical Pressure: 541.5 atm = 36.84 pcia = 3.732 MN/m²
12.7 Specific Gravity: 0.880 at 20°C (liquid)
12.8 Liquid Surface Tension: 30.53 dynes/cm = 0.03053 N/m at 15.5°C
12.9 Liquid Water Interfacial Tension: 36.06 dynes/cm = 0.03606 N/m at 20°C
12.10 Vapor (Gas) Specific Gravity: Not pertinent
12.11 Ratio of Specific Heats of Vapor (Gas): 1.086
12.12 Latent Heat of Vaporization: 149 Btu/lb = 82.9 cal/g = 3.47 X 10⁵ J/kg
12.13 Heat of Combustion: −17,558 Btu/lb = −9754.7 cal/g = −408.41 X 10⁵ 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: 30.94 cal/g
12.18 Limiting Value: Data not available
12.19 Reid Vapor Pressure: [illegible]

NOTES

JUNE 1985

p-XYLENE

XLP

Common Synonyms: Dimethylbenzene	Watery liquid — Colorless — Sweet odor Floats on water. Flammable, irritating vapor is produced. Freezing point is 56°F.

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

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook)

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: $p\text{-}C_6H_4(CH_3)_2$
3.3 IMO/UN Designation: 3.2/1307
3.4 DOT ID No.: 1307
3.5 CAS Registry No.: 106-42-3

4. OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped): Liquid
4.2 Color: Colorless
4.3 Odor: Like benzene; 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 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

6. FIRE HAZARDS

6.1 Flash Point: 81°F C.C.
6.2 Flammable Limits in Air: 1.1%-6.6%
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: 870°F
6.8 Electrical Hazard: Class I, Group D
6.9 Burning Rate: 6.6 mm/min.
6.10 Adiabatic Flame Temperature: Data not available
6.11 Stoichiometric Air to Fuel Ratio: Data not available
6.12 Flame Temperature: Data not available

7. CHEMICAL REACTIVITY

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

8. WATER POLLUTION

8.1 Aquatic Toxicity: 22 ppm/96 hr/bluegill/TL_m/fresh water
8.2 Waterfowl Toxicity: Data not available
8.3 Biological Oxygen Demand (BOD): 0 lb/lb in 5 days
8.4 Food Chain Concentration Potential: Data not available

9. SHIPPING INFORMATION

9.1 Grades of Purity: Research: 99.99%; Pure: 99.8%; Technical: 99.0%
9.2 Storage Temperature: Ambient
9.3 Inert Atmosphere: No requirement
9.4 Venting: Open (flame arrester) or pressure-vacuum

10. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook)

A-T-U

11. HAZARD CLASSIFICATIONS

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

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

11.3 NFPA Hazard Classification:

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

12. PHYSICAL AND CHEMICAL PROPERTIES

12.1 Physical State at 15°C and 1 atm: Liquid
12.2 Molecular Weight: 106.16
12.3 Boiling Point at 1 atm: 280.6°F = 138.3°C = 411.5°K
12.4 Freezing Point: 55.9°F = 13.3°C = 286.5°K
12.5 Critical Temperature: 649.4°F = 343.0°C = 616.2°K
12.6 Critical Pressure: 508.4 atm = 34.65 psia = 3.510 MN/m²
12.7 Specific Gravity: 0.861 at 20°C (liquid)
12.8 Liquid Surface Tension: 28.3 dynes/cm = 0.0283 N/m at 20°C
12.9 Liquid Water Interfacial Tension: 37.5 dynes/cm = 0.0375 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: 150 Btu/lb = 81 cal/g = 3.4 X 10⁵ J/kg
12.13 Heat of Combustion: −17,550 Btu/lb = −9754.7 cal/g = −408.41 X 10⁵ 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: 37.83 cal/g
12.26 Limiting Value: Data not available
12.27 Reid Vapor Pressure: 0.34 psia

NOTES

APPENDIX B

MISCELLANEOUS REPORTS

SITE SAFETY FOLLOW-UP REPORT

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

Was the HASP followed as presented? _____yes _____no

DESCRIBE IN DETAIL ANY CHANGES TO THE HASP:

REASON FOR CHANGES:

APPROVED BY: SITE MANAGER _____ DATE: _____-
___

SITE SAFETY OFFICER _____ DATE: _____

EVALUATION OF HEALTH AND SAFETY PLAN

Was the HASP adequate? _____yes _____no

WHAT CHANGES WOULD YOU RECOMMEND?

ABB ENVIRONMENTAL SERVICES, INC.
ACCIDENT REPORT

SITE INFORMATION:

Site:_____ Job Number:_____

Location:_____

Location of Accident (if different from above):_____

Did injury involve ABB-ES employee?_____ Subcontractor?_____ Other?_____

PERSONAL INFORMATION:

Name of Injured Person:_____

Address of Injured Person:_____

SSN:_____ DOB:_____ Marital Status:_____

Department:_____ Date of Hire:_____

ACCIDENT INFORMATION:

Date of Accident:_____ Time of Accident:_____ Weather Conditions:_____

Name of Witness:_____ Telephone No.:_____

Address:_____

Accident Category: ☐ Chemical Exposure ☐ Physical Injury ☐ Motor Vehicle ☐ Fire
☐ Property Damage (list):_____ ☐ Other:_____

Severity: ☐ Medical Treatment ☐ Non-disabling ☐ Disabling ☐ Fatality
☐ Estimated Amount of Property Damage:_____

Classification of Injury:

☐ Heat Burns	☐ Allergic Reaction	☐ Lacerations	☐ Fracture
☐ Chemical Burns	☐ Bites	☐ Punctures	☐ Dislocations
☐ Radiation Burns	☐ Poison Ivy	☐ Abrasions	☐ Nausea
☐ Toxic-Respiratory	☐ Heat Stroke	☐ Sprains	☐ Headache
☐ Toxic-Dermal	☐ Cold Exposure	☐ Bruises	☐ Faint/Dizzy
☐ Toxic-Ingestion	☐ Blisters	☐ Concussion	

☐ Other:_____

If chemical exposure, list all possible contaminants of concern:_____

_____

_____

Part(s) of Body Affected:_____ Degree of Disability:_____

Date Medical Care Received:_____ Emergency Service:_____ Follow-up Examination Needed:_____

Name and Address of Medical Facility:_____

_____

Name of Attending Physician:_____ Telephone Number:_____

Date/Time Employee Went Back to Work:_____ Employee on Restricted Duty?_____

Estimated Number of Days Away from Work:_____

CAUSE OF INJURY/ACCIDENT:

Causative agent(s) most directly related to accident (e.g., object, substance, material, machinery, equipment, or weather):_____

_____

Were there unsafe mechanical/physical/environmental condition(s) at the time of the accident?_____

_____

Did an unsafe act contribute to the accident?_____ If yes, specify:_____

_____

Did personal factors contribute to the accident (e.g., improper attitude, lack of knowledge or skill, slow reaction, fatigue, inattention, or horseplay)?_____

_____

ACCIDENT PREVENTION:

Level of personal protective equipment required in the HASP:_____

Was injured using required equipment?_____ If not, how did actual equipment differ from what was required in the HASP? Describe:_____

_____

Was personal protective equipment required in the HASP adequate for site conditions?_____

If no, what additional equipment was needed?_____

_____

What can be done to prevent a reoccurrence of this type of accident (e.g., ventilation, machine modification/guarding, modification of work practices, or additional training)?_____

_____

_____

NARRATIVE:

Provide a detailed description of how and why the accident occurred. Include objects, equipment, tools, circumstances of assigned duties, weather, etc. (be specific):_____

_____

_____

_____

_____

_____

_____

_____

_____

Signature of Preparer:_____ Date:_____

Signature of Site Manager:_____ Date:_____

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

APPENDIX C

HEAT STRESS CASUALTY PREVENTION PLAN

HEAT STRESS CASUALTY PREVENTION PLAN

1.1 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.

1.1.1 Identification and Treatment

1.1.1.1 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.

1.1.1.2 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 may 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.

1.1.2 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:

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

1.1.3 **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.

1.2 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.

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

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

1.2.1 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.

1.2.1.1 **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.

1.2.1.2 **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.

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.

1.2.1.3 **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 wriggling your toes and moving your ankles. Never wear tight boots.

1.2.2 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.

1.2.2.1 **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 °F
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

1.2.2.2 **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.

1.2.2.3 **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.

1.2.2.4 **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.

1.2.3 Safety and 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

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

1.2.4.1 **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 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?

1.2.4.2 **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.

1.2.4.3 **Site Access** Snow and ice could make travel on site access roads impossible, or treacherous at best. Personnel should not be allowed to work onsite if conditions could severely hamper the arrival or departure of emergency vehicles. If the route to offsite 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 and plowing services for site access roads;
- a dependable, four-wheel-drive vehicle available to onsite personnel for transporting an injured person to an offsite medical facility; and
- sleeping bags, blankets, a food supply, and water kept onsite 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.

1.2.4.4 **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 onsite. 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., Dräger 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 D

LEVEL B OPERATIONS

I. Introduction

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

II. Team Size

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

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

Health and Safety Officer

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

Decontamination Person

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

APPENDIX E

RESPIRATORY PROTECTION PROGRAM

RESPIRATORY PROTECTION PROGRAM

I. INTRODUCTION

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

II. PERSONNEL REQUIREMENTS

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

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

III. APPLICABLE EQUIPMENT

ABB-ES maintains the following respiratory protective equipment:

- full-face chemical/mechanical air purifying respirators
- self-contained breathing apparatus
- full-face air line-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 onsite conditions. Respiratory protective equipment should not be used arbitrarily by any ABB-ES personnel.

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

IV. PERSONNEL TRAINING

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

- 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.

V. STANDARD RESPIRATORY PROTECTION PROCEDURES

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

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

These procedures are attached.

VI. PROGRAM ADMINISTRATION AND DOCUMENTATION

The administration of ABB-ES' Respiratory Protection Program is the responsibility of the Health and Safety Manager. Administration includes:

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

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

Fit testing and respirator maintenance is performed by the equipment manager of ABB-ES' Sample Control and Staging Center 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 ABB-ES' 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 ABB-ES' Respiratory Protection Program is achieved through several media:

- Documentation of respirator selection is included in the hazard assessment of each site's HASP.

- Documentation of personnel training is maintained in both hard-copy 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.

- Documentation of fit-testing is maintained on file with the equipment manager of the Sample Control and Staging Center, utilizing the appropriate form. (Exhibit 1)

- 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 for each respirator, SCBA, and escape respirator by the equipment manager. (Exhibit 2)

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

EXHIBIT 1

RESPIRATOR FIT TEST WORKSHEET

RESPIRATOR FIT TEST WORKSHEET

PERSONAL INFORMATION:

Applicant Name:_____

Group/Team:_____

Date of Test:_____

Employee Number:_____

EQUIPMENT INFORMATION:

Manufacturer:_____

Model/Size:_____

TEST RESULTS:

	PASS	FAIL
(1) Initial Odor Recognition	☐	☐
(2) Negative Pressure Test	☐	☐
(3) Positive Pressure Test:	☐	☐
(4) Isoamyl Acetate Vapor Test (Banana oil):	☐	☐
(5) Irritant Smoke Test:	☐	☐

ADDITIONAL INFORMATION:

	YES	NO
Passed most recent Pulmonary Function Test (Spirometry)?	☐	☐
Date of Last Exam:_____		
Corrective lenses required for normal work tasks?	☐	☐
Clean shaven?	☐	☐
Any facial characteristics that interfere with respirator fit (e.g., beard or scars)?	☐	☐
If yes, specify:_____		
Employee briefed on the fundamental principals of respiratory protection, use, inspection, cleaning, maintenance, and storage of equipment?	☐	☐

I hereby certify the subject employee has been fit tested according to procedures specified in Appendix F, Section F.7.0 of the Health and Safety Program Manual.

_____ Testers Name

_____ Date

EXHIBIT 2

RESPIRATOR USE & MAINTENANCE RECORD

RESPIRATOR USE AND MAINTENANCE RECORD

Respirator

_____
ID Number

Respirator Type _____

Manufacturer _____

Model Number _____ Date Place In Service _____

Date	Assigned to Whom or Location of Storage	Inspection/Maintenance and Charging (SCBAs) Information	Serviced By

STANDARD RESPIRATORY PROTECTION PROCEDURE NO. 1
RESPIRATORY PROTECTION PRINCIPLES

1.0 INTRODUCTION

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

1.1 ROUTES OF EXPOSURE

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

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

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

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

1.2 OXYGEN DEFICIENCY

1.2.1 Oxygen and the Respiratory Process

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

Table 1
ATMOSPHERIC COMPOSITION

GAS	VOLUME (%)	PARTIAL PRESSURE (mm Hg AT SEA LEVEL)
Nitrogen	78.9	594
Oxygen	20.95	159
Argon	0.93	7
Carbon dioxide	0.04	0.03

It is not the percentage of oxygen in the air, but rather its partial pressure, that is important in respiration. As one increases in altitude, the percentage of oxygen stays constant, but its partial pressure drops. Additionally, as the percentage of oxygen in the air drops, so does its partial pressure.

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

1.2.2 Oxygen Levels/Physiological Effect

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

Note that as altitude increases, the percentage of oxygen stays constant, but the partial pressure drops. There is currently no standard that accounts for the drop in partial pressure with altitude; the problem is currently under study by NIOSH.

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

1.3 PARTICULATE CONTAMINANTS - AEROSOLS

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

1. Pharynx - 10-30 μm
2. Trachea - 10 μm
3. Bronchus - 5-10 μm
4. Alveoli - 0.1-1 μm

Particulates less than 0.5 μm may never be deposited in the respiratory tract and may simply be exhaled.

Particulates affect the human body as follows.

1. Nuisances - inert substances that cause no lung damage but inhibit proper functioning of the lungs.

2. Inert pulmonary reaction causing substances - substances that produce nonspecific pulmonary effects.

Table 2
PHYSIOLOGICAL EFFECTS OF OXYGEN DEFICIENCY

Oxygen Volume Percentage At Sea Level	Physiological Effect
16-12	Increased breathing volume. Accelerated heartbeat. Impaired attention and thinking. Impaired coordination.
14-10	Very faulty judgment. Very poor muscular coordination. Muscular exertion causes rapid fatigue that may cause permanent heart damage. Intermittent respiration.
10-6	Nausea. Vomiting. Inability to perform vigorous movement, or loss of all movement. Unconsciousness, followed by death.
Less than 6	Spasmatic breathing. Convulsive movements. Death in minutes.

3. Pulmonary fibrosis causing substances - substances that produce effects ranging from nodule production to serious diseases such as asbestosis.

4. Irritants - substances that irritate, inflame, or ulcerate lung tissues.

5. Systemic poisons - substances that cause injury to specific organs and body systems.

6. Allergens - substances that produce hypersensitivity.

1.4 GASEOUS CONTAMINANTS

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

Gaseous contaminants affect the human body as follows.

1. Irritants - corrosive compounds that injure and inflame tissue.

2. Asphyxiants - substances that displace oxygen or prevent the use of oxygen by the body.

3. Anesthetics - substances that depress the central nervous system and cause intoxication or loss of sensation.

4. Systemic poisons - substances that cause diseases.

1.5 EXPRESSING AIR CONTAMINANT CONCENTRATIONS

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

1. Particulates

   a. mppcf - millions of particulates per cubic foot.
   b. ppcc - particles per cubic centimeter.
   c. mg/m^3 - milligrams per cubic meter.

2. Gases and Vapors

   a. ppm - volumes per million volumes of air (parts per million).
   b. ppb - volumes per billion volumes of air (parts per billion).
   c. mg/m^3 - milligrams of gas per cubic meter.
   d. Conversion of units. The following equation converts mg/m^3 to ppm, at 24°C and 760 mm Hg.

$$ppm = \frac{24.45}{molecularweight} mg/m^3$$

This equation is extremely useful for determining respiratory protection requirements.

1.6 MEASURES OF RESPIRATORY HAZARDS

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

The guidelines used in measuring respiratory hazards are listed below.

1. Threshold Limit Value. The threshold limit value (TLV) is recommended by the American Conference of Governmental Industrial Hygienists (ACGIH) and is derived from consensus review. It is a time-weighted average concentration set for a particular substance that represents a level that almost all workers can be exposed to for an 8-hr day (40-hr week) without suffering adverse health effects. It is assumed that following each 8-hr. exposure there will be a 16-hr. recovery period and that after 5 days there will be a 48-hr. recovery period. The TLV lists are revised on a yearly basis.

2. Permissible Exposure Limits. The permissible exposure limits (PELs) are set forth in the Occupational Safety and Health Administration (OSHA) Standards 29 CFR 1910.1000, Tables Z-1-A, Z-2, and Z-3. These levels were promulgated initially from the ACGIH TLV lists (1968) and updated in 1989. As part of the law, they represent the legal maximum concentrations for personnel exposure. They are not updated on a yearly basis, as is the TLV list. Therefore, the most current ACGIH TLV or PEL, whichever is lower, is used in determining respiratory protection.

3. Immediately Dangerous to Life and Health. 30 CFR 11.3 defines conditions that are immediately dangerous to life and health (IDLH) as "conditions that pose an immediate threat to life or health or conditions that pose an immediate threat of severe exposure to contaminants such as radioactive materials, which are likely to have an adverse cumulative or delayed effect on health".

   OSHA adds these criteria:

   a. The worker must be able to escape without losing his life or suffering permanent health damage within 30 minutes.

   b. The worker must be able to escape without severe eye or respiratory irritation or other reactions.

4. Lower Explosive Limit. The lower explosive level (LEL) is the lowest concentration by volume of a gas or vapor in air that will explode when there is an ignition source.

1.7 RESPIRATORY PROTECTION

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

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

The legal requirements for respiratory protection are summarized below.

1. Williams and Steiger Occupational Safety and Health Act of 1970 established standards that state that "approved or accepted respirators shall be used when they are available".

2. 29 CFR 1910.134 gives legal requirements for the selection and use of respiratory equipment as promulgated by OSHA and based on American National Standards Institute (ANSI) Standard Z88.2, "American National Standards Practices for Respiratory Protection". Standard Z88.2 was originally a consensus standard, but now has been cited as a Federal regulation.

3. 30 CFR Part 11 describes tests for permissibility of respiratory protective apparatus and updates or deletes approvals. 30 CFR Part 11 also cites ANSI Z88.2 as the basis for respiratory protection.

STANDARD RESPIRATORY PROTECTION PROCEDURE NO. 2
SELECTION OF RESPIRATORS

2.0 INTRODUCTION

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

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

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

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

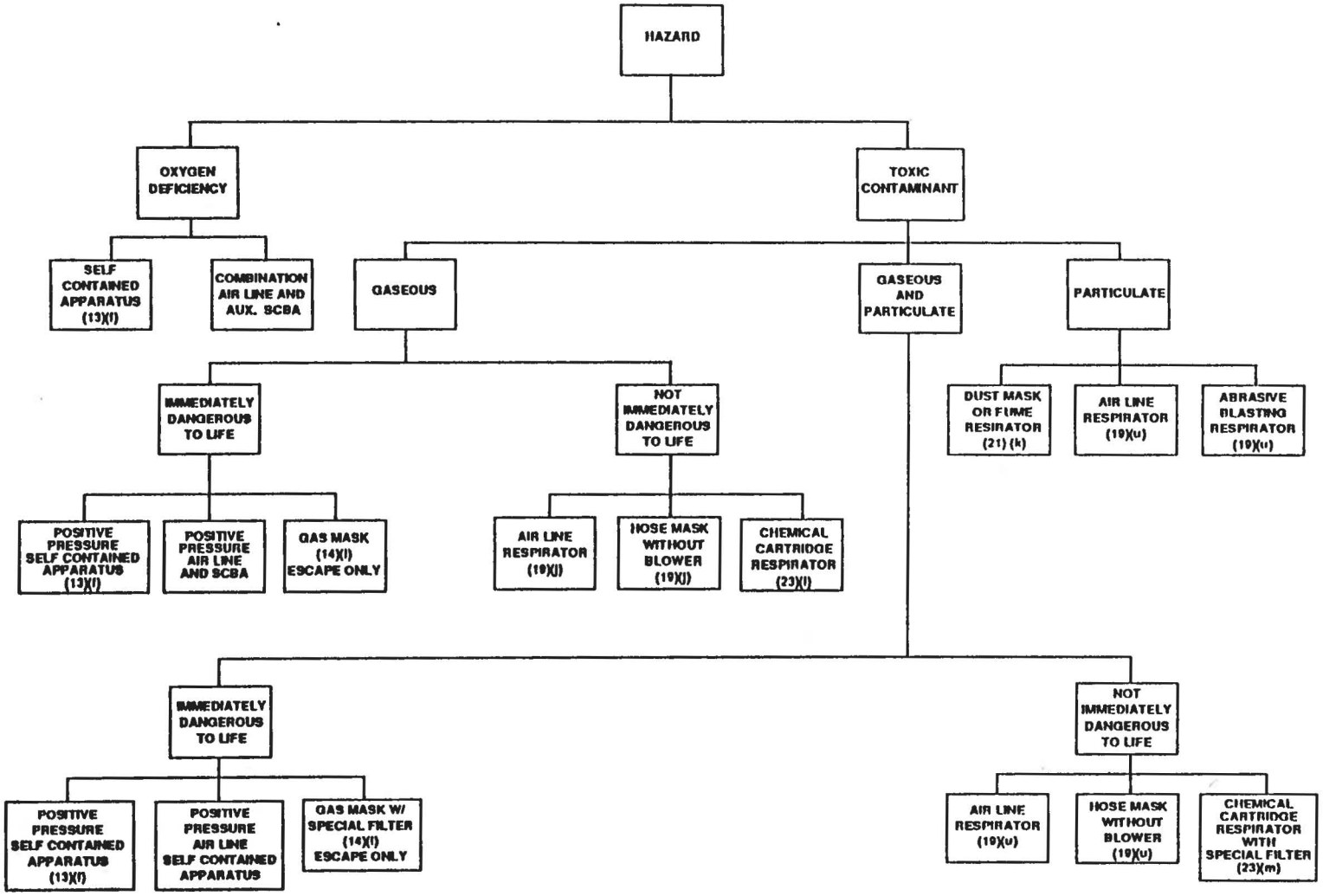
Throughout this text, reference is made to PELs. Prudent, accepted practice dictates the use of current ACGIH TLVs or PELs, whichever is lower.

2.1 GENERAL DECISION LOGIC FLOWCHART

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

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

    a. Permissible exposure limits specified in 29 CFR 1910.1000 (Tables Z-1-A, Z-2, and Z-3),



BASED ON BUREAU OF MINES INFORMATION CIRCULAR 7792

NUMBERS IN PARENTHESIS REFER TO BUREAU OF MINES SCHEDULE.

LETTERS IN PARENTHESIS REFER TO SUBPART OF NIOSH/NESA 30 CFR PART II

FIGURE E-1

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

RCRA FACILITY INVESTIGATION HEALTH AND SAFETY PLAN U.S. NAVAL STATION MAYPORT, FLORIDA

b. Warning properties if the substance is a gas or a vapor,

c. Eye irritation potential of the substance,

d. LEL for the substance,

e. IDLH concentration for the substance,

f. Any possibility of poor sorbent efficiency at IDLH concentration and below,

g. Any possibility of systemic injury of death resulting from absorbance of the substance (as a gas or vapor) through the skin,

h. Any possibility of severe skin irritation resulting from contact of the skin with corrosive gases, vapors, or particulates,

i. The vapor pressure of the substance (and equivalent ppm), and

j. Any possibility of high heat of reaction with sorbent material in cartridge or canister.

2. Step 2 - Determine Physical State of Substance. Determine the physical state(s) of the substance as it is likely to be encountered in the occupational environment. It will be either (1) gas or vapor; (2) particulate (dust, fume or mist); or (3) combination of (1) and (2).

3. Step 3 - Assemble a Table of Permissible Respiratory Protection for Substance. This is done using the material from Step 1 and the appropriate specific decision logic chart from Section 2.3 below and respirator protection factors. Classes of respirators are only included where at least one device has been approved.

4. IF STEPS 1 THROUGH 3 CANNOT BE COMPLETED, THE ATMOSPHERE IS UNKNOWN AND MUST BE CLASSIFIED IDLH. ONLY POSITIVE PRESSURE SCBA MAY BE SELECTED.

2.2 SPECIFIC DECISION LOGIC CHARTS

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

2.3 DECISION LOGIC CRITERIA

2.3.1 Skin Absorption and Irritation

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

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

Where information is available indicating systemic injury or death resulting from absorbance of gas or vapor through the skin or where severe skin irritation or injury may occur from exposure to a gas, corrosive vapor, or particulate, the following statement is included as a footnote to the respirator tables, and both the employee and employer are cautioned in the appendices concerning their use.

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

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

2.3.2 Poor Warning Properties

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

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

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

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

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

2.3.3 Sorbents

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

1. Where supporting evidence exists of immediate (less than 3 min.) breakthrough time at the IDLH concentration and below for a cartridge or canister sorbent, air-purifying devices shall not be allowed for any use, escape or otherwise. See Table 1.

2. Where there is reason to suspect that commonly used sorbents (e.g., activated charcoal) do not provide adequate sorption efficiency against a specific contaminant, use of such sorbents shall not be allowed. However, where another sorbent material has been demonstrated to be effective against a specific contaminant, approved respirators using the effective sorbent material shall be allowed.

3. Where there is reason to suspect that a sorbent has a high heat of reaction with a substance, use of that sorbent is not allowed.

4. Where there is reason to suspect that a substance sorbed on a sorbent of a cartridge or canister is shock sensitive, use of air-purifying respirators is disallowed.

2.3.4 Eye Irritation

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

1. For routine work operations, any perceptible eye irritation is considered unacceptable. Therefore, only full facepiece respirators are permissible in contaminant concentrations that produce eye irritation. Protection may be required in certain concentrations of gases and vapors. For escape, some eye irritation is permissible if it is determined that such irritation would not inhibit escape and such irritation is reversible.

2. Where quantitative eye irritation data cannot be found in literature references, and theoretical considerations indicate that substance should not be an eye irritant, half-facepiece respirators are allowed.

3. Where a review of the literature indicates a substance causes eye irritation but no eye irritation threshold is specified, the data will be evaluated to determine whether quarter- or half-facepiece respirators can be used.

Table 1
Effect of Solvent Vapor on Respirator Cartridge Efficiency[a]

SOLVENT	Time to Reach 1 Percent Breakthrough (10 ppm) (Min)
Aromatics	
Benzene	73
Toluene	94
Ethyl benzene	84
m-Xylene	99
Cumene	81
Mesitylene	86
Alcohols	
Methanol	0.2
Ethanol	28
Isopropanol	54
Allyl alcohol	66
n-Propanol	70
Sec-Butanol	96
Butanol	115
2-Methoxyethanol	116
Isoamyl alcohol	97
4-Methyl-2-pentanol	75
2-Ethoxyethanol	77
Amyl alcohol	102
2-Ethyl-1-butanol	76.5
Monochlorides	
Methyl chloride	0.05
Vinyl chloride	3.8
Ethyl chloride	5.6
Allyl chloride	31
1-Chloropropane	25
1-Chlorobutane	72
Chlorocyclopentane	78
Chlorobenzene	107
1-Chlorohexane	77
o-Chlorotoluene	102
1-Chloroheptane	82
3-Chloromethyl heptane	63

Table 1 (Continued)
Effect of Solvent Vapor on Respirator Cartridge Efficiency[a]

SOLVENT	Time to Reach 1 Percent Breakthrough (10 ppm) (Min)
Dichlorides	
Dichloromethane	10
Trans-1,2-dichloroethylene	33
1,1-Dichloroethane	23
cis-1,2-Dichloroethylene	30
1,2-Dichloroethane	54
1,2-Dichloropropane	65
1,4-Dichlorobutane	108
o-Dichlorobenzene	109
Trichlorides	
Chloroform	33
Methyl chloroform	40
Trichloroethylene	55
1,1,2-Trichloroethane	72
1,2,3-Trichloropropane	111
Tetra- and Pentachlorides	
Carbon tetrachloride	77
Perchloroethylene	107
1,1,2,2-Tetrachloroethane	104
Pentachloroethane	93
Acetates	
Methyl acetate	33
Vinyl acetate	55
Ethyl acetate	67
Isopropyl acetate	65
Isopropenyl acetate	83
Propyl acetate	79
Allyl acetate	76
sec-Butyl acetate	83
Butyl acetate	77
Isopentyl acetate	71
2-Methoxyethyl acetate	93
1,3-Dimethylbutyl acetate	61
Amyl acetate	73
2-Ethoxylethyl acetate	80
Hexyl acetate	67

Table 1 (Continued)
Effect of Solvent Vapor on Respirator Cartridge Efficiency[a]

SOLVENT	Time to Reach 1 Percent Breakthrough (10 ppm) (Min)
Ketones	
Acetone	37
2-Butanone	82
2-Pentanone	104
3-Pentanone	94
4-Methyl-2-pentanone	96
Mesityl oxide	122
Cyclopentanone	141
3-Heptanone	91
2-Heptanone	101
Cyclohexanone	126
5-Methyl-3-heptanone	86
3-Methylcyclohexanone	101
Diisobutyl ketone	71
4-Methylcyclohexanone	111
Alkanes	
Pentane	61
Hexane	52
Methylcyclopentane	62
Cyclohexane	69
Cyclohexene	86
2,2,4-Trimethylpentane	68
Heptane	78
Methycyclohexane	69
5-Ethylidene-2-norbornene	87
Nonane	76
Decane	71
Amines	
Methyl amine	12
Ethyl amine	40
Isopropyl amine	66
Propyl amine	90
Diethyl amine	88
Butyl amine	110
Triethyl amine	81
Dipropyl amine	93
Diisopropyl amine	77
Cyclohexyl amine	112
Dibutyl amine	76

Table 1 (Continued)
Effect of Solvent Vapor on Respirator Cartridge Efficiency[a]

SOLVENT	Time to Reach 1 Percent Breakthrough (10 ppm) (Min)
Miscellaneous Materials	
Acrylonitrile	49
Pyridine	119
1-Nitropropane	143
Methyl iodide	12
Dibromomethane	82
1,2-Dibromoethane	141
Acetic anhydride	124
Bromobenzene	142

[a] The above cartridge pairs were tested at 1000 ppm, 50 percent relative humidity, 22°C, and 53.3 l/min. (equivalent to a moderately heavy work rate). The time to achieve a 1 percent breakthrough is noted for each cartridge pair. Cartridges were preconditioned at room temperature and 50 percent relative humidity for at least 24 hours prior to testing.

2.3.5 IDLH

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

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

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

In establishing the IDLH concentration the following factors are considered.

1. Escape without loss of life or irreversible health effects. Thirty minutes is considered the maximum permissible exposure time for escape.

2. Severe eye or respiratory irritation or other reactions that would prevent escape without injury.

IDLH should be determined from the following sources:

1. Specific IDLH provided in the literature, NIOSH Pocket Guide to Chemical Hazards, 1990.

2. Human exposure data.

3. Acute animal exposure data.

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

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

1. Where acute animal exposure data are available (30 min. to 4-hr. exposures), the lowest exposure concentration causing death or irreversible health effects in any species is determined to be the IDLH concentration.

2. Chronic exposure data may have no relevance to the acute effects and should be used in determining the IDLH concentration only upon competent toxicologic judgment.

3. Where there is no toxicologic evidence of an IDLH concentration, 500 times the permissible exposure limit shall determine the upper limit above which only highly reliable breathing apparatus providing maximum worker protection is used.

2.3.6 Lower Explosive Limit

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

Contaminant concentrations in excess of the LEL are considered to be IDLH. At or above the LEL, the use of respirators is limited to those devices that provide the maximum protection (i.e., positive pressure self-contained breathing apparatus (SCBA) and the combination positive pressure supplied-air respirators with auxiliary positive pressure SCBA).

2.3.7 Protection Factors

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

The protection factor of a given respirator for a specific user times the PEL (or TLV) for a given substance is the maximum allowable concentration for that substance for which the respirator may be used. For example, say the protection

factor of 50 for a full-face mask respirator will provide protection up to 1000 ppm. Maximum use concentrations (MUC) are calculated using the formula: PELX Protection Factor = MUC. Note that there is a difference between "quantitative" protection factors and "qualitative" protection factors. The correct protection factor must be used in determining the maximum allowable concentration.

2.3.8 Escape

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

3.0 RESPIRATOR QUALITATIVE FITTING METHODS

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

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

3.1 TEST 1 - NEGATIVE PRESSURE TEST

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

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

3.2 TEST 2 - POSITIVE PRESSURE TEST

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

3.3 TEST 3 - ISOAMYL ACETATE VAPOR (BANANA OIL) TEST

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

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

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

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

1. The user puts on the respirator in a normal manner in an area where he/she cannot smell banana oil and thus not be influenced by the odor while performing the fitting test. If it is an air-purifying device, it must be equipped with a cartridge(s) or canister specifically designed for protection against organic vapors.

2. The capsule or saturated cloth is passed close to the respirator sealing surfaces.

3. If the user smells banana oil, he readjusts the facepiece and/or adjusts the head straps without unduly tightening them.

4. The user repeats step 2. If banana oil is not smelled, there is assumed to be a satisfactory seal. If the wearer smells the vapor, an attempt should be made to find the leakage point. If the leak cannot be located, another respirator of the same type and brand should be tried. If this leaks, another brand of respirator with a facepiece of the same type but slightly different shape or size should be tried.

5. After a fit is obtained, if the respirator is an air-purifying device, it must be equipped with the correct filter(s), cartridge(s) or canister for the anticipated hazard.

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

1. Normal breathing.

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

3. Slowly performing side-to-side and up-and-down head movements: these movements should be exaggerated, but should approximate those that take place on the job.

4. Talking: this is most easily accomplished by reading prepared text loudly enough to be understood by someone standing nearby.

5. Other exercises may be added depending upon the situation: for example, if users are going to spend a significant part of their time bent over at some task, it will include an exercise approximating this bending.

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

3.4 TEST 4 - IRRITANT SMOKE TEST

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

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

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

1. The user puts on the respirator normally, taking care not to tighten the headstrap uncomfortably and stands with his/her back to a source of exhaust ventilation.

2. The tester tells the user to close his/her eyes, even if wearing a full facepiece respirator, and to keep them closed until told to open them.

3. The tester lightly puffs smoke over the respirator, holding the smoke tube at least two feet from it. At this time, the test should keep the amount of smoke minimal and pause between puffs to note the user's reaction.

4. If the user detects no leakage, the tester will increase the smoke density and move the smoke tube progressively closer to the subject, still remaining alert to any reactions.

5. When the smoke tube has been brought to within about 6 inches of the respirator with no leakage detected, the tester will start to direct smoke specifically at potential sources of leakage, around the sealing surfaces and exhalation valve, while the subject's head is still.

6. At this point, if no leakage has been detected, the user may cautiously begin the head movements described in the isoamyl acetate test. The tester should remain especially alert and be prepared to stop producing smoke immediately.

7. If leakage is detected at any time, the tester should stop the smoke and let the user readjust the facepiece or head strap tension. The tester should then start the test at step 2.

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

4.0 INTRODUCTION

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

This program includes:

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

4.1 INSPECTION FOR DEFECTS

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

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

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

4.2 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. Records of inspections are kept on forms presented in Section VI-Program Administration and Documentation.

4.3 INSPECTION PROCEDURES

Respirator inspection shall include checking of:

1. Tightness of the connections,
2. Facepiece,
3. Valves,
4. Connecting tubes, and
5. Canisters, filters, or cartridges.

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

4.4 FIELD INSPECTION OF AIR-PURIFYING RESPIRATORS

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

1. Examine the facepiece for:

    a. Excessive dirt,

    b. Cracks, tears, holes or physical distortion of shape from improper storage,

    c. Inflexibility of rubber facepiece (stretch and knead to restore flexibility),

    d. Cracked or badly scratched lenses in full facepieces,

    e. Incorrectly mounted full facepiece lenses, or broken or missing mounting clips,

    f. Cracked or broken air-purifying element holder(s), badly worn threads or missing gasket(s),

2. Examine the head straps or head harness for:

    a. breaks,
    b. loss of elasticity,
    c. broken or malfunctioning buckles and attachments, and
    d. excessively worn serrations on head harness which might permit slippage (full facepieces only).

3. Examine the exhalation valve for the following after removing its cover:

    a. Foreign material, such as detergent residue, dust particles or human hair under valve seat,

    b. Cracks, tears or distortion in the valve material,

    c. Improper insertion of the valve body in the facepiece,

    d. Cracks, breaks or chips in the valve body, particularly the sealing surface,

    e. Missing or defective valve cover,

    f. Improper installation of the valve in the valve body,

4. Examine the air-purifying element(s) for:

    a. Incorrect cartridge, canister or filter for the hazard,

b. Incorrect installation, loose connections, missing or worn gasket or cross threading in the holder,

c. Expired shelf-life date on the cartridge or canister,

d. Cracks or dents in the outside case of the filter, cartridge or canister, indicated by the absence of sealing material, tape, foil, etc. over the inlet, and

e. Identical cartridges if more than one are used.

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

The proper care of SCBAs involves:

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

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

1. Preliminary inspection. Check to ensure that:

   a. High-pressure hose connector is tight on cylinder fitting,
   b. Bypass valve is closed,
   c. Mainline valve is closed,
   d. There is no cover or obstruction on regulator outlet, and
   e. Pressure in the tank is at least 1,800 psi.

2. Backpack and harness assembly.

   a. Straps

      1. Visually inspect for complete set.
      2. Visually inspect for frayed or damaged straps that may break during use.

   b. Buckles

      1. Visually inspect for mating ends.
      2. Check locking function.

   c. Backplate and cylinder lock

      1. Visually inspect backplate for cracks and for missing rivets or screws.

      2. Visually inspect cylinder hold-down strap and physically check strap tightener and lock to ensure that it is fully engaged.

3. Cylinder and cylinder valve assembly

   a. Cylinder

      1. Physically check cylinder to ensure that it is tightly fastened to backplate.

      2. Check hydrostatic test date to ensure that it is current.[1]

      3. Visually inspect cylinder for large dents or gouges in metal.

   b. Head and valve assembly

      1. Visually inspect cylinder valve lock for presence.

      2. Visually inspect cylinder gauge for condition of face, needle, and lens.

      3. Open cylinder valve and listen or feel for leakage around packing. (If leakage is noted, do not use until repaired.). Note function of valve lock.

4. Regulator and high-pressure hose

   a. High-pressure hose and connector

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

   b. Regulator and low-pressure alarm

      1. Cover outlet of regulator with palm of hand. Open mainline valve and read regulator gauge (must read at least 1,800 psi and not more than rated cylinder pressure).

      2. Close cylinder valve and slowly move hand from regulator outlet to allow slow flow of air. Gauge should begin to show immediate loss of pressure as air flows. Low-pressure alarm should sound between 650 and 550 psi. Remove hand completely from outlet and close mainline valve.

      3. Place mouth onto or over regulator outlet and blow. A positive pressure should be created and maintained for 5 to 10 seconds without any loss of air. Next, establish a slight negative pressure in regulator and hold for 5 to 10 sec. Vacuum should remain constant. This tests the integrity of the diaphragm. Any loss of pressure or vacuum during this test indicates a leak in the apparatus.

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[1]Monthly inspection only.

4. Open cylinder valve.

5. Place hand over regulator outlet and open mainline valve. Remove hand from outlet and replace in rapid movement. Repeat twice. Air should escape when hand is removed each time, indicating a positive pressure in chamber. Close mainline valve and remove hand from outlet.

6. Ascertain that no obstruction is in or over the regulator outlet. Open and close the bypass valve momentarily to ensure flow of air through bypass system.

5. Facepiece and corrugated breathing tube.

a. Facepiece

1. Visually inspect head harness for damaged serrations and deteriorated rubber. Visually inspect rubber facepiece body for signs of deterioration or extreme distortion.

2. Visually inspect lens for proper seal in rubber facepiece, retaining clamp properly in place, and cracks or large scratches.

3. Visually inspect exhalation valve for visible deterioration or foreign materials buildup.

b. Breathing tube and connector

1. Stretch breathing tube and visually inspect for deterioration and holes.

2. Visually inspect connector to ensure good condition of threads and for presence and proper condition of "O" ring or rubber gasket seal.

3. Negative pressure test on facepiece.[2]

(a) Don backpack and facepiece.

(b) With facepiece held tightly to face or facepiece properly donned, stretch breathing tube to open corrugations and place thumb or hand over end of connector.

(c) Inhale. Negative pressure should be created inside mask, causing it to pull tightly to face. This negative pressure should be maintained for 5 to 10 sec. If negative pressure leaks down, the facepiece assembly is not adequate and should not be worn.

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[2]For regular monthly inspection, only steps (b) and (c) of procedures are necessary.

6. Storage of units. Check that:

   a. Cylinder is refilled as necessary and unit is cleaned and inspected.

   b. Cylinder valve is closed.

   c. High-pressure hose connector is tight on cylinder.

   d. Pressure is bled off high-pressure hose and regulator.

   e. Bypass valve is closed.

   f. Mainline valve is closed.

   g. All straps are completely loosened and laid straight.

   h. Facepiece is properly stored to protect against dust, sunlight, heat, extreme cold, excess moisture, and damaging chemicals.

4.6 CLEANING AND SANITIZING

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

1. Hypochlorite solution (50 ppm of chlorine) made by adding approximately two milliliters of bleach (such as Clorox) to one liter of water, or two tablespoons of bleach per gallon of water. A two-minute immersion disinfects the respirators.

2. Aqueous solution of iodine (50 ppm of iodine) made by adding approximately 0.8 milliliters of tincture of iodine per liter of water, or one teaspoon of tincture of iodine per gallon of water. Again, a two-minute immersion is sufficient.

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

4.7 RINSING

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

4.8 DRYING

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

4.9 REASSEMBLY AND INSPECTION

The clean, dry respirator facepieces should be reassembled and inspected in an area separate from the disassembly area to avoid contamination. The inspection procedures have been discussed; special emphasis should be given to inspecting the respirators for detergent or soap residue left by inadequate rinsing. This appears most often under the seat of the exhalation valve, and can cause valve leakage or sticking. The respirator should be thoroughly inspected and all defects corrected. New or retested cartridges and canisters should be installed, and the completely reassembled respirator should be tested for leaks. For SCBA devices, the facepiece should be combined with the tested regulator and the fully charged cylinder, and an operational check performed.

4.10 MAINTENANCE AND REPAIR

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

This restriction applies particularly to maintenance of the more complicated devices, especially SCBA, and more specifically, regulator valves and low pressure warning devices. These devices should be returned to the manufacturer or to a trained technician for adjustment or repair. No problems are anticipated in repairing and maintaining most simple respirators, particularly the commonly used air-purifying type.

4.11 RESPIRATOR STORAGE

Respirators must be stored to protect against:

- Dust,
- Sunlight,
- Heat,
- Extreme cold,
- Excessive moisture,
- Damaging chemicals, and
- Mechanical damage.

Damage and contamination of respirators may take place if they are stored on a workbench, or in a tool cabinet or toolbox, among heavy tools, greases and dirt or in a vehicle. Freshly cleaned respirators should be placed in reusable plastic bags until reissue. They should be stored in a clean, dry location away from direct sunlight. They should be placed in a single layer with the facepiece and exhalation valve in an undistorted position to prevent rubber or plastic from taking a permanent distorted "set".

APPENDIX F

VAPOR EMISSION RESPONSE PLAN

APPENDIX F
VAPOR EMISSION RESPONSE PLAN

The vapor emission response plan is divided into two sections, the minor and major emission response plans.

Minor Emission Response Plan

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

Drilling activities can also resume (with appropriate upgrade in personnel protection) if the organic level continues reading above background, other parameters permitting (e.g., the LEL at the wellhead is below 20 percent, and the H_2S level is below 10 ppm). However, the organic level 200 feet downwind of the work zone must not exceed background.

If the organic level is above 50 ppm or the H_2S level is above 10 ppm at the work zone perimeter, then the Site Health and Safety Officer must be notified and well drilling activities stopped.

If the LEL exceeds 10 percent, proper precautions (e.g., non-sparking [bronze] tools, spark arresters on heavy equipment, and intrinsically safe equipment) are used). If LELs exceed 20 percent, all drilling activities shall be stopped immediately and all engines (ignition sources) will be turned off. Drilling personnel will leave the area and notify the Site Health and Safety Officer.

Major Emission Response Plan

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

- organic levels greater than background,
- LEL greater than 20 percent, or
- H_2S levels greater than 10 ppm.

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

1. The perimeter of the closest downwind residential or commercial property will be monitored. If organic vapor levels read above background or if H_2S levels approach 10 ppm above background, then the Site Health and Safety Officer will immediately contact local police authorities.

2. The appropriate personnel listed on the Master Phone List are to be notified by the Site Health and Safety Officer.

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

Response Action

The well drillers will immediately proceed as follows.

1. Break the drill rods at the nearest joint unless the rods can be removed from the hole in one lift.

2. As soon as possible, leave the site and notify the Site Safety Officer. The well drillers shall not proceed with remedial efforts until instructed to do so by the Site Safety Officer.

The Site Safety Officer will determine if a Minor or Major Vapor Emission condition (as defined in the previous section) exists and will activate the appropriate Vapor Emission Response Plan.

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

APPENDIX G

SITE-SPECIFIC SAFETY PLANS

ABB ENVIRONMENTAL SERVICES
SUMMARY SITE SAFETY PLAN

A. GENERAL INFORMATION

SITE: Site 1, Landfill A

SITE OWNER/CONTACT: David Driggers (SDIV), Mike Davenport (NAVSTA)

LOCATION: Mayport Naval Station, Mayport, Florida

PLAN PREPARED BY: Mike Jaynes UPDATED: 1/10/94

APPROVED BY: _____ DATE: _____

OBJECTIVE(S): to maintain health and safety during RCRA facility investigation activities that include monitoring well installation and soil, sediment and groundwater sampling.

PROPOSED DATE(S) OF INVESTIGATION: July 1993 to May 1995

BACKGROUND REVIEW: Complete: X Preliminary: ____

OVERALL HAZARD: Serious: ____ Moderate: ____ Low: X Unknown: ____

B. SITE/WASTE CHARACTERISTICS

WASTE TYPES: Liquid X Solid ____ Sludge ____ Gas ____

CHARACTERISTICS: Corrosive X Ignitable ____ Radioactive ____

Volatile X Toxic X Reactive ____ Unknown ____

SITE DESCRIPTION: Site 1 (Landfill A) is located under the area currently occupied by Jacksonville Ship Yards, a tenant contractor on NAVSTA Mayport. The site was operated from 1942 to 1960 and was the original landfill on the base. The 4-acre site consists of approximately 18 trenches that measure approximately 15 feet wide, 8 feet deep, and 400 feet long. The site has a 2 to 3 foot soil cover and waste is not exposed at the surface.

PRINCIPAL DISPOSAL METHOD (type and location): Approximately 54,000 gal/yr of industrial waste were disposed of, along with other bulk wastes. Some liquid wastes were in drums, others were dumped directly into the fill area. The landfill materials were ignited at approximately 1500 hours, Monday through Friday and allowed to burn.

ABB ENVIRONMENTAL SERVICES
SUMMARY SITE SAFETY PLAN

A. GENERAL INFORMATION

SITE: Site 1, Landfill A

SITE OWNER/CONTACT: David Driggers (SDIV), Mike Davenport (NAVSTA)

LOCATION: Mayport Naval Station, Mayport, Florida

PLAN PREPARED BY: Mike Jaynes UPDATED: 1/10/94

APPROVED BY: _____ DATE: _____

OBJECTIVE(S): to maintain health and safety during RCRA facility investigation activities that include monitoring well installation and soil, sediment and groundwater sampling.

PROPOSED DATE(S) OF INVESTIGATION: July 1993 to May 1995

BACKGROUND REVIEW: Complete: X Preliminary: ____

OVERALL HAZARD: Serious: ____ Moderate: ____ Low: X Unknown: ____

B. SITE/WASTE CHARACTERISTICS

WASTE TYPES: Liquid X Solid ____ Sludge ____ Gas ____

CHARACTERISTICS: Corrosive X Ignitable ____ Radioactive ____

Volatile X Toxic X Reactive ____ Unknown ____

SITE DESCRIPTION: Site 1 (Landfill A) is located under the area currently occupied by Jacksonville Ship Yards, a tenant contractor on NAVSTA Mayport. The site was operated from 1942 to 1960 and was the original landfill on the base. The 4-acre site consists of approximately 18 trenches that measure approximately 15 feet wide, 8 feet deep, and 400 feet long. The site has a 2 to 3 foot soil cover and waste is not exposed at the surface.

PRINCIPAL DISPOSAL METHOD (type and location): Approximately 54,000 gal/yr of industrial waste were disposed of, along with other bulk wastes. Some liquid wastes were in drums, others were dumped directly into the fill area. The landfill materials were ignited at approximately 1500 hours, Monday through Friday and allowed to burn.

- FID readings range from 9.0 ppm to 700 ppm and
- benzene readings range from 0.5 ppm to 50 ppm.

Level B required if:

- FID readings are greater than 700 ppm and
- benzene readings are greater or equal to 50 ppm (5.0 Dräger tube).

SITE MONITORING INSTRUMENTATION: A photoionization meter will be on hand at/ all times to monitor total volatile organics in ambient air surrounding exploration activities.

DECONTAMINATION PROCEDURES:

Personnel: Will be conducted as outlined in Section 8.1

Equipment: Will be conducted as outlined in Section 8.2 between each boring, upon entry to NAVSTA, and upon completion of the drilling program prior to the subcontractor leaving the NAVSTA.

MOBILIZATION AND SITE ENTRY: A contamination reduction area will be established onsite. Field work preparation, staging, and decontamination will take place in this area (see Figure 8-1).

TEAM ORGANIZATION:

Team Member	Responsibility
L. Smith	Site-Safety Officer/FOL
M. Jaynes	Sampler
F. Rizk	Sampler
K. Murray	Sampler
P. Layne	Project Manager
F. Lesesne	RFI Task Leader
Others	As required

WORK LIMITATIONS (Time of day, etc.): During daylight hours only and as restricted by Mayport NAVSTA operations and security.

PERSONNEL PROTECTIVE GEAR, DECONTAMINATION, AND OTHER MATERIAL DISPOSAL: Personnel will use Level D Protection. See Table G-1, p. G-55 for a list of personnel protective gear. Decontamination fluids will be containerized and turned over to base personnel to incorporate with their hazardous waste.

- FID readings range from 9.0 ppm to 700 ppm and
- benzene readings range from 0.5 ppm to 50 ppm.

Level B required if:

- FID readings are greater than 700 ppm and
- benzene readings are greater or equal to 50 ppm (5.0 Dräger tube).

SITE MONITORING INSTRUMENTATION: A photoionization meter will be on hand at/ all times to monitor total volatile organics in ambient air surrounding exploration activities.

DECONTAMINATION PROCEDURES:

Personnel: Will be conducted as outlined in Section 8.1

Equipment: Will be conducted as outlined in Section 8.2 between each boring, upon entry to NAVSTA, and upon completion of the drilling program prior to the subcontractor leaving the NAVSTA.

MOBILIZATION AND SITE ENTRY: A contamination reduction area will be established onsite. Field work preparation, staging, and decontamination will take place in this area (see Figure 8-1).

TEAM ORGANIZATION:

Team Member	Responsibility
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WORK LIMITATIONS (Time of day, etc.): During daylight hours only and as restricted by Mayport NAVSTA operations and security.

PERSONNEL PROTECTIVE GEAR, DECONTAMINATION, AND OTHER MATERIAL DISPOSAL: Personnel will use Level D Protection. See Table G-1, p. G-55 for a list of personnel protective gear. Decontamination fluids will be containerized and turned over to base personnel to incorporate with their hazardous waste.

ABB ENVIRONMENTAL SERVICES
SUMMARY SITE SAFETY PLAN

A. GENERAL INFORMATION

SITE: Site 2, Landfill B, Site 4, Landfill D

Site 5, Landfill E, Site 6, Landfill B

SITE OWNER/CONTACT: David Driggers (SDIV), Mike Davenport (NAVSTA)

LOCATION: Mayport Naval Station, Mayport, Florida

PLAN PREPARED BY: Mike Jaynes UPDATED: 1/10/94

APPROVED BY: _____ DATE: _____

OBJECTIVE(S): To maintain health and safety during RCRA Facility investigation activities that include installing additional monitoring wells and groundwater, soil, and sediment sampling.

PROPOSED DATE(S) OF INVESTIGATION: January 1992 to October 1994

BACKGROUND REVIEW: Complete: X Preliminary: ____

OVERALL HAZARD: Serious: ____ Moderate: ____ Low: X Unknown: ____

B. SITE/WASTE CHARACTERISTICS

WASTE TYPES: Liquid X Solid ____ Sludge ____ Gas ____

CHARACTERISTICS: Corrosive X Ignitable ____ Radioactive ____

Volatile X Toxic X Reactive ____ Unknown ____

SITE DESCRIPTION: Site 2, Landfill B, is approximately 2 acres in size and as deep as 8 feet. The trenches were constructed by dragline and are approximately 15 feet wide and 300 feet long. The trenches intersect the water table. The site is located under the current ordnance storage area.

Site 4, Landfill D, is located under the northwestern corner of the eastern-most dredge spoil disposal area. The landfill was operated between 1963 and 1985 and occupies approximately 3 acres. The landfill consisted of a series of pits (estimated eight), each approximately 40 feet square and 8 feet deep. These pits intersected the water table.

ABB ENVIRONMENTAL SERVICES
SUMMARY SITE SAFETY PLAN

A. GENERAL INFORMATION

SITE: Site 2, Landfill B, Site 4, Landfill D

~~Site 5, Landfill E, Site 6, Landfill B~~

SITE OWNER/CONTACT: David Driggers (SDIV), Mike Davenport (NAVSTA)

LOCATION: Mayport Naval Station, Mayport, Florida

PLAN PREPARED BY: Mike Jaynes UPDATED: 1/10/94

APPROVED BY: _____ DATE: _____

OBJECTIVE(S): To maintain health and safety during RCRA Facility investigation activities that include installing additional monitoring wells and groundwater, soil, and sediment sampling.

PROPOSED DATE(S) OF INVESTIGATION: January 1992 to October 1994

BACKGROUND REVIEW: Complete: X Preliminary: ____

OVERALL HAZARD: Serious: ____ Moderate: ____ Low: X Unknown: ____

B. SITE/WASTE CHARACTERISTICS

WASTE TYPES: Liquid X Solid ____ Sludge ____ Gas ____

CHARACTERISTICS: Corrosive X Ignitable ____ Radioactive ____

Volatile X Toxic X Reactive ____ Unknown ____

SITE DESCRIPTION: Site 2, Landfill B, is approximately 2 acres in size and as deep as 8 feet. The trenches were constructed by dragline and are approximately 15 feet wide and 300 feet long. The trenches intersect the water table. The site is located under the current ordnance storage area.

Site 4, Landfill D, is located under the northwestern corner of the eastern-most dredge spoil disposal area. The landfill was operated between 1963 and 1985 and occupies approximately 3 acres. The landfill consisted of a series of pits (estimated eight), each approximately 40 feet square and 8 feet deep. These pits intersected the water table.

MODIFICATIONS/ACTION LEVELS: The breathing zone will be monitored with a flame ionization detector (FID). If vapor levels steadily exceed background, the breathing zone will be monitored using a 0.5/a benzene Dräger tube. If benzene levels reach 0.5 ppm or greater, then protection will be upgraded to Level C; if not, work will continue at modified Level D until FID readings exceed 9 ppm, and then upgraded to Level C. If FID readings reach 50 ppm, a 5.0 benzene Dräger tube will be used. If benzene levels exceed 50 ppm, then protection will be upgraded to Level B; if not, work will continue at Level C until FID readings exceed 700 ppm, and then upgraded to Level B.

SUMMARY:

Modified Level D acceptable if:

- FID readings are less than 50 ppm and
- benzene is less than 0.5. ppm (0.5 Dräger tube).

Level C required if:

- FID readings range from 9.0 ppm to 700 ppm and
- benzene readings range from 0.5 ppm to 50 ppm.

Level B required if:

- FID readings are greater than 700 ppm and
- benzene readings are greater or equal to 50 ppm (5.0 Dräger tube).

SITE MONITORING INSTRUMENTATION: A photoionization meter will be on hand at all times to monitor total volatile organics in ambient air surrounding exploration activities.

DECONTAMINATION PROCEDURES

Personnel: Will be conducted as outlined in Section 8.1

Equipment: Will be conducted as outlined in Section 8.2 between each boring and upon entry to NAVSTA and upon completion of the drilling program prior to the subcontractor leaving the NAVSTA.

MOBILIZATION AND SITE ENTRY: A contamination reduction area will be established onsite. Field work preparation, staging, and decontamination will take place in this area (see Figure 8-1).

MODIFICATIONS/ACTION LEVELS: The breathing zone will be monitored with a flame ionization detector (FID). If vapor levels steadily exceed background, the breathing zone will be monitored using a 0.5/a benzene Dräger tube. If benzene levels reach 0.5 ppm or greater, then protection will be upgraded to Level C; if not, work will continue at modified Level D until FID readings exceed 9 ppm, and then upgraded to Level C. If FID readings reach 50 ppm, a 5.0 benzene Dräger tube will be used. If benzene levels exceed 50 ppm, then protection will be upgraded to Level B; if not, work will continue at Level C until FID readings exceed 700 ppm, and then upgraded to Level B.

SUMMARY:

Modified Level D acceptable if:

- FID readings are less than 50 ppm and
- benzene is less than 0.5. ppm (0.5 Dräger tube).

Level C required if:

- FID readings range from 9.0 ppm to 700 ppm and
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Level B required if:

- FID readings are greater than 700 ppm and
- benzene readings are greater or equal to 50 ppm (5.0 Dräger tube).

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Personnel: Will be conducted as outlined in Section 8.1

Equipment: Will be conducted as outlined in Section 8.2 between each boring and upon entry to NAVSTA and upon completion of the drilling program prior to the subcontractor leaving the NAVSTA.

MOBILIZATION AND SITE ENTRY: A contamination reduction area will be established onsite. Field work preparation, staging, and decontamination will take place in this area (see Figure 8-1).

E. EMERGENCY INFORMATION

LOCAL RESOURCES

Ambulance:	(904) 744-4545
Hospital Emergency Room:	(904) 247-2900
Poison Control Center:	(904) 492-2414
Police:	(904) 246-7331
Fire Department:	(904) 249-2381
Airport: (NAF)	241-6150

SITE RESOURCES

Water Supply:	J. Cummings or Al Alvarez,	241-6317
Telephone:	J. Cummings, 246-6317, or Al Alvarez	241-6317
Utilities:	J. Cummings, 246-6317, or Al Alvarez	241-6317
Security:		241-6301

EMERGENCY CONTACTS

1. Dr. David Barnes, EMR . . . . . .(800) 229-3674
2. Florida Poison Control Center . . . . . .(800) 282-3171
3. ABB-ES (Maine). . . . . .(800) 341-0406
4. ABB-ES (Florida). . . . . .(800) 462-3073
5. ABB-ES (Detroit). . . . . .(313) 569-3955
6. USEPA Emergency Response. . . . . .(800) 414-8802

F. EMERGENCY ROUTES
(Give road or other directions; attach map)

HOSPITAL: Refer to Figure G-2 at end of this section.

SITE EVACUATION: In the event that the site needs to be evacuated, ABB-ES personnel will notify base security and Mike Davenport of Civil Engineering and evacuate through the nearest gate.

E. EMERGENCY INFORMATION

LOCAL RESOURCES

Ambulance:	(904) 744-4545
Hospital Emergency Room:	(904) 247-2900
Poison Control Center:	(904) 492-2414
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F. EMERGENCY ROUTES
(Give road or other directions; attach map)

HOSPITAL: Refer to Figure G-2 at end of this section.

SITE EVACUATION: In the event that the site needs to be evacuated, ABB-ES personnel will notify base security and Mike Davenport of Civil Engineering and evacuate through the nearest gate.

Site 8B and 8C, Waste Oil Treatment Facility. At the waste oil treatment facility (Site 8C) wastewater containing entrained oil enters a chambered rapid mix/flocculation tank. In the rapid mix section, hydrated lime is added as a coagulant aid. The rapid-mix tank has a capacity of 1,200 gallons and provides 6 minutes of detention at the design rate of 200 gallons per minute. The oily wastewater then flows into the flocculation tank where the mixture is allowed to form a settleable floc. The flocculation tank has a capacity of 6,200 gallons and provides about 31 minutes of detention at the design rate of 200 gallons per minute.

The flocculated waste solids then flow into a centerwell-feed clarifier. The floc settles to the bottom with clarified water overflowing the surface. A sludge scraper in the bottom of the clarifier directs sludge to a center hopper. Twenty percent of the sludge is recirculated to the head of the flocculation tank which serves to improve flocculation and sedimentation. The clarifier is designed with an overflow rate of 900 gallons per square foot per day. From the clarifier, the effluent enters a neutralization tank. Overflow from the neutralization tank flows to an effluent leaching pond (Site 8B), which has an overflow to the St. Johns River.

PRINCIPAL DISPOSAL METHOD (type and location): Dumping of liquid waste oils and oily waste waters.

STATUS (active, inactive, unknown): The Waste Oil Pit is an inactive site. However, the sludge lagoons, waste oil treatment, and effluent leaching pond are active areas.

HISTORY (Worker or non-worker injury; complaints from public; previous agency action): Five groundwater monitoring wells were installed near Site 8 on the shore of the St. Johns River. Analyses of the groundwater showed a presence of hydrocarbons and a light non-aqueous phase liquid (LNAPL) has been observed on top of the water table in two of the wells.

C. HAZARD EVALUATION

Chemicals that personnel may be exposed to are solvents and waste containing volatile organic compounds, fuel hydrocarbons, and inorganic chemicals such as chromium, mercury, and lead contained in sludges and other wastes. A chemical Hazard Information Sheet for each compound suspected of being present on-site is contained in Appendix A.

D. SAFETY PROCEDURES

Map/Sketch Attached? Yes Site Secured? Yes

Perimeter Identified? Yes Zone(s) of Contamination Identified? Yes

PERIMETER ESTABLISHMENT: Access to Mayport NAVSTA is restricted at all points.

Site 8B and 8C, Waste Oil Treatment Facility. At the waste oil treatment facility (Site 8C) wastewater containing entrained oil enters a chambered rapid mix/flocculation tank. In the rapid mix section, hydrated lime is added as a coagulant aid. The rapid-mix tank has a capacity of 1,200 gallons and provides 6 minutes of detention at the design rate of 200 gallons per minute. The oily wastewater then flows into the flocculation tank where the mixture is allowed to form a settleable floc. The flocculation tank has a capacity of 6,200 gallons and provides about 31 minutes of detention at the design rate of 200 gallons per minute.

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STATUS (active, inactive, unknown): The Waste Oil Pit is an inactive site. However, the sludge lagoons, waste oil treatment, and effluent leaching pond are active areas.

HISTORY (Worker or non-worker injury; complaints from public; previous agency action): Five groundwater monitoring wells were installed near Site 8 on the shore of the St. Johns River. Analyses of the groundwater showed a presence of hydrocarbons and a light non-aqueous phase liquid (LNAPL) has been observed on top of the water table in two of the wells.

three

C. HAZARD EVALUATION

Chemicals that personnel may be exposed to are solvents and waste containing volatile organic compounds, fuel hydrocarbons, and inorganic chemicals such as chromium, mercury, and lead contained in sludges and other wastes. A chemical Hazard Information Sheet for each compound suspected of being present on-site is contained in Appendix A.

D. SAFETY PROCEDURES

Map/Sketch Attached? Yes Site Secured? Yes

Perimeter Identified? Yes Zone(s) of Contamination Identified? Yes

PERIMETER ESTABLISHMENT: Access to Mayport NAVSTA is restricted at all points.

TEAM ORGANIZATION

Team Member	Responsibility
L. Smith	Site-Safety Officer/FOL
M. Jaynes	Sampler
F. Rizk	Sampler
P. Layne	Project Manager
F. Lesesne	RFI Task Leader
Others	As required

WORK LIMITATIONS (Time of day, etc.): During daylight hours only and as restricted by Mayport NAVSTA operations and security.

PERSONNEL PROTECTIVE GEAR, DECONTAMINATION AND OTHER MATERIAL DISPOSAL: Personnel will use Level D Protection. See Table G-1, p. G-55 for a list of personnel protective gear. Decontamination fluids will be containerized and handled in accordance with the Investigation-Derived Waste (IDW) Management Plan.

TEAM ORGANIZATION

Team Member	Responsibility
L. Smith	Site-Safety Officer/FOL
M. Jaynes	Sampler
F. Rizk	Sampler
P. Layne	Project Manager
F. Lesesne	RFI Task Leader
Others	As required

WORK LIMITATIONS (Time of day, etc.): During daylight hours only and as restricted by Mayport NAVSTA operations and security.

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ABB ENVIRONMENTAL SERVICES
SUMMARY SITE SAFETY PLAN

A. GENERAL INFORMATION

SITE: Site 8D, Hazardous Waste Storage Facility

SITE OWNER/CONTACT: David Driggers (SDIV), Mike Davenport (NAVSTA)

LOCATION: Mayport Naval Station, Mayport, Florida

PLAN PREPARED BY: Mike Jaynes UDATED: 1/10/94

APPROVED BY: _____ DATE: _____

OBJECTIVE(S): to maintain health and safety during RCRA Facility Investigation activities that include monitoring well installation and soil, sediment, and groundwater sampling.

PROPOSED DATE(S) OF INVESTIGATION: December 1992 to October 1994

BACKGROUND REVIEW: Complete: X Preliminary: ____

OVERALL HAZARD: Serious: ____ Moderate: ____ Low: X Unknown: ____

B. SITE/WASTE CHARACTERISTICS

WASTE TYPES: Liquid X Solid ____ Sludge ____ Gas ____

CHARACTERISTICS: Corrosive X Ignitable ____ Radioactive ____

Volatile X Toxic X Reactive ____ Unknown ____

SITE DESCRIPTION: Site 8D, RCRA Hazardous Waste Storage Facility. The NAVSTA Mayport hazardous waste container storage facility is located on the north side of the station adjacent to a taxiway that is no longer in use. The site is comprised of a single enclosed structure encompassing 3,920 square feet of storage and aisle space. The structure is comprised of seven storage bays with each having a separate spill containment structure. The facility is permitted for a maximum storage of 26,400 gallons. It was designed to handle 480 pelletized 55-gallon drums.

PRINCIPAL DISPOSAL METHOD (type and location): Drum storage area.

STATUS (active, inactive, unknown): Active.

ABB ENVIRONMENTAL SERVICES
SUMMARY SITE SAFETY PLAN

A. GENERAL INFORMATION

SITE: Site 8D, Hazardous Waste Storage Facility

SITE OWNER/CONTACT: David Driggers (SDIV), Mike Davenport (NAVSTA)

LOCATION: Mayport Naval Station, Mayport, Florida

PLAN PREPARED BY: Mike Jaynes UDATED: 1/10/94

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PRINCIPAL DISPOSAL METHOD (type and location): Drum storage area.

STATUS (active, inactive, unknown): Active.

Level B required if:

- FID readings are greater than 700 ppm and
- benzene readings are greater or equal to 50 ppm (5.0 Dräger tube).

DECONTAMINATION PROCEDURES:

Personnel: Will be conducted as outlined in Section 8.1

Equipment: Will be conducted as outlined in Section 8.2 between each boring, upon entry to NAVSTA, and upon completion of the drilling program prior to the subcontractor leaving the NAVSTA.

MOBILIZATION AND SITE ENTRY: A contamination reduction area will be established onsite. Field work preparation, staging, and decontamination will take place in this area (see Figure 8-1).

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F. Lesesne	RFI Task Leader
Others	As required

WORK LIMITATIONS (Time of day, etc.): During daylight hours only and as restricted by Mayport NAVSTA operations and security.

PERSONNEL PROTECTIVE GEAR, DECONTAMINATION AND OTHER MATERIAL DISPOSAL: Personnel will use Level D Protection. See Table G-1, p. G-55 for a list of personnel protective gear. Decontamination fluids will be containerized and handled in accordance with the IDW Management Plan.

Level B required if:

- FID readings are greater than 700 ppm and
- benzene readings are greater or equal to 50 ppm (5.0 Dräger tube).

DECONTAMINATION PROCEDURES:

Personnel: Will be conducted as outlined in Section 8.1

Equipment: Will be conducted as outlined in Section 8.2 between each boring, upon entry to NAVSTA, and upon completion of the drilling program prior to the subcontractor leaving the NAVSTA.

MOBILIZATION AND SITE ENTRY: A contamination reduction area will be established onsite. Field work preparation, staging, and decontamination will take place in this area (see Figure 8-1).

TEAM ORGANIZATION:

Team Member	Responsibility
L. Smith	Site-Safety Officer/FOL
M. Jaynes	Sampler
F. Rizk	Sampler
P. Layne	Project Manager
F. Lesesne	RFI Task Leader
Others	As required

WORK LIMITATIONS (Time of day, etc.): During daylight hours only and as restricted by Mayport NAVSTA operations and security.

PERSONNEL PROTECTIVE GEAR, DECONTAMINATION AND OTHER MATERIAL DISPOSAL: Personnel will use Level D Protection. See Table G-1, p. G-55 for a list of personnel protective gear. Decontamination fluids will be containerized and handled in accordance with the IDW Management Plan.

ABB ENVIRONMENTAL SERVICES
SUMMARY SITE SAFETY PLAN

A. GENERAL INFORMATION

SITE: Site 9, Fuel Spill Area

SITE OWNER/CONTACT: David Driggers (SDIV), Mike Davenport (NAVSTA)

LOCATION: Mayport Naval Station, Mayport, Florida

PLAN PREPARED BY: Mike Jaynes UDATED: 1/10/94

APPROVED BY: _____ DATE: _____

OBJECTIVE(S): to maintain health and safety during RCRA Facility Investigation activities that include monitoring well installation and soil, sediment, and groundwater sampling.

PROPOSED DATE(S) OF INVESTIGATION: December 1992 to October 1994

BACKGROUND REVIEW: Complete: X Preliminary: ____

OVERALL HAZARD: Serious: ____ Moderate: ____ Low: X Unknown: ____

B. SITE/WASTE CHARACTERISTICS

WASTE TYPES: Liquid X Solid X Sludge ____ Gas ____

CHARACTERISTICS: Corrosive ____ Ignitable X Radioactive ____

Volatile X Toxic ____ Reactive ____ Unknown ____

SITE DESCRIPTION: Site 9, Fuel Spill Area, is located in the fuel farm area north and west of tank 201. The site was identified from soil borings that smelled strongly of fuel.

PRINCIPAL DISPOSAL METHOD (type and location): Disposal method is unknown. This may be the result of leaks in the fuel farm area.

STATUS (active, inactive, unknown): Active.

ABB ENVIRONMENTAL SERVICES
SUMMARY SITE SAFETY PLAN

A. GENERAL INFORMATION

SITE: Site 9, Fuel Spill Area

SITE OWNER/CONTACT: David Driggers (SDIV), Mike Davenport (NAVSTA)

LOCATION: Mayport Naval Station, Mayport, Florida

PLAN PREPARED BY: Mike Jaynes UDATED: 1/10/94

APPROVED BY: _____ DATE: _____

OBJECTIVE(S): to maintain health and safety during RCRA Facility Investigation activities that include monitoring well installation and soil, sediment, and groundwater sampling.

PROPOSED DATE(S) OF INVESTIGATION: December 1992 to October 1994

BACKGROUND REVIEW: Complete: X Preliminary: ____

OVERALL HAZARD: Serious: ____ Moderate: ____ Low: X Unknown: ____

B. SITE/WASTE CHARACTERISTICS

WASTE TYPES: Liquid X Solid X Sludge ____ Gas ____

CHARACTERISTICS: Corrosive ____ Ignitable X Radioactive ____

Volatile X Toxic ____ Reactive ____ Unknown ____

SITE DESCRIPTION: Site 9, Fuel Spill Area, is located in the fuel farm area north and west of tank 201. The site was identified from soil borings that smelled strongly of fuel.

PRINCIPAL DISPOSAL METHOD (type and location): Disposal method is unknown. This may be the result of leaks in the fuel farm area.

STATUS (active, inactive, unknown): Active.

SITE MONITORING INSTRUMENTATION: A photoionization meter will be on hand at all times to monitor total volatile organics in ambient air surrounding exploration activities.

DECONTAMINATION PROCEDURES

Personnel: Will be conducted as outlined in Section 8.1

Equipment: Will be conducted as outlined in Section 8.2 between each boring, upon entry to NAVSTA, and upon completion of the drilling program prior to the subcontractor leaving the NAVSTA.

MOBILIZATION AND SITE ENTRY: A contamination reduction area will be established onsite. Field work preparation, staging, and decontamination will take place in this area (see Figure 8-1).

TEAM ORGANIZATION:

Team Member	Responsibility
L. Smith	Site-Safety Officer/FOL
M. Jaynes	Sampler
F. Rizk	Sampler
P. Layne	Project Manager
F. Lesesne	RFI Task Leader
Others	As required

WORK LIMITATIONS (Time of day, etc.): During daylight hours only and as restricted by Mayport NAVSTA operations and security.

PERSONNEL PROTECTIVE GEAR, DECONTAMINATION AND OTHER MATERIAL DISPOSAL: Personnel will use Level D Protection. See Table G-1, p. G-55 for a list of personnel protective gear. Decontamination fluids will be containerized and handed in accordance with the IDW Management Plan.

SITE MONITORING INSTRUMENTATION: A photoionization meter will be on hand at all times to monitor total volatile organics in ambient air surrounding exploration activities.

DECONTAMINATION PROCEDURES

Personnel: Will be conducted as outlined in Section 8.1

Equipment: Will be conducted as outlined in Section 8.2 between each boring, upon entry to NAVSTA, and upon completion of the drilling program prior to the subcontractor leaving the NAVSTA.

MOBILIZATION AND SITE ENTRY: A contamination reduction area will be established onsite. Field work preparation, staging, and decontamination will take place in this area (see Figure 8-1).

TEAM ORGANIZATION:

Team Member	Responsibility
L. Smith	Site-Safety Officer/FOL
M. Jaynes	Sampler
F. Rizk	Sampler
P. Layne	Project Manager
F. Lesesne	RFI Task Leader
Others	As required

WORK LIMITATIONS (Time of day, etc.): During daylight hours only and as restricted by Mayport NAVSTA operations and security.

PERSONNEL PROTECTIVE GEAR, DECONTAMINATION AND OTHER MATERIAL DISPOSAL: Personnel will use Level D Protection. See Table G-1, p. G-55 for a list of personnel protective gear. Decontamination fluids will be containerized and handed in accordance with the IDW Management Plan.

ABB ENVIRONMENTAL SERVICES
SUMMARY SITE SAFETY PLAN

A. GENERAL INFORMATION

SITE: Site 11, Neutralization Basin

SITE OWNER/CONTACT: David Driggers (SDIV), Mike Davenport (NAVSTA)

LOCATION: Mayport Naval Station, Mayport, Florida

PLAN PREPARED BY: Mike Jaynes UDATED: 1/10/94

APPROVED BY: _____ DATE: _____

OBJECTIVE(S): to maintain health and safety during RCRA Facility Investigation activities that include monitoring well installation and soil, sediment, and groundwater sampling.

PROPOSED DATE(S) OF INVESTIGATION: December 1992 to February 1993

BACKGROUND REVIEW: Complete: X Preliminary: ____

OVERALL HAZARD: Serious: ____ Moderate: ____ Low: X Unknown: ____

B. SITE/WASTE CHARACTERISTICS

WASTE TYPES: Liquid X Solid ____ Sludge ____ Gas ____

CHARACTERISTICS: Corrosive ____ Ignitable ____ Radioactive ____

Volatile ____ Toxic X Reactive ____ Unknown X

SITE DESCRIPTION: Site 11, Neutralization Basin, is located at the northern end of the Naval Station between Mayport Basin and the St. Johns River. It is a lined basin rebuilt in 1986 for neutralization of boiler cleaning waste prior to discharge to the base wastewater treatment facility.

PRINCIPAL DISPOSAL METHOD (type and location): liquids/solids into basin.

STATUS (active, inactive, unknown): Active.

ABB ENVIRONMENTAL SERVICES
SUMMARY SITE SAFETY PLAN

A. GENERAL INFORMATION

SITE: Site 11, Neutralization Basin

SITE OWNER/CONTACT: David Driggers (SDIV), Mike Davenport (NAVSTA)

LOCATION: Mayport Naval Station, Mayport, Florida

PLAN PREPARED BY: Mike Jaynes UDATED: 1/10/94

APPROVED BY: _____ DATE: _____

OBJECTIVE(S): to maintain health and safety during RCRA Facility Investigation activities that include monitoring well installation and soil, sediment, and groundwater sampling.

PROPOSED DATE(S) OF INVESTIGATION: December 1992 to February 1993

BACKGROUND REVIEW: Complete: X Preliminary: ____

OVERALL HAZARD: Serious: ____ Moderate: ____ Low: X Unknown: ____

B. SITE/WASTE CHARACTERISTICS

WASTE TYPES: Liquid X Solid ____ Sludge ____ Gas ____

CHARACTERISTICS: Corrosive ____ Ignitable ____ Radioactive ____

Volatile ____ Toxic X Reactive ____ Unknown X

SITE DESCRIPTION: Site 11, Neutralization Basin, is located at the northern end of the Naval Station between Mayport Basin and the St. Johns River. It is a lined basin rebuilt in 1986 for neutralization of boiler cleaning waste prior to discharge to the base wastewater treatment facility.

PRINCIPAL DISPOSAL METHOD (type and location): liquids/solids into basin.

STATUS (active, inactive, unknown): Active.

DECONTAMINATION PROCEDURES:

Personnel: Will be conducted as outlined in Section 8.1

Equipment: Will be conducted as outlined in Section 8.2 between each boring and upon entry to NAVSTA and upon completion of the drilling program prior to the subcontractor leaving the NAVSTA.

MOBILIZATION AND SITE ENTRY: A contamination reduction area will be established onsite. Field work preparation, staging, and decontamination will take place in this area (see Figure 8-1).

TEAM ORGANIZATION:

Team Member	Responsibility
L. Smith	Site-Safety Officer/FOL
M. Jaynes	Sampler
F. Rizk	Sampler
P. Layne	Project Manager
F. Lesesne	RFI Task Leader
Others	As required

WORK LIMITATIONS (Time of day, etc.): During daylight hours only and as restricted by Mayport NAVSTA operations and security.

PERSONNEL PROTECTIVE GEAR, DECONTAMINATION AND OTHER MATERIAL DISPOSAL: Personnel will use Level D Protection. See Table G-1, p. G-55 for a list of personnel protective gear. Decontamination fluids will be containerized and handled in accordance with the IDW Management Plan.

DECONTAMINATION PROCEDURES:

Personnel: Will be conducted as outlined in Section 8.1

Equipment: Will be conducted as outlined in Section 8.2 between each boring and upon entry to NAVSTA and upon completion of the drilling program prior to the subcontractor leaving the NAVSTA.

MOBILIZATION AND SITE ENTRY: A contamination reduction area will be established onsite. Field work preparation, staging, and decontamination will take place in this area (see Figure 8-1).

TEAM ORGANIZATION:

Team Member	Responsibility
L. Smith	Site-Safety Officer/FOL
M. Jaynes	Sampler
F. Rizk	Sampler
P. Layne	Project Manager
F. Lesesne	RFI Task Leader
Others	As required

WORK LIMITATIONS (Time of day, etc.): During daylight hours only and as restricted by Mayport NAVSTA operations and security.

PERSONNEL PROTECTIVE GEAR, DECONTAMINATION AND OTHER MATERIAL DISPOSAL: Personnel will use Level D Protection. See Table G-1, p. G-55 for a list of personnel protective gear. Decontamination fluids will be containerized and handled in accordance with the IDW Management Plan.

ABB ENVIRONMENTAL SERVICES
SUMMARY SITE SAFETY PLAN

A. GENERAL INFORMATION

SITE: Site 13, Old Fire Fighting Training Area

SITE OWNER/CONTACT: David Driggers (SDIV), Mike Davenport (NAVSTA)

LOCATION: Mayport Naval Station, Mayport, Florida

PLAN PREPARED BY: Mike Jaynes UDATED: 1/10/94

APPROVED BY: _____ DATE: _____

OBJECTIVE(S): to maintain health and safety during RCRA Facility Investigation activities that include monitoring well installation and soil, sediment, and groundwater sampling.

PROPOSED DATE(S) OF INVESTIGATION: January 1992 to October 1994

BACKGROUND REVIEW: Complete: X Preliminary: ____

OVERALL HAZARD: Serious: ____ Moderate: ____ Low: X Unknown: ____

B. SITE/WASTE CHARACTERISTICS

WASTE TYPES: Liquid X Solid ____ Sludge ____ Gas ____

CHARACTERISTICS: Corrosive X Ignitable X Radioactive ____

Volatile X Toxic X Reactive X Unknown ____

SITE DESCRIPTION: Site 13, Old Fire Fighting Training Area, is located under the parking area of the new Aircraft Intermediate Maintenance Division (AIMD) Building. The site was used as a Fire Fighting Training Area from 1973 to 1982.

PRINCIPAL DISPOSAL METHOD (type and location): Application and ignition of miscellaneous fuels and waste oils were made to the ground surface during training exercises.

STATUS (active, inactive, unknown): inactive.

ABB ENVIRONMENTAL SERVICES
SUMMARY SITE SAFETY PLAN

A. GENERAL INFORMATION

SITE: Site 13, Old Fire Fighting Training Area

SITE OWNER/CONTACT: David Driggers (SDIV), Mike Davenport (NAVSTA)

LOCATION: Mayport Naval Station, Mayport, Florida

PLAN PREPARED BY: Mike Jaynes UDATED: 1/10/94

APPROVED BY: _____ DATE: _____

OBJECTIVE(S): to maintain health and safety during RCRA Facility Investigation activities that include monitoring well installation and soil, sediment, and groundwater sampling.

PROPOSED DATE(S) OF INVESTIGATION: January 1992 to October 1994

BACKGROUND REVIEW: Complete: X Preliminary: ____

OVERALL HAZARD: Serious: ____ Moderate: ____ Low: X Unknown: ____

B. SITE/WASTE CHARACTERISTICS

WASTE TYPES: Liquid X Solid ____ Sludge ____ Gas ____

CHARACTERISTICS: Corrosive X Ignitable X Radioactive ____

Volatile X Toxic X Reactive X Unknown ____

SITE DESCRIPTION: Site 13, Old Fire Fighting Training Area, is located under the parking area of the new Aircraft Intermediate Maintenance Division (AIMD) Building. The site was used as a Fire Fighting Training Area from 1973 to 1982.

PRINCIPAL DISPOSAL METHOD (type and location): Application and ignition of miscellaneous fuels and waste oils were made to the ground surface during training exercises.

STATUS (active, inactive, unknown): inactive.

SITE MONITORING INSTRUMENTATION: A photoionization meter will be on hand at all times to monitor total volatile organics in ambient air surrounding exploration activities.

If dry dusty conditions, a respirable dust monitor will be used. If levels exceed 2.5 mg/m^3, stop operations and contact the HSO, HSS, or HSM.

DECONTAMINATION PROCEDURES

Personnel: Will be conducted as outlined in Section 8.1

Equipment: Will be conducted as outlined in Section 8.2 between each boring, upon entry to NAVSTA and upon completion of the drilling program prior to the subcontractor leaving the NAVSTA.

MOBILIZATION AND SITE ENTRY: A contamination reduction area will be established onsite. Field work preparation, staging, and decontamination will take place in this area (see Figure 8-1).

TEAM ORGANIZATION:

Team Member	Responsibility
L. Smith	Site-Safety Officer/FOL
M. Jaynes	Sampler
F. Rizk	Sampler
K. Murray	Sampler
P. Layne	Project Manager
F. Lesesne	RFI Task Leader
Others	As required

WORK LIMITATIONS (Time of day, etc.): During daylight hours only and as restricted by Mayport NAVSTA operations and security.

PERSONNEL PROTECTIVE GEAR, DECONTAMINATION AND OTHER MATERIAL DISPOSAL: Personnel will use Level D Protection. See Table G-1, p. G-55 for a list of personnel protective gear. Decontamination fluids will be containerized and turned over to base personnel to incorporate with their hazardous waste.

SITE MONITORING INSTRUMENTATION: A photoionization meter will be on hand at all times to monitor total volatile organics in ambient air surrounding exploration activities.

If dry dusty conditions, a respirable dust monitor will be used. If levels exceed 2.5 mg/m^3, stop operations and contact the HSO, HSS, or HSM.

DECONTAMINATION PROCEDURES

Personnel: Will be conducted as outlined in Section 8.1

Equipment: Will be conducted as outlined in Section 8.2 between each boring, upon entry to NAVSTA and upon completion of the drilling program prior to the subcontractor leaving the NAVSTA.

MOBILIZATION AND SITE ENTRY: A contamination reduction area will be established onsite. Field work preparation, staging, and decontamination will take place in this area (see Figure 8-1).

TEAM ORGANIZATION:

Team Member	Responsibility
L. Smith	Site-Safety Officer/FOL
M. Jaynes	Sampler
F. Rizk	Sampler
K. Murray	Sampler
P. Layne	Project Manager
F. Lesesne	RFI Task Leader
Others	As required

WORK LIMITATIONS (Time of day, etc.): During daylight hours only and as restricted by Mayport NAVSTA operations and security.

PERSONNEL PROTECTIVE GEAR, DECONTAMINATION AND OTHER MATERIAL DISPOSAL: Personnel will use Level D Protection. See Table G-1, p. G-55 for a list of personnel protective gear. Decontamination fluids will be containerized and turned over to base personnel to incorporate with their hazardous waste.

ABB ENVIRONMENTAL SERVICES
SUMMARY SITE SAFETY PLAN

A. GENERAL INFORMATION

SITE: Site 14, Mercury/Oily Waste Spill Site

SITE OWNER/CONTACT: David Driggers (SDIV), Mike Davenport (NAVSTA)

LOCATION: Mayport Naval Station, Mayport, Florida

PLAN PREPARED BY: Mike Jaynes UDATED: 1/10/94

APPROVED BY: _____ DATE: _____

OBJECTIVE(S): to maintain health and safety during RCRA Facility Investigation activities that include monitoring well installation and soil, sediment, and groundwater sampling.

PROPOSED DATE(S) OF INVESTIGATION: November 1994 to May 1995

BACKGROUND REVIEW: Complete: X Preliminary: ____

OVERALL HAZARD: Serious: ____ Moderate: ____ Low: X Unknown: ____

B. SITE/WASTE CHARACTERISTICS

WASTE TYPES: Liquid X Solid ____ Sludge ____ Gas ____

CHARACTERISTICS: Corrosive X Ignitable X Radioactive ____

Volatile X Toxic X Reactive ____ Unknown ____

SITE DESCRIPTION: Site 14, Mercury/Oily Waste Spill Site, is located west of the Fleet Training Center, Building 1456. The site consists of two areas that were constructed in 1977 on or adjacent to the concrete pad used for fire fighting training activities. One area was used for storing 55 gallon drums containing mercuric nitrate wastes. The other area at the site is located around an oil-water separator directly behind Building 1456.

PRINCIPAL DISPOSAL METHOD (type and location): Mercuric nitrate drums rusted out and leaked mercuric nitrate solution onto the soils. The other site is an oily waste spill.

ABB ENVIRONMENTAL SERVICES
SUMMARY SITE SAFETY PLAN

A. GENERAL INFORMATION

SITE: Site 14, Mercury/Oily Waste Spill Site

SITE OWNER/CONTACT: David Driggers (SDIV), Mike Davenport (NAVSTA)

LOCATION: Mayport Naval Station, Mayport, Florida

PLAN PREPARED BY: Mike Jaynes UDATED: 1/10/94

APPROVED BY: _____ DATE: _____

OBJECTIVE(S): to maintain health and safety during RCRA Facility Investigation activities that include monitoring well installation and soil, sediment, and groundwater sampling.

PROPOSED DATE(S) OF INVESTIGATION: November 1994 to May 1995

BACKGROUND REVIEW: Complete: X Preliminary: ____

OVERALL HAZARD: Serious: ____ Moderate: ____ Low: X Unknown: ____

B. SITE/WASTE CHARACTERISTICS

WASTE TYPES: Liquid X Solid ____ Sludge ____ Gas ____

CHARACTERISTICS: Corrosive X Ignitable X Radioactive ____

Volatile X Toxic X Reactive ____ Unknown ____

SITE DESCRIPTION: Site 14, Mercury/Oily Waste Spill Site, is located west of the Fleet Training Center, Building 1456. The site consists of two areas that were constructed in 1977 on or adjacent to the concrete pad used for fire fighting training activities. One area was used for storing 55 gallon drums containing mercuric nitrate wastes. The other area at the site is located around an oil-water separator directly behind Building 1456.

PRINCIPAL DISPOSAL METHOD (type and location): Mercuric nitrate drums rusted out and leaked mercuric nitrate solution onto the soils. The other site is an oily waste spill.

Level B required if:

- FID readings are greater than 700 ppm and
- benzene readings are greater or equal to 50 ppm (5.0 Dräger tube).

SITE MONITORING INSTRUMENTATION: A photoionization meter will be on hand at all times to monitor total volatile organics in ambient air surrounding exploration activities.

If dry dusty conditions, a respirable dust monitor will be used. If levels exceed 2.5 mg/m^3, stop operations and contact the HSO, HSS, or HSM.

DECONTAMINATION PROCEDURES

Personnel: Will be conducted as outlined in Section 8.1

Equipment: Will be conducted as outlined in Section 8.2 between each boring, upon entry to NAVSTA, and upon completion of the drilling program prior to the subcontractor leaving the NAVSTA.

MOBILIZATION AND SITE ENTRY: A contamination reduction area will be established onsite. Field work preparation, staging, and decontamination will take place in this area (see Figure 8-1).

TEAM ORGANIZATION:

Team Member	Responsibility
L. Smith	Site-Safety Officer/FOL
M. Jaynes	Sampler
F. Rizk	Sampler
K. Murray	Sampler
P. Layne	Project Manager
F. Lesesne	RFI Task Leader
Others	As required

WORK LIMITATIONS (Time of day, etc.): During daylight hours only and as restricted by Mayport NAVSTA operations and security.

PERSONNEL PROTECTIVE GEAR, DECONTAMINATION AND OTHER MATERIAL DISPOSAL: Personnel will use Level D Protection. See Table G-1, p. G-55 for a list of personnel protective gear. Decontamination fluids will be containerized and turned over to base personnel to incorporate with their hazardous waste.

Level B required if:

- FID readings are greater than 700 ppm and
- benzene readings are greater or equal to 50 ppm (5.0 Dräger tube).

SITE MONITORING INSTRUMENTATION: A photoionization meter will be on hand at all times to monitor total volatile organics in ambient air surrounding exploration activities.

If dry dusty conditions, a respirable dust monitor will be used. If levels exceed 2.5 mg/m^3, stop operations and contact the HSO, HSS, or HSM.

DECONTAMINATION PROCEDURES

Personnel: Will be conducted as outlined in Section 8.1

Equipment: Will be conducted as outlined in Section 8.2 between each boring, upon entry to NAVSTA, and upon completion of the drilling program prior to the subcontractor leaving the NAVSTA.

MOBILIZATION AND SITE ENTRY: A contamination reduction area will be established onsite. Field work preparation, staging, and decontamination will take place in this area (see Figure 8-1).

TEAM ORGANIZATION:

Team Member	Responsibility
L. Smith	Site-Safety Officer/FOL
M. Jaynes	Sampler
F. Rizk	Sampler
K. Murray	Sampler
P. Layne	Project Manager
F. Lesesne	RFI Task Leader
Others	As required

WORK LIMITATIONS (Time of day, etc.): During daylight hours only and as restricted by Mayport NAVSTA operations and security.

PERSONNEL PROTECTIVE GEAR, DECONTAMINATION AND OTHER MATERIAL DISPOSAL: Personnel will use Level D Protection. See Table G-1, p. G-55 for a list of personnel protective gear. Decontamination fluids will be containerized and turned over to base personnel to incorporate with their hazardous waste.

ABB ENVIRONMENTAL SERVICES
SUMMARY SITE SAFETY PLAN

A. GENERAL INFORMATION

SITE: Site 15, Old Pesticide Area

SITE OWNER/CONTACT: David Driggers (SDIV), Mike Davenport (NAVSTA)

LOCATION: Mayport Naval Station, Mayport, Florida

PLAN PREPARED BY: Mike Jaynes UDATED: 1/10/94

APPROVED BY: _____ DATE: _____

OBJECTIVE(S): to maintain health and safety during RCRA Facility Investigation activities that include monitoring well installation and soil, sediment, and groundwater sampling.

PROPOSED DATE(S) OF INVESTIGATION: December 1992 to October 1994

BACKGROUND REVIEW: Complete: X Preliminary: ____

OVERALL HAZARD: Serious: ____ Moderate: ____ Low: X Unknown: ____

B. SITE/WASTE CHARACTERISTICS

WASTE TYPES: Liquid X Solid ____ Sludge ____ Gas ____

CHARACTERISTICS: Corrosive ____ Ignitable ____ Radioactive ____

Volatile ____ Toxic X Reactive ____ Unknown ____

SITE DESCRIPTION: Site 15 - Old Pesticide Area is located west of air field in northwestern portion of base. It was a pesticide and Application Equipment Storage Area used for 1 year (1964-1965).

PRINCIPAL DISPOSAL METHOD (type and location): Spills and washing of equipment onto ground.

STATUS (active, inactive, unknown): Inactive.

HISTORY (Worker or non-worker injury; complaints from public; previous agency action): No previous investigations at this site.

ABB ENVIRONMENTAL SERVICES
SUMMARY SITE SAFETY PLAN

A. GENERAL INFORMATION

SITE: Site 15, Old Pesticide Area

SITE OWNER/CONTACT: David Driggers (SDIV), Mike Davenport (NAVSTA)

LOCATION: Mayport Naval Station, Mayport, Florida

PLAN PREPARED BY: Mike Jaynes UDATED: 1/10/94

APPROVED BY: _____ DATE: _____

OBJECTIVE(S): to maintain health and safety during RCRA Facility Investigation activities that include monitoring well installation and soil, sediment, and groundwater sampling.

PROPOSED DATE(S) OF INVESTIGATION: December 1992 to October 1994

BACKGROUND REVIEW: Complete: X Preliminary: ____

OVERALL HAZARD: Serious: ____ Moderate: ____ Low: X Unknown: ____

B. SITE/WASTE CHARACTERISTICS

WASTE TYPES: Liquid X Solid ____ Sludge ____ Gas ____

CHARACTERISTICS: Corrosive ____ Ignitable ____ Radioactive ____

Volatile ____ Toxic X Reactive ____ Unknown ____

SITE DESCRIPTION: Site 15 - Old Pesticide Area is located west of air field in northwestern portion of base. It was a pesticide and Application Equipment Storage Area used for 1 year (1964-1965).

PRINCIPAL DISPOSAL METHOD (type and location): Spills and washing of equipment onto ground.

STATUS (active, inactive, unknown): Inactive.

HISTORY (Worker or non-worker injury; complaints from public; previous agency action): No previous investigations at this site.

If dry dusty conditions, a respirable dust monitor will be used. If levels exceed 2.5 mg/m^3, stop operations and contact the HSO, HSS, or HSM.

DECONTAMINATION PROCEDURES

Personnel: Will be conducted as outlined in Section 8.1

Equipment: Will be conducted as outlined in Section 8.2 between each boring, upon entry to NAVSTA, and upon completion of the drilling program prior to the subcontractor leaving the NAVSTA.

MOBILIZATION AND SITE ENTRY: A contamination reduction area will be established onsite. Field work preparation, staging, and decontamination will take place in this area (see Figure 8-1).

TEAM ORGANIZATION:

Team Member	Responsibility
L. Smith	Site-Safety Officer/FOL
M. Jaynes	Sampler
F. Rizk	Sampler
P. Layne	Project Manager
F. Lesesne	RFI Task Leader
Others	As required

WORK LIMITATIONS (Time of day, etc.): During daylight hours only and as restricted by Mayport NAVSTA operations and security.

PERSONNEL PROTECTIVE GEAR, DECONTAMINATION AND OTHER MATERIAL DISPOSAL: Personnel will use Level D Protection. See Table G-1, p. G-55 for a list of personnel protective gear. Decontamination fluids will be containerized and handled in accordance with the IDW Management Plan.

If dry dusty conditions, a respirable dust monitor will be used. If levels exceed 2.5 mg/m^3, stop operations and contact the HSO, HSS, or HSM.

DECONTAMINATION PROCEDURES

Personnel: Will be conducted as outlined in Section 8.1

Equipment: Will be conducted as outlined in Section 8.2 between each boring, upon entry to NAVSTA, and upon completion of the drilling program prior to the subcontractor leaving the NAVSTA.

MOBILIZATION AND SITE ENTRY: A contamination reduction area will be established onsite. Field work preparation, staging, and decontamination will take place in this area (see Figure 8-1).

TEAM ORGANIZATION:

Team Member	Responsibility
L. Smith	Site-Safety Officer/FOL
M. Jaynes	Sampler
F. Rizk	Sampler
P. Layne	Project Manager
F. Lesesne	RFI Task Leader
Others	As required

WORK LIMITATIONS (Time of day, etc.): During daylight hours only and as restricted by Mayport NAVSTA operations and security.

PERSONNEL PROTECTIVE GEAR, DECONTAMINATION AND OTHER MATERIAL DISPOSAL: Personnel will use Level D Protection. See Table G-1, p. G-55 for a list of personnel protective gear. Decontamination fluids will be containerized and handled in accordance with the IDW Management Plan.

ABB ENVIRONMENTAL SERVICES
SUMMARY SITE SAFETY PLAN

A. GENERAL INFORMATION

SITE: Site 16, Old Transformer Storage Yard

SITE OWNER/CONTACT: David Driggers (SDIV), Mike Davenport (NAVSTA)

LOCATION: Mayport Naval Station, Mayport, Florida

PLAN PREPARED BY: Mike Jaynes UDATED: 1/10/94

APPROVED BY: _____ DATE: _____

OBJECTIVE(S): to maintain health and safety during RCRA Facility Investigation activities that includes monitoring well installation and soil, sediment and groundwater sampling.

PROPOSED DATE(S) OF INVESTIGATION: December 1992 to October 1994

BACKGROUND REVIEW: Complete: X Preliminary: ____

OVERALL HAZARD: Serious: ____ Moderate: ____ Low: X Unknown: ____

B. SITE/WASTE CHARACTERISTICS

WASTE TYPES: Liquid X Solid ____ Sludge ____ Gas ____

CHARACTERISTICS: Corrosive ____ Ignitable ____ Radioactive ____

Volatile ____ Toxic X Reactive ____ Unknown ____

SITE DESCRIPTION: Site 16, Old Transformer Storage Yard is located on the east side of the fuel tank farm at Tank 204, on the asphalt area of an abandoned runway. The area has been used since 1981 to store out-of-service transformers.

PRINCIPAL DISPOSAL METHOD (type and location): Spills and washing of equipment onto ground.

STATUS (active, inactive, unknown): Inactive.

ABB ENVIRONMENTAL SERVICES
SUMMARY SITE SAFETY PLAN

A. GENERAL INFORMATION

SITE: Site 16, Old Transformer Storage Yard

SITE OWNER/CONTACT: David Driggers (SDIV), Mike Davenport (NAVSTA)

LOCATION: Mayport Naval Station, Mayport, Florida

PLAN PREPARED BY: Mike Jaynes UDATED: 1/10/94

APPROVED BY: _____ DATE: _____

OBJECTIVE(S): to maintain health and safety during RCRA Facility Investigation activities that includes monitoring well installation and soil, sediment and groundwater sampling.

PROPOSED DATE(S) OF INVESTIGATION: December 1992 to October 1994

BACKGROUND REVIEW: Complete: X Preliminary: ____

OVERALL HAZARD: Serious: ____ Moderate: ____ Low: X Unknown: ____

B. SITE/WASTE CHARACTERISTICS

WASTE TYPES: Liquid X Solid ____ Sludge ____ Gas ____

CHARACTERISTICS: Corrosive ____ Ignitable ____ Radioactive ____

Volatile ____ Toxic X Reactive ____ Unknown ____

SITE DESCRIPTION: Site 16, Old Transformer Storage Yard is located on the east side of the fuel tank farm at Tank 204, on the asphalt area of an abandoned runway. The area has been used since 1981 to store out-of-service transformers.

PRINCIPAL DISPOSAL METHOD (type and location): Spills and washing of equipment onto ground.

STATUS (active, inactive, unknown): Inactive.

SITE MONITORING INSTRUMENTATION: A photoionization meter will be on hand at all times to monitor total volatile organics in ambient air surrounding exploration activities.

If dry dusty conditions, a respirable dust monitor will be used. If levels exceed 2.5 mg/m^3, stop operations and contact the HSO, HSS, or HSM.

DECONTAMINATION PROCEDURES

Personnel: Will be conducted as outlined in Section 8.1

Equipment: Will be conducted as outlined in Section 8.2 between each boring and upon entry to NAVSTA and upon completion of the drilling program prior to the subcontractor leaving the NAVSTA.

MOBILIZATION AND SITE ENTRY: A contamination reduction area will be established onsite. Field work preparation, staging, and decontamination will take place in this area (see Figure 8-1).

TEAM ORGANIZATION:

Team Member	Responsibility
L. Smith	Site-Safety Officer/FOL
M. Jaynes	Sampler
F. Rizk	Sampler
P. Layne	Project Manager
F. Lesesne	RFI Task Leader
Others	As required

WORK LIMITATIONS (Time of day, etc.): During daylight hours only and as restricted by Mayport NAVSTA operations and security.

PERSONNEL PROTECTIVE GEAR, DECONTAMINATION AND OTHER MATERIAL DISPOSAL: Personnel will use Level D Protection. See Table G-1, p. G-55 for a list of personnel protective gear. Decontamination fluids will be containerized and handled in accordance with the IDW Management Plan.

E. EMERGENCY INFORMATION

LOCAL RESOURCES

Ambulance: Liberty Ambulance Service	(904) 721-0008
Hospital Emergency Room: Baptist Medical Center	(904) 247-2999
Poison Control Center:	(800) 282-3171
Police: Naval Station	(904) 270-5583
Fire Department: Naval Station	(904) 270-5333
Airport: Craig Air Field	(904) 641-8969

SITE RESOURCES

Water Supply:	J. Cummings or Al Alvarez,	241-6317
Telephone:	J. Cummings, 246-6317, or Al Alvarez,	241-6317
Utilities:	J. Cummings, 246-6317, or Al Alvarez,	241-6317
Security:		241-6301

EMERGENCY CONTACTS

1. Dr. David Barnes, EMR . . . . . .(800) 229-3674
2. Florida Poison Control Center . . . . . .(800) 282-3171
3. ABB-ES (Maine). . . . . .(800) 848-6297
4. ABB-ES (Florida). . . . . .(904) 656-1293
5. ABB-ES (Detroit). . . . . .(313) 489-8040
6. USEPA Emergency Response. . . . . .(800) 414-8802

F. EMERGENCY ROUTES
(Give road or other directions; attach map)

HOSPITAL: Refer to Figure G-2 at end of this section.

SITE EVACUATION: In the event that the site needs to be evacuated, ABB-ES personnel will notify base security and Mike Davenport of Civil Engineering and evacuate through the nearest gate.

ABB ENVIRONMENTAL SERVICES
SUMMARY SITE SAFETY PLAN

A. GENERAL INFORMATION

SITE: Site 17, Solid Waste Incinerator

SITE OWNER/CONTACT: David Driggers (SDIV), Mike Davenport (NAVSTA)

LOCATION: Mayport Naval Station, Mayport, Florida

PLAN PREPARED BY: Mike Jaynes UDATED: 1/10/94

APPROVED BY: _____ DATE: _____

OBJECTIVE(S): to maintain health and safety during RCRA Facility Investigation activities that include monitoring well installation and soil, sediment, and groundwater sampling.

PROPOSED DATE(S) OF INVESTIGATION: November 1994 to May 1995

BACKGROUND REVIEW: Complete: X Preliminary: ____

OVERALL HAZARD: Serious: ____ Moderate: ____ Low: X Unknown: ____

B. SITE/WASTE CHARACTERISTICS

WASTE TYPES: Liquid ____ Solid X Sludge ____ Gas X

CHARACTERISTICS: Corrosive ____ Ignitable ____ Radioactive ____

Volatile ____ Toxic X Reactive ____ Unknown ____

SITE DESCRIPTION: Site 17 is a solid waste incinerator burning Class I, II, and III wastes located at the southern end of Mayport Basin, northeast of the golf course.

PRINCIPAL DISPOSAL METHOD (type and location): Incineration.

STATUS (active, inactive, unknown): Active.

HISTORY (Worker or non-worker injury; complaints from public; previous agency action): None known. The boiler operates under FDER Permit No. A019-17873.

C. HAZARD EVALUATION

The solid waste incinerator is used for burning Class I, II, and III wastes. Respiratory protection is not required around the incinerator unless HNU readings greater than 5 ppm are encountered.

D. SITE SAFETY PROCEDURES

Map/Sketch Attached? Yes Site Secured? Yes

Perimeter Identified? Yes Zone(s) of Contamination Identified? No

PERIMETER ESTABLISHMENT: Access to Mayport NAVSTA is restricted at all points.

PERSONNEL PROTECTION

TASK	MINIMUM LEVEL OF PROTECTION
All Activities	Level D

MODIFICATIONS/ACTION LEVELS: The breathing zone will be monitored with a flame ionization detector (FID). If vapor levels steadily exceed background, the breathing zone will be monitored using a 0.5/a benzene Dräger tube. If benzene levels reach 0.5 ppm or greater, then protection will be upgraded to Level C; if not, work will continue at modified Level D until FID readings exceed 9 ppm, and then upgraded to Level C. If FID readings reach 50 ppm, a 5.0 benzene Dräger tube will be used. If benzene levels exceed 50 ppm, then protection will be upgraded to Level B; if not, work will continue at Level C until FID readings exceed 700 ppm, and then upgraded to Level B.

SUMMARY:

Modified Level D acceptable if:

- FID readings are less than 50 ppm and
- benzene is less than 0.5. ppm (0.5 Dräger tube).

Level C required if:

- FID readings range from 9.0 ppm to 700 ppm and
- benzene readings range from 0.5 ppm to 50 ppm.

Level B required if:

- FID readings are greater than 700 ppm and
- benzene readings are greater or equal to 50 ppm (5.0 Dräger tube).

SITE MONITORING INSTRUMENTATION: A photoionization meter will be on hand at all times to monitor total volatile organics in ambient air surrounding exploration activities.

DECONTAMINATION PROCEDURES

Personnel: Will be conducted as outlined in Section 8.1

Equipment: Will be conducted as outlined in Section 8.2 between each boring, upon entry to NAVSTA, and upon completion of the drilling program prior to the subcontractor leaving the NAVSTA.

MOBILIZATION AND SITE ENTRY: A contamination reduction area will be established onsite. Field work preparation, staging, and decontamination will take place in this area (see Figure 8-1).

TEAM ORGANIZATION:

Team Member	Responsibility
L. Smith	Site-Safety Officer/FOL
M. Jaynes	Sampler
R. Rizk	Sampler
P. Layne	Project Manager
F. Lesesne	RFI Task Leader
Others	As required

WORK LIMITATIONS (Time of day, etc.): During daylight hours only and as restricted by Mayport NAVSTA operations and security.

PERSONNEL PROTECTIVE GEAR, DECONTAMINATION AND OTHER MATERIAL DISPOSAL: Personnel will use Level D Protection. See Table G-1, p. G-55 for a list of personnel protective gear. Decontamination fluids will be containerized and handed in accordance with the IDW Management Plan.

E. EMERGENCY INFORMATION

LOCAL RESOURCES

Ambulance: Liberty Ambulance Service	(904) 721-0008
Hospital Emergency Room: Baptist Medical Center	(904) 247-2999
Poison Control Center:	(800) 282-3171
Police: Naval Station	(904) 270-5583
Fire Department: Naval Station	(904) 270-5333
Airport: Craig Air Field	(904) 641-8969

SITE RESOURCES

Water Supply:	J. Cummings or Al Alvarez,	241-6317
Telephone:	J. Cummings, 246-6317, or Al Alvarez,	241-6317
Utilities:	J. Cummings, 246-6317, or Al Alvarez,	241-6317
Security:		241-6301

EMERGENCY CONTACTS

1. Dr. David Barnes, EMR . . . . . .(800) 229-3674
2. Florida Poison Control Center . . . . . .(800) 282-3171
3. ABB-ES (Maine). . . . . .(800) 848-6297
4. ABB-ES (Florida). . . . . .(904) 656-1293
5. ABB-ES (Detroit). . . . . .(313) 489-8040
6. USEPA Emergency Response. . . . . .(800) 414-8802

F. EMERGENCY ROUTES
(Give road or other directions; attach map)

HOSPITAL: Refer to Figure G-2 at end of this section.

SITE EVACUATION: In the event that the site needs to be evacuated, ABB-ES personnel will notify base security and Mike Davenport of Civil Engineering and evacuate through the nearest gate.

ABB ENVIRONMENTAL SERVICES
SUMMARY SITE SAFETY PLAN

SUMMARY OF ALL SITES

SITE: Naval Station Mayport

SITE OWNER/CONTACT: David Driggers (SDIV), Mike Davenport (NAVSTA)

LOCATION: Mayport Naval Station, Mayport, Florida

PLAN PREPARED BY: Keith Peterson/Tracie Vaught DATE: 10/24/89

UPDATED BY: Mike Jaynes DATE: 1/10/94

APPROVED BY: _____ DATE: _____

OBJECTIVE(S): to maintain health and safety during RCRA facility investigation activities that include monitoring well installation and soil, sediment and groundwater sampling.

PROPOSED DATE(S) OF INVESTIGATION: January 1992 to December 1996

BACKGROUND REVIEW: Complete: X Preliminary: ____

OVERALL HAZARD: Serious: ____ Moderate: ____ Low: X Unknown: ____

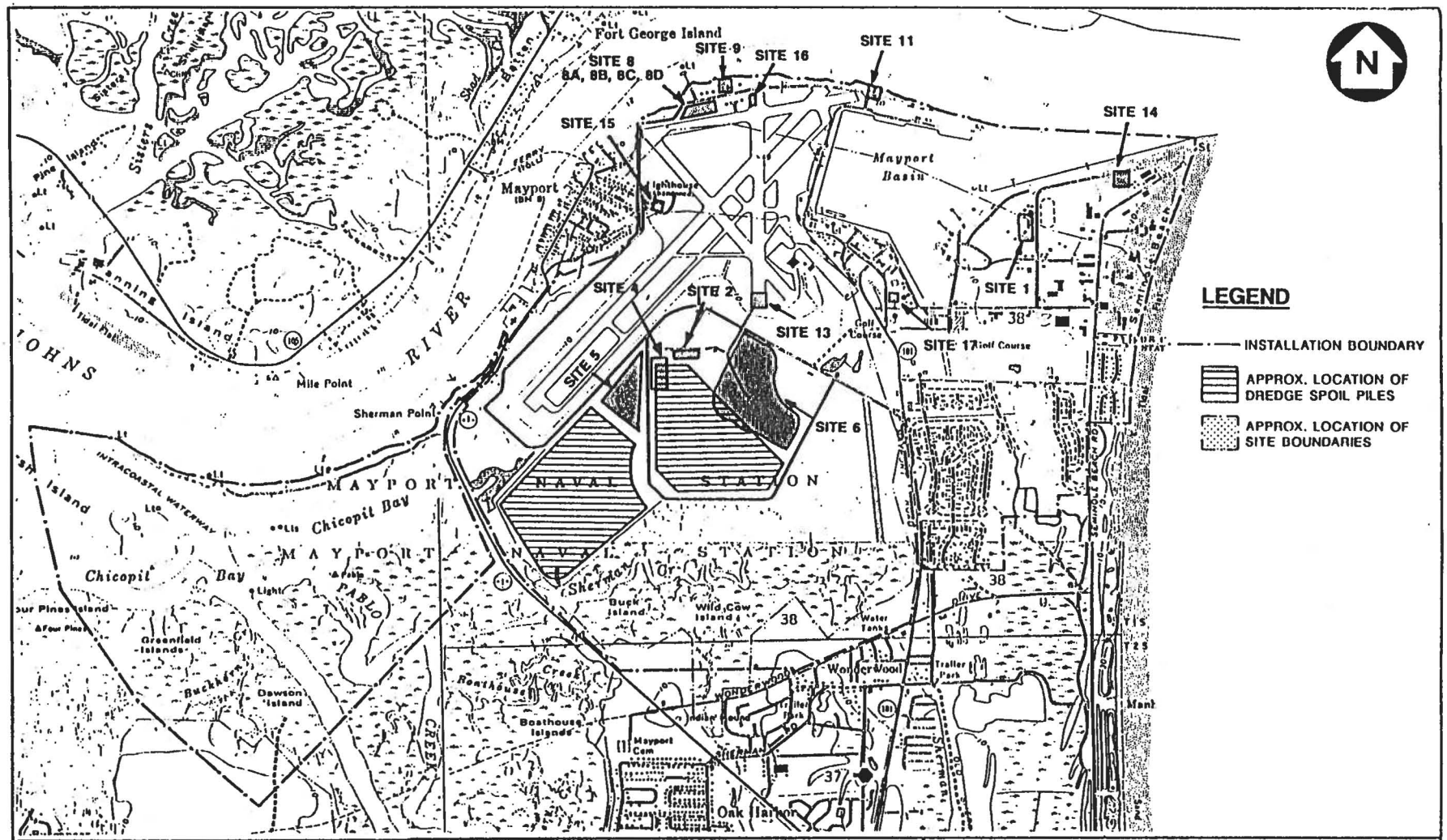
B. SITE/WASTE CHARACTERISTICS

WASTE TYPES: Liquid X Solid X Sludge ____ Gas X

CHARACTERISTICS: Corrosive X Ignitable X Radioactive ____

Volatile X Toxic X Reactive X Unknown ____

SITE DESCRIPTION: The Naval Station Mayport is an active Navy base. The 17 sites to be investigated are shown on Figure G-1. Sites 1, 2, 4, 5, and 6 are inactive landfills. Site 8 is an inactive waste oil pit. Sites 8A, 8B, and 8C are parts of an active oily waste treatment plant. Site 8D is the active hazardous waste storage facility. Site 9 is a fuel spill area. Site 11 is an active neutralization basin. Site 13 is an inactive fire fighting training area. Site 14 is the site of a mercury and oily waste spill. Site 15 is an inactive pesticide handling area. Site 16 is an inactive transformer storage yard. Site 17 is an active carbonaceous fuel boiler. Investigations will include a magnetometer survey, monitoring well and piezometer installation, and sampling of groundwater, surface water, soil, sediment, and sludge.



SOURCE:
U.S.G.S. QUADRANGLE MAYPORT, FLORIDA, PHOTOREVISED 1982 AND
U.S.G.S. QUADRANGLE JACKSONVILLE BEACH, FLORIDA, PHOTOREVISED 1981

SCALE IN FEET

0 3000 6000

FIGURE G-1

LOCATION OF POTENTIAL CONTAMINATION SITES

RCRA FACILITY INVESTIGATION HEALTH AND SAFETY PLAN

U.S. NAVAL STATION MAYPORT, FLORIDA

PRINCIPAL DISPOSAL METHOD (type and location): Trench method in the landfills; spilling, leaking, and dumping of wastes at other sites; and burning at the incinerator.

STATUS (active, inactive, unknown): Inactive and active.

HISTORY (Worker or non-worker injury; complaints from public; previous agency action): The Naval Station was commissioned in 1942 and the specific sites have been in operation at various times between 1942 and the present. For specific information please refer to the site specific descriptions of this appendix.

C. HAZARD EVALUATION

Chemicals that personnel may be exposed to include solvents and wastes containing volatile organic compounds, fuel hydrocarbons, pesticides, PCBs, and inorganic chemicals such as chromium, mercury, and lead contained in sludge and other wastes. A chemical Hazard Information Sheet for each compound suspected of being present onsite is contained in Appendix A. Chemicals and properties are summarized in Table G-2

D. SITE SAFETY PROCEDURES

Map/Sketch Attached? Yes Site Secured? Yes

Perimeter Identified? Yes Zone(s) of Contamination Identified? Yes

PERIMETER ESTABLISHMENT: Access to Mayport NAVSTA is restricted at all points.

PERSONNEL PROTECTION

TASK	MINIMUM LEVEL OF PROTECTION
All Activities	Level D

MODIFICATIONS: Should it become apparent during any phase of the field activities that conditions are different from those anticipated, the HSO will immediately withdraw all personnel from the site until health and safety conditions at the site are reevaluated.

SITE MONITORING INSTRUMENTATION: A photoionization meter will be on hand at all times to monitor total volatile organics in ambient air surrounding exploration activities.

If dry dusty conditions, a respirable dust monitor will be used. If levels exceed 2.5 mg/m^3, stop operations and contact the HSO, HSS, or HSM.

DECONTAMINATION PROCEDURES:

Personnel: Will be conducted as outlined in Section 8.1

Equipment: Will be conducted as outlined in Section 8.2 between each boring, upon entry to NAVSTA, and upon completion of the drilling program prior to the subcontractor leaving the NAVSTA.

MOBILIZATION AND SITE ENTRY: A contamination reduction area will be established onsite. Field work preparation, staging, and decontamination will take place in this area (see Figure 8-1).

TEAM ORGANIZATION:

Team Member	Responsibility
L. Smith	Site-Safety Officer
M. Jaynes	Sampler
F. Rizk	Sampler
K. Murray	Sampler
P. Layne	Project Manager
G. Brown/F. Lesesne	RFI Task Leader
Others	As required

WORK LIMITATIONS (Time of day, etc.): During daylight hours only and as restricted by Mayport NAVSTA operations and security.

PERSONNEL PROTECTIVE GEAR, DECONTAMINATION, AND OTHER MATERIAL DISPOSAL: Personnel will use Level D Protection. See Table G-1 for a list of personnel protective gear. Decontamination fluids will be containerized and turned over to base personnel to incorporate with their hazardous waste.

Table G-1
Personnel Safety Equipment Check List

Quantity Required	Protective and Safety Equipment	Model or Material
0	SCBA	MSA 401
0	Spare Cylinders	
0	Escape Mask	ELSA
0	Full Face	
0	Cartridge	
1pp	Hardhat w/Face Shield	
1pp	*Safety Glasses	
1ppd	Ear Protection	
1ppd	*Gloves, inner	surgical
5ppd	*Gloves, outer	nitrile
0	Chem Resist Coveralls	
2pp	Disposable Coveralls	Coated Tyvek
0	Splash Aprons	Vinyl
1pp	*Boots: Safety Boots	
0	Fully Encapsulated Suits	
1pp	*Dosimeters	TLD
0	First Aid Equipment	
1	*Utility First Aid Kit	
0	Industrial First Aid Kit	
0	Stretcher	
0	Oxygen	
1	*Eye Wash Station	Portable
0	Emergency Shower	
0	*Fire Extinguisher	CO_2
0	Safety Harness	
0	Emergency Tools	
0	Other	
6	Duct Tape (rolls)	
1pp	Snake Bite Kits	

* - Mandatory
pp - per person
ppd - per person per day

E. EMERGENCY INFORMATION

LOCAL RESOURCES

Ambulance: Liberty Ambulance Service	(904) 721-0008
Hospital Emergency Room: Baptist Medical Center	(904) 247-2999
Poison Control Center:	(800) 282-3171
Police: Naval Station	(904) 270-5583
Fire Department: Naval Station	(904) 270-5333
Airport: Craig Air Field	(904) 641-8969

SITE RESOURCES

Water Supply:	J. Cummings or Al Alvarez	241-6317
Telephone:	J. Cummings, 246-6317, or Al Alvarez,	241-6317
Utilities:	J. Cummings, 246-6317, or Al Alvarez,	241-6317
Security:		241-6301

EMERGENCY CONTACTS

1. Dr. David Barnes, EMR . . . . . .(800) 229-3674
2. Florida Poison Control Center . . . . . .(800) 282-3171
3. ABB-ES (Maine). . . . . .(800) 848-6297
4. ABB-ES (Florida). . . . . .(904) 656-1293
5. ABB-ES (Detroit). . . . . .(313) 489-8040
6. USEPA Emergency Response. . . . . .(800) 414-8802

F. EMERGENCY ROUTES
(Give road or other directions; attach map)

HOSPITAL: Refer to Figure G-2 at end of this section.

SITE EVACUATION: In the event that the site needs to be evacuated, ABB-ES personnel will notify base security and Mike Davenport of Civil Engineering and evacuate through the nearest gate.

Table G-2
Chemicals Potentially Present

Naval Station Mayport
Mayport, Florida

Chemical	Approximate Odor Threshold (ppm)	OSHA Permissible Exposure Limit[1] (ppm)	Physical Characteristics	Dermal Toxicity	Remarks
Acetic Acid	1.0	10	Colorless liquid; pungent; sharp odor (vinegar).	Will burn skin and eyes.	Harmful if swallowed; do not induce vomiting; drink a lot of water or milk.
Acetone	100	750	Colorless liquid, sweetish, pleasant odor.	Irritating to eyes, nose, and throat.	If inhaled, may cause difficult breathing, or loss of consciousness.
Aniline	0.5	2 (skin)	Colorless to pale brown liquid; aromatic amine-like odor.	Irritating to eyes	Poisonous if swallowed or if skin is exposed. If in eyes, flush with plenty of water.
Antimony		0.5 mg/m^3	Metal: silver-white, lustrous, hard, brittle solid; scale-like crystals.	Irritating to nose, throat, mouth, and skin.	If contacted, will cause dizziness, headaches, nausea, vomiting, and stomach cramps. If contact with eyes, flush immediately. Harmful if swallowed.
Arsenic		0.01 mg/m^3	Metal: silver-gray or tin-white, brittle odorless solid.	Irritating to eyes, respiratory irritation.	If inhaled, will cause ulceration of nasal septum. If contact with eyes flush immediately. Harmful if swallowed.
Arsenic disulfide	Odorless	0.2, A1 mg/m^3	Red brown; solid; odorless.	Will burn eyes and skin.	Poisonous if inhaled; harmful to skin; poisonous if swallowed.
Benzene	4.7	1	Colorless liquid, aromatic odor.	Moderate skin irritant.	Inhalation of large amounts attacks central nervous system (CNS); chronic poisoning may cause leukemia.
Beryllium		0.02 mg/m^3	Metal: gray-white, hard, brittle solid.		If inhaled, will cause respiratory symptoms, weakness, and fatigue. If contact with eyes, flush immediately.
n-Butyl alcohol	2.5	650	Colorless liquid-alcohol-like; pungent odor.	Irritating to skin, eyes, and throat.	If inhaled, will cause nausea, headache, and dizziness. Move to fresh air. Harmful if swallowed.

See notes at end of table.

Table G-2 (Continued)
Chemicals Potentially Present

Naval Station Mayport
Mayport, Florida

Chemical	Approximate Odor Threshold (ppm)	OSHA Permissible Exposure Limit[1] (ppm)	Physical Characteristics	Dermal Toxicity	Remarks
Cadmium sulfate	---	.005 mg/m^3	Solid white and no odor.	Irritating to skin and eyes.	If swallowed, will cause nausea and vomiting.
Carbon disulfide	10	4 (skin)	Colorless liquid; rotten egg to sweet odor.	Will burn and irritate skin and eyes.	Harmful if swallowed; if inhaled, will cause nausea, vomiting, difficult breathing, or loss of consciousness. Move to fresh air.
Carbon tetrachloride	---	2	Colorless liquid with an ether-like odor (sweetish).	Moderate skin and eye irritant; moderately toxic.	Inhalation, absorption, ingestion, or contact may cause CNS depression, liver and/or kidney damage, and skin irritation; suspected carcinogen.
Chlordane		0.05 mg/m^3 (skin)	Amber-colored, viscous liquid, pungent chlorine-like odor	Irritating to eyes	If inhaled, will cause blurred vision and confusion. If contact with eyes, flush immediately. Will cause tremors and convulsions. Harmful if swallowed.
Chlorobenzene	0.21	[1]10	Colorless liquid, sweet, almond odor.	Liquid irritating to skin and eyes.	If inhaled, will cause coughing or dizziness.
Chromic sulfate	---	0.5 mg/m^3	Solid with no odor, technical product dark green; color varies with hydration.	Irritating to skin and eyes.	Harmful if inhaled or swallowed; move to fresh air; if breathing stops, give artificial respiration.
Cresols	5	5 (skin)	Colorless to dark yellow liquid or solid; sweet and tarry smell.	Will burn skin and eyes.	Harmful if swallowed
Cyanide		5.0 mg/m^3	White granular or crystalline solids w/ faint almond like odor.	Irritating to eyes and skin.	If inhaled, asphyxia and death can occur. If contact with eyes, flush immediately. Harmful if swallowed.
Cyclo hexanone	0.12	25 (skin)	Colorless to lightly yellow liquid; peppermint odor.	Will burn skin and eyes.	Harmful if swallowed
1-2-Dibromo-3-Chloropropane (Nemagon)		0.001	Dense yellow or amber liquid, pungent odor.	Irritating to eyes, nose, throat, and skin.	If inhaled, will cause drowsiness, nausea, and vomiting. If contact with eyes, flush immediately. Harmful if swallowed.

See notes at end of table.

Table G-2 (Continued)
Chemicals Potentially Present

Naval Station Mayport
Mayport, Florida

Chemical	Approximate Odor Threshold (ppm)	OSHA Permissible Exposure Limit[1] (ppm)	Physical Characteristics	Dermal Toxicity	Remarks
1,4-Dichlorobenzene		75	Colorless or white crystalline solid.	Irritating to eyes and skin.	If contacted, will cause nausea, vomiting, and headaches. If contact with eyes, flush immediately. Harmful if swallowed.
O-Dichlorobenzene	4.0; 50	[1]25 (skin)	Colorless liquid; pleasant odor.	Irritating to skin and eyes.	Harmful if swallowed
4,4-DDT		1 mg/m^3 (skin)	Colorless crystals or off-white powder, aromatic odor.	Irritating to eyes, tongue, lips, face, and skin.	If ingested, will cause headaches, fatigue, and convulsions. If contact with eyes, flush immediately. Harmful if swallowed.
Ethyl acetate	1	400	Colorless liquid; pleasant fruity odor.	Irritating to skin and eyes; harmful if swallowed.	Inhalation, ingestion, or contact may irritate eyes, nose, or throat. Flush affected areas with plenty of water.
Ethylbenzene	140	100	Colorless liquid; gasoline-like odor.	Moderate skin irritant.	Liquid blisters skin; inhalation results in dizziness, depression.
Ethylene dibromide	—	20	Clear liquid, mild sweet odor.	—	—
Ethyl ether	0.83	400	Colorless liquid; sweet odor.	Irritating to eyes, nose, and throat.	Harmful if inhaled; it will cause nausea, vomiting, headache, or loss of consciousness.
bis-(2-Ethylhexyl) phthalate		5.0 mg/m^3	Colorless, oily liquid with a slight odor.	Irritating to eyes	If contact with eyes, flush immediately. Carcinogen.
Gasolines: straight run	.25	300	Colorless liquid; gasoline odor.	Irritating to skin and eyes.	Inhalation or ingestion will cause dizziness, headache, difficulty in breathing, and vomiting.
Heptachlor		0.5 mg/m^3 (skin)	White to light tan crystals with a camphor-like odor.		If contact with eyes, flush immediately. Carcinogen. Harmful if swallowed.
Lead dusts and fumes	—	0.05 (29 CFR 1910. 1025)	Soft, ductile, gray metal, soluble in water containing weak acid.	—	Lead poisoning may cause fatigue, anemia, abdominal pains, and neurological damage.

See notes at end of table.

Table G-2 (Continued)
Chemicals Potentially Present

Naval Station Mayport
Mayport, Florida

Chemical	Approximate Odor Threshold (ppm)	OSHA Permissible Exposure Limit[1] (ppm)	Physical Characteristics	Dermal Toxicity	Remarks
Manganese		5.0 mg/m^3	Metal: A lustrous, brittle, silvery solid.		If inhaled, Parkinson's, asthenia possible. Harmful if swallowed.
Mercury	---	0.05 mg/m^3 (skin)	Silvery liquid, odorless.	---	Effects of exposure may be delayed.
Methyl alcohol	100	200 (skin)	Colorless liquid; alcohol odor.	Irritating to eyes, nose, and throat.	Poisonous if swallowed; if inhaled, will cause dizziness, headache, difficult breathing , or loss of consciousness.
Methyl chloride	---	50	Colorless liquid, sweet non-irritating odor.	Will cause frostbite; not irritating to eyes, ears, and throat.	If inhaled, will cause nausea, vomiting, headache, difficult breathing, or loss of consciousness; move to fresh air.
Methylene chloride		500 1,000 (ceiling)	Colorless liquid with a chloroform--like odor (Gas - above 104 F).	Irritating to eyes and skin.	If inhaled, will cause fatigue, weakness, and sleepiness. If contact with eyes, flush immediately. Carcinogen. Harmful if swallowed.
Methyl ethyl ketone	10	200	Colorless liquid, sweet odor.	Irritating to eyes, nose, and throat.	If inhaled, will cause nausea, vomiting, headache, dizziness, difficult breathing, or loss of consciousness; harmful if swallowed.
Mineral spirits	---	---	Colorless liquid, gasoline odor.	Irritating to skin and eyes.	Harmful if swallowed; do not induce vomiting; drink water.
Nitro-benzene	5.94	1 (skin)	Light grayish-yellow liquid, almond or shoe polish color.	Poisonous if exposed to skin.	Poisonous if swallowed; will burn eyes.
2-Nitro-propane	300	10, A2	Colorless liquid, mild fruity odor.	Irritating to eyes, nose, and throat.	If inhaled, will cause headache, dizziness, coughing, or difficult breathing.
Oils, diesel	---	---	Light, brown liquid, fuel oil odor.	Irritating to skin and eyes.	Harmful if swallowed, do not induce vomiting, drink water or milk.
Oils, misc. lubricating	---	---	Yellow liquid, lube oil odor.	Irritating to skin and eyes.	Harmful if swallowed, do not induce vomiting, drink water or milk.
Oils, misc. penetrating	---	---	Yellowish liquid, motor oil odor.	Irritating to skin and eyes.	Harmful if swallowed, do not induce vomiting, drink water or milk.

See notes at end of table.

Table G-2 (Continued)
Chemicals Potentially Present

Naval Station Mayport
Mayport, Florida

Chemical	Approximate Odor Threshold (ppm)	OSHA Permissible Exposure Limit[1] (ppm)	Physical Characteristics	Dermal Toxicity	Remarks
Oils, misc. transformer	---	---	Colorless to light brown liquid; motor oil odor.	Irritating to skin and eyes.	Harmful if swallowed, do not induce vomiting, drink water or milk.
Pyridine	0.021	5	Colorless to yellow liquid; sharp, nauseating odor.	Irritating to eyes, nose, and throat.	Will burn eyes; liquid is poisonous if exposed to skin.
Silver sulfate	---	0.01 mg/m^3	Solid white to gray, odorless.	Irritating to skin, eyes,and nose.	Harmful if swallowed; if inhaled, will cause coughing or difficult breathing.
Sulfuric acid	1 mg/m^3	1 mg/m^3	Colorless to dark brown liquid; odorless.	Irritating to eyes, nose, and throat.	Inhalation will cause coughing, difficult breathing, or loss of consciousness; harmful if swallowed; do not induce vomiting; drink water or milk.
1,1,2,2-Tetrachloroethane		1.0	Colorless to pale-yellow liquid, pungent odor.	Irritating to eyes and skin.	If inhaled, will cause nausea, vomiting, and abdominal pain. If contact with eyes, flush immediately. Harmful if swallowed.
Thallium		0.1 mg/m^3 (skin)	Appearance and odor vary.	Irritating to eyes	If inhaled, will cause nausea and abdominal pain. If contacted, will cause chest pain, pulmonary edema, seizure, and psychosis. If contact with eyes, flush immediately. Harmful if swallowed.
Trichlorofluoromethane	---	C1000	Colorless liquid, odorless.	---	Inhalation will cause dizziness or difficult breathing; move to fresh air.
1,1,1-Trichloroethane	100	350	Colorless liquid, sweet odor.	Irritating to eyes, nose, and throat.	If inhaled, may cause dizziness or difficult breathing; move to fresh air; if swallowed may produce nausea.
1,1,2-Trichloroethane	---	10	Colorless liquid; sweet odor like chloroform.	Toxic, eye and skin irritant; absorbed by skin.	Inhalation, skin absorption, ingestion, or contact may cause CNS depression, liver and kidney damage, and eye and nose irritation.
Trichloroethylene	---	50	Colorless, liquid, sweet odor like chloroform.	Toxic by inhalation; moderate skin and eye irritant.	Inhalation, ingestion, or contact may cause headache, vertigo, visual disturbance, tremors, somnolence, nausea, and vomiting; cardiac arrhythmias; paresthesia.

See notes at end of table.

Table G-2 (Continued)
Chemicals Potentially Present

Naval Station Mayport
Mayport, Florida

Chemical	Approximate Odor Threshold (ppm)	OSHA Permissible Exposure Limit[1] (ppm)	Physical Characteristics	Dermal Toxicity	Remarks
Trans-1,2-Dichlor-ethylene	---	[1]200	Colorless liquid; pleasant odor.	Moderately toxic by ingestion.	Inhalation, ingestion, or contact may cause irritation of eyes and respiratory system; CNS depression; flammable.
Tetrachlor-oethylene	—	25	Colorless liquid; ether-like odor.	Moderate skin and eye irritant.	Inhalation, ingestion, or contact may irritate eyes, nose, or throat; flush face or neck; vertigo, dizziness, incoordination, and headache.
Toluene	0.17	100	Colorless liquid; pleasant aromatic odor.	Mild skin irritant	Ingestion or aspiration can cause pulmonary edema, depressed respiration.
Vanadium		0.05 mg/m^3	Yellow-orange powder or dark gray, odorless flakes.	Irritating to eyes and throat.	If contacted, will cause coughing, wheezing, bronchitis, and dyspnea. If contact with eyes, flush immediately. Harmful if swallowed.
Xylene	0.05	100	Colorless liquid; aromatic odor.	Moderate skin irritant.	Inhalation causes headache and dizziness; vapors irritate eyes; can be fatal if ingested.

[1]Indicates no permissible exposure limit available or threshold limit value (TLV) was lower than PEL; TLV reported instead.

Note: ppm = parts per million.
skin = can be readily absorbed through intact skin.
A1 = known human carcinogen.
A2 = suspected human carcinogen.
CNS = central nervous system.

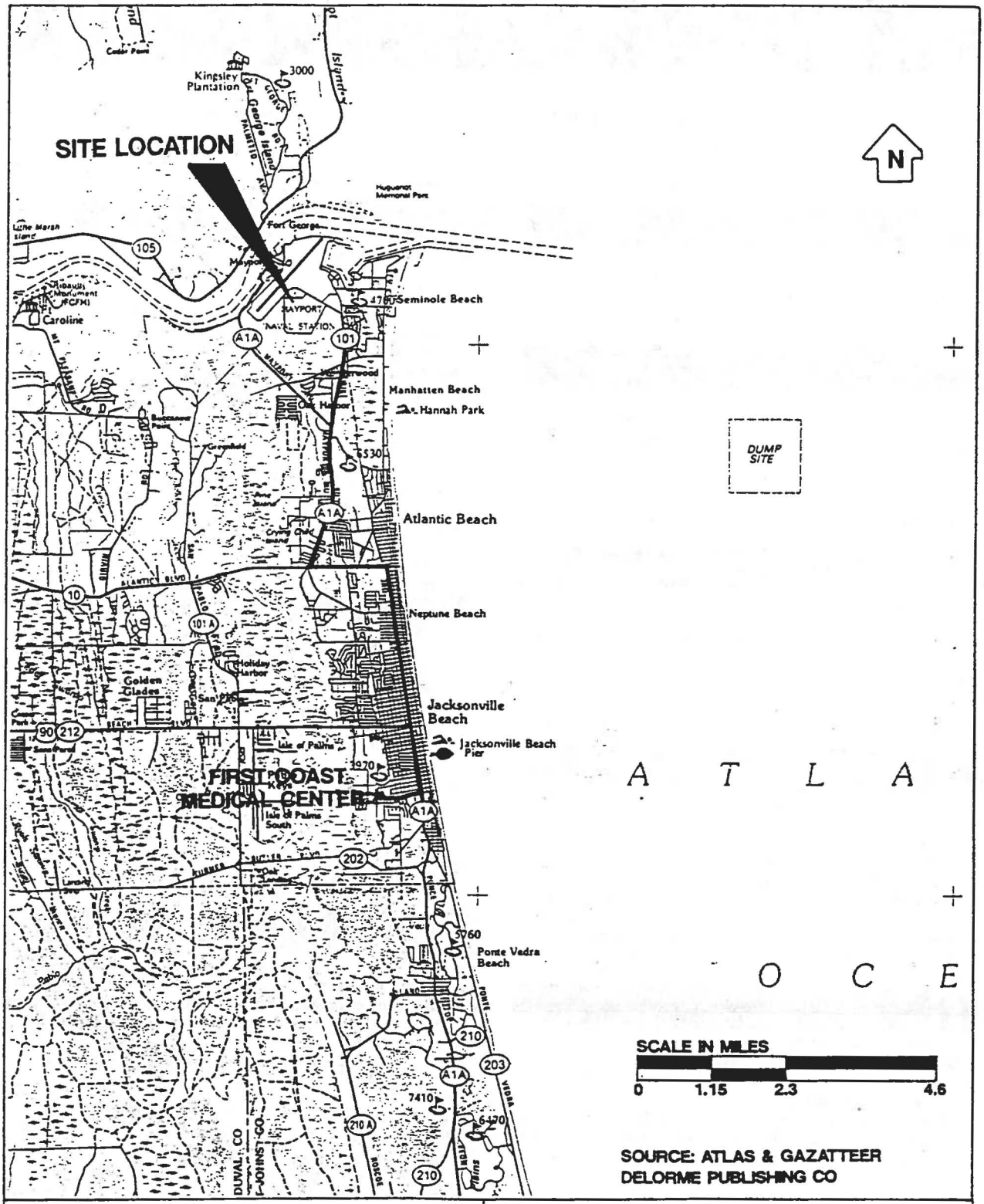


FIGURE G-2

ROUTE TO FIRST COAST MEDICAL CENTER

RCRA FACILITY INVESTIGATION HEALTH AND SAFETY PLAN
U.S. NAVAL STATION
MAYPORT, 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 discriminatory action.

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 civil penalties against employers of up to $7,000 for each serious violation and for optional penalties of up to $7,000 for each nonserious violation. Penalties of up to $7,000 per day may be proposed for failure to correct violations within the proposed time period and for each day the violation continues beyond the prescribed abatement date. Also, any employer who willfully or repeatedly violates the Act may be assessed penalties of up to $70,000 for each such violation. A violation of posting requirements can bring a penalty of up to $7,000.

There are also provisions for criminal penalties. Any willful violation resulting in the death of any 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 both. A second conviction of an employer doubles the possible term of imprisonment. Falsifying records, reports, or applications is punishable by a fine of $10,000 or up to six months in jail or both.

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.

VOLUNTARY ACTIVITY

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.

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

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) 337-2378
Philadelphia, Pennsylvania	(215) 596-1201
San Francisco, California	(415) 744-6670
Seattle, Washington	(206) 442-5930

Washington, D.C.
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Lynn Martin, Secretary of Labor
U.S. Department of Labor
Occupational Safety and Health Administration

To report suspected fire hazards, imminent danger safety and health hazards in the workplace, or other job safety and health emergencies, such as toxic waste in the workplace, call OSHA's 24-hour hotline: 1-800-321-OSHA.

APPENDIX H

FIELD TEAM REVIEW SHEET

FIELD TEAM REVIEW

(This sheet must be received by the Site Safety Officer prior to onsite activity.)

I, _____, have read the Site Safety Plan for the _____ site. I understand the rationale for the safety procedures specified and for modification of those procedures. I agree to comply with the provisions of this Safety Plan.

Signature_____

Date_____

MEDICAL DATA SHEET. This Medical Data Sheet will be completed by all onsite personnel and will be kept in the Support Zone during site operations. It is in no way a substitute for the Medical Surveillance Program requirements consistent with the ABB-ES Corporate Health and Safety Program for Hazardous Waste Sites. This data sheet will accompany any personnel when medical assistance or transport to hospital facilities is required. If more information is required, use the back of this sheet.

Project: _____

Name: _____

Home Address: _____

Home Phone: Area Code ( ) _____

DOB: _____ Height: _____ Weight: _____

In case of emergency, contact: _____ (spouse) _____

Address: _____

Telephone (home): _____

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

Allergies: _____

List medication taken regularly: _____

Particular sensitivities: _____

Previous/recent illnesses or exposures to hazardous chemicals: _____

_____

Name of Personal Physician: _____

Telephone: Area Code ( ) _____