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FINAL WORK PLAN FOR PRELIMINARY ASSESSMENT SITE INVESTIGATION AND REMEDIAL INVESTIGATION FEASIBILITY STUDY AT PLANT 4 VOLUME 4 OF 4 NAS FORT WORTH TX

8/1/1990

UNC GEOTECH

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NAVAL AIR STATION
FORT WORTH JRB
CARSWELL FIELD
TEXAS

ADMINISTRATIVE RECORD
COVER SHEET

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Air Force Plant 4

Preliminary Assessment/ Site Inspection and Remedial Investigations/ Feasibility Studies

Volume IV

Final Health and Safety Plan

Prepared for
U.S. Department of the Air Force
Headquarters Aeronautics Systems Division
Wright-Patterson Air Force Base, Ohio

Submitted by UNC Geotech under
DOE Contract No. DE–AC07–86ID12584 for the
U. S. Department of Energy

CNG/WMP-PN-12

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FINAL HEALTH AND SAFETY PLAN

for

Preliminary Assessment/Site Inspection
and
Remedial Investigation/Feasibility Studies

at

U.S. Air Force Plant 4
Tarrant County, Texas

Prepared for

Department of the Air Force
Headquarters Aeronautical Systems Division
Wright-Patterson Air Force Base, Ohio

August 1990

Prepared by

UNC Geotech
P.O. Box 14000
Grand Junction, CO 81502

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1.0 INTRODUCTION AND PRELIMINARY ASSESSMENT

1.1 POLICY

It is the policy of UNC Geotech to provide a safe and healthful work environment for all its employees. UNC Geotech considers no phase of operation or administration to be of greater importance than injury and illness prevention. Safety takes precedence over expediency or shortcuts, and every attempt is made to reduce the possibility of injury, illness, or accident occurrence.

The purpose of this Health and Safety Plan is to assign UNC site personnel health and safety responsibilities, to prescribe mandatory operating procedures, and to establish personnel protective equipment requirements for job, work, or activity, for alternative and contingency work items, for emergency response, and for spill cleanup and abatement. This plan is to be used for all Remedial Investigation/ Feasibility Study (RI/FS) operations at Air Force Plant 4 (AFP 4) including but not limited to monitoring well drilling and construction, soil boring and sampling, and groundwater sampling.

The Health and Safety Plan complies with all applicable Occupational Safety and Health Administration (OSHA) regulations and will be updated in the event that new OSHA regulations are promulgated or current OSHA regulations change such that they may affect the Safety and Health policies contained in this plan. This plan is in accordance with UNC Health and Safety Policies and Procedures.

The provisions of this plan are mandatory for all UNC personnel and subcontractors assigned to this project. The Project Manager will have a listing of all employees who have been, or will be, assigned to this activity. All authorized visitors to any of the work sites will be required to abide by UNC policy and procedures. Work conditions can be expected to change as the operation progresses. As appropriate, written addenda to the plan will be provided by Health, Safety and Security (HS&S). No changes to this plan will be implemented without prior approval by the Manager of HS&S.

1.2 SITE BACKGROUND

1.2.1 Location

AFP 4 is located in Tarrant County Texas, seven miles northwest of the City of Fort Worth (See Figure 1.1). AFP 4 occupies 602 acres and is bounded on the north by Lake Worth, on the east by Carswell Air Force Base, and on the south and west by the City of White Settlement.

1.2.2 Site Topography

Topography at AFP 4 is generally flat except for areas adjacent to Meandering Road Creek and along the shore of Lake Worth. Elevations range from 590 feet along the shore of Lake Worth to Approximately 670 feet above mean sea level at the southwest corner of AFP 4. Site topography is shown on Figure 1.2

1.2.3 Site History

AFP 4 became operational in 1942 when Consolidated Aircraft began manufacturing the B-24 bomber for national defense during World War II. In 1953, General Dynamics took over operation of the manufacturing facility. Since 1953, AFP 4 has produced B-36, B-58, and F-111 aircraft, and currently produces F-16 aircraft. In addition to F-16 aircraft, General Dynamics produces spare parts, radar units, and missile components.

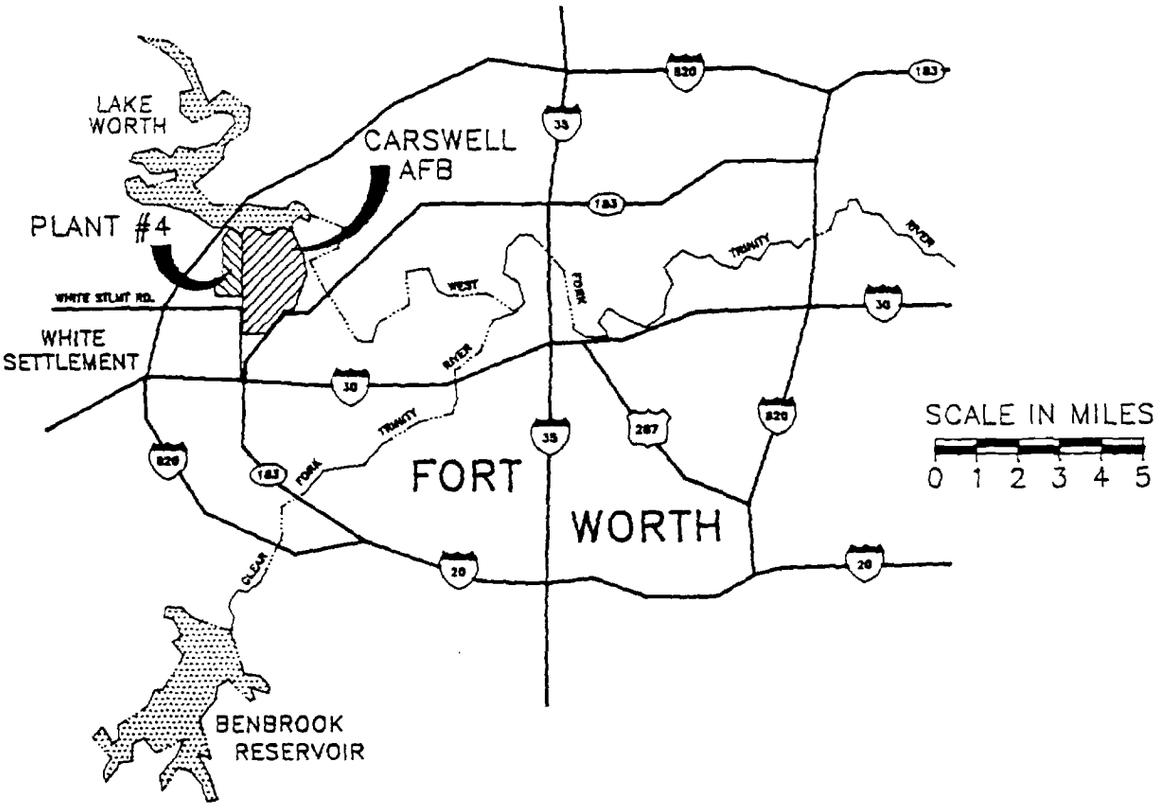
Manufacturing operations at AFP 4, have resulted in the generation of various hazardous wastes which include waste oils, fuels, spent solvents, paint residues, and spent process chemicals. Throughout most of the plants history, waste oil, solvents, and fuels were disposed of at on-site landfills or were burned in fire training exercises. Chemical wastes were initially discharged to the sanitary sewer system which went to the City of Fort Worth treatment system. In the 1970s chemical process wastes were treated on-site at a newly constructed chemical waste treatment system prior to being discharged to the sanitary sewer system. Currently, waste oils and solvents are disposed of by a contractor and burning of these wastes has been discontinued. Chemical wastes continue to be treated on-site prior to discharge to the sanitary sewer system.

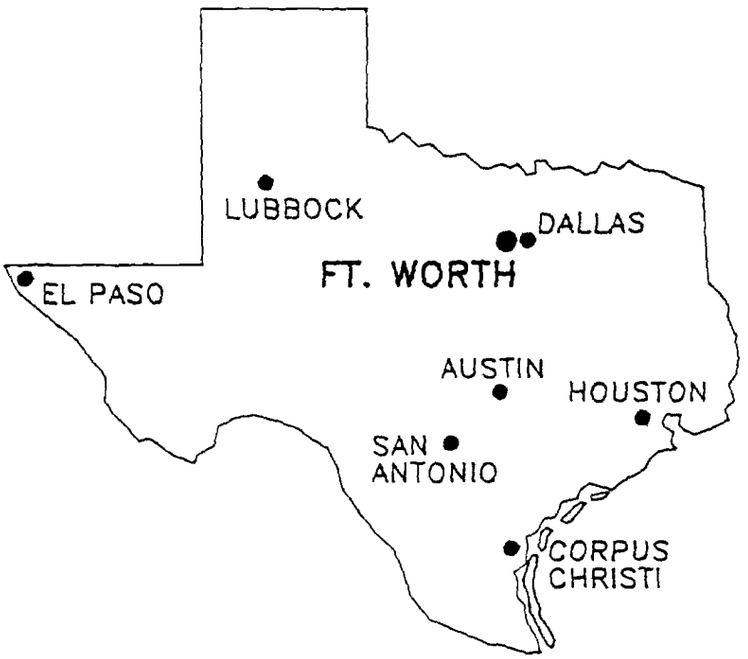
1.2.4 Previous Investigations

Potential contamination at AFP 4 was first noted by a private citizen in September, 1982. General Dynamics was notified and took immediate action. The source of the observed contamination was thought to be leachate from a landfill. In October, 1982, General Dynamics began construction of French Drain No. 1 to prevent migration of contaminated groundwater toward Meandering Road Creek and divert the flow of surface water from the outfall where the contamination was first noted.

In November, 1982, the USAF Aeronautical Systems Division, through General Dynamics, retained Hargis and Montgomery, Inc. to investigate the potential for groundwater contamination at AFP 4. Hargis and Montgomery drilled and constructed 12 monitor wells from November, 1982 to January, 1983 and submitted a summary report in February, 1983 (Hargis and Montgomery, 1983). From February, 1983 to March, 1985, Hargis and Montgomery and Hargis and Associates, Inc. drilled and constructed an additional 87 monitor wells during the second phase of the AFP 4 hydrogeologic assessment. From November, 1985 to March, 1988 an additional 36 monitor wells were constructed and 33 soil borings were drilled by Hargis and Associates. Results of these investigations are contained within several reports (Hargis and Associates, Inc., 1985a-c, 1987a-b, 1988a-b).

The IRP for AFP 4 was initiated in March 1984 when CH2M Hill conducted a Phase I Records Search (CH2M Hill, 1984). CH2M Hill ranked 20 identified disposal sites (Figure 2) in August, 1984 according to the USAF Hazard Assessment Rating Methodology (HARM).





(After Radian, 1987)

Figure 1-1 General Location of AFP 4

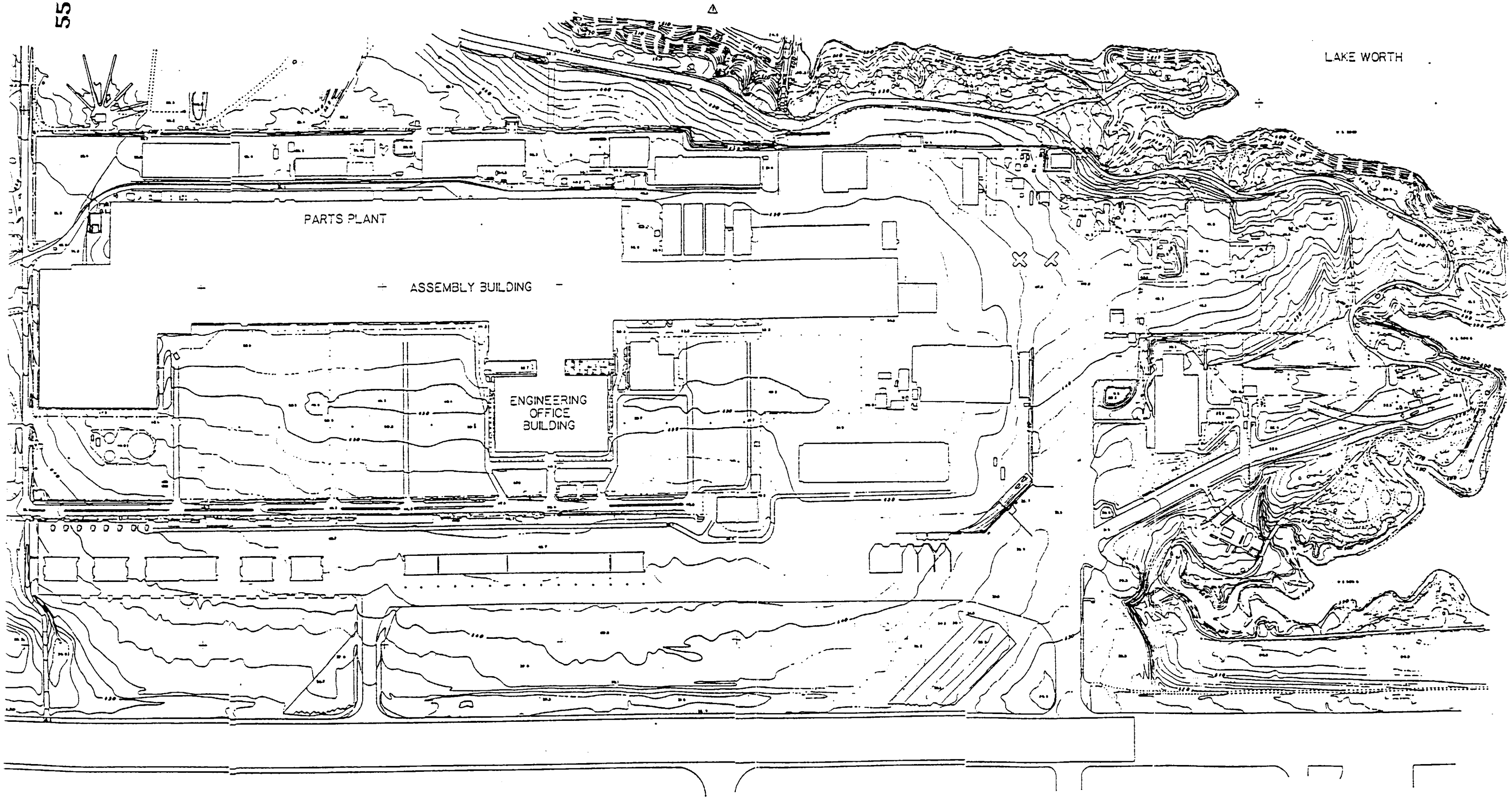


Figure 1-2 Surface Topography at AFP 4

The U.S. Army Corps of Engineers was retained in June 1985 to further delineate groundwater conditions along the southern base boundary and the East Parking Lot area of AFP 4. The Corps of Engineers drilled 28 soil borings and constructed 6 monitor wells (U.S. Army Corps of Engineers, 1986).

Radian Corporation was retained in September, 1985 to perform Phase II, Stage I, Confirmation/Quantification of the IRP. Radian drilled 11 soil borings and constructed 12 groundwater monitoring wells. Additional work included a confirmation sampling round of all existing monitoring wells. A summary report of field investigations performed during the IRP Phase II, Stage 1 Confirmation/Quantification studies was prepared (Radian, 1987).

In December, 1985, Intellus Corporation was contracted to conduct an IRP Phase IV Remedial Action Plan for ten potential disposal sites and Phase IV A Remedial Action Plan plus Phase IV B Design and Construction for Fuel Saturation Areas Nos. 1 and 3. In support of the tasks, Intellus Corporation drilled 12 soil borings and constructed 24 groundwater monitoring wells (Intellus Corporation, 1986a-b and 1987).

A Technical Review Committee (TRC) for AFP 4 was established in 1983. The TRC consists of representatives from the U.S. Environmental Protection Agency (EPA) Region VI, the Texas Water Commission, the City of Fort Worth, the City of White Settlement, the USAF, Army Corps of Engineers, and General Dynamics. Periodic TRC meetings have been held since 1983 to keep the local authorities and community informed of remedial investigations at AFP 4.

1.3 POTENTIAL CHEMICAL CONTAMINANTS

Table 1.3-1 is a list of potential on-site contaminants which have been found on soil samples or from the literature which provided preliminary information about the site. The exposure limits are also identified. Table 1.2-2 provides a list of Expected Contaminants and the associated hazards.

TABLE 1.3-1

Contaminant	OSHA Permissible Exposure Limit	ACGIH Threshold Limit Value
Benzene	1 ppm	10 ppm
Toluene	200 ppm	100 ppm
Trichloroethylene	100 ppm	50 ppm
Xylene	100 ppm	100 ppm
Chlorobenzene	75 ppm	75 ppm
Chloroform	50 ppm	10 ppm
1,1,1-Trichloroethane	350 ppm	350 ppm
Vinyl Chloride	1 ppm	5 ppm
1,2-Dichloroethane	50 ppm	10 ppm
Tetrachloroethylene	100 ppm	50 ppm
Methylene Chloride	500 ppm	50 ppm
Trans-1,2-Dichloroethylene	220 ppm	200 ppm
Ethylbenzene	100 ppm	100 ppm
Gasoline	-------	300 ppm
Chromium	0.5 m/m3	0.05 m/m3
Jet Fuel JP4	-------	------
Jet Fuel JP5	-------	------

TABLE 1.3-2

PRIMARY HAZARDS ASSOCIATED WITH EXPECTED CONTAMINANTS

Contaminant	Primary Exposure Routes	Symptoms and Hazards
Chlorobenzene	Inhalation, Contact, Ingestion	Irritation of eyes and skin, incoordination, drowsiness, respiratory and nervous system, liver, kidney damage
Chloroform	Inhalation, Contact, Ingestion	Dizziness, dullness, nausea, headache, fatigue, irritation of eyes and skin, liver, eye, kidney, heart, and skin damage
1,1,1- Trichloroethane	Inhalation, Contact, Ingestion	Headache, eye irritation, poor equilibrium, lassitude, central nervous system depression, dermatitis, cardiac arrhythmia
Vinyl Chloride	Inhalation	Weakness, abdominal pain, bleeding, liver, central nervous system, blood, respiratory system, lymphatic system damage
1,2-Dichloroethane	Inhalation, Absorption, Contact, Ingestion	Depression, nausea, vomiting, dermatitis, eye irritation, kidney, liver, eye, skin, central nervous system damage
Tetrachloroethylene	Inhalation, Absorption, Contact, Ingestion	Eye, nose, throat irritation nausea, dizziness, headache, liver, kidney, eye, upper respiratory system, central nervous system damage
Methylene Chloride	Inhalation, Absorption, Contact, Ingestion	Headache, nausea, vomiting, liver toxin
Trichloroethylene	Inhalation, Absorption, Contact, Ingestion	Drowsiness, dizziness, tremor, mental confusion, vomiting, abdominal cramps, liver cancer

Table 1.3.2 Continued
PRIMARY HAZARDS ASSOCIATED WITH EXPECTED CONTAMINANTS

Trans-1,2-di chloroethylene	Inhalation, Contact, Ingestion	Irritation of eyes and respiratory system, central nervous system depression
Ethylbenzene	Inhalation, Absorption, Contact	Irritation of eyes, mucous membrane, dermatitis, narcosis, coma, central nervous system damage, dermatitis
Toluene	Inhalation, Absorption, Contact, Ingestion	Fatigue, weakness, confusion, dizziness, headache, insomnia, dilated pupils, central nervous system, liver and kidney damage, dermatitis
Benzene	Inhalation, Absorption, Contact, Ingestion	Irritation of eyes, nose, and respiratory system, headache, nausea, fatigue, abdominal pain, dermatitis, blood, CNS, skin, bone marrow and respiratory system damage, leukemia
Gasoline	Inhalation, Contact, Ingestion	Irritation of eyes, skin, respiratory system, dermatitis, tumors
Chromium	Inhalation, Ingestion	Histologic fibrosis of lungs
Jet Fuel - JP4	Inhalation, Contact, Ingestion	Dizziness, incoordination, loss of balance, headache, irritation of respiratory tract, eyes, skin, mucous membranes, unconsciousness, respiratory failure
Jet Fuel - JP5	Inhalation, Absorption, Contact, Ingestion	Dizziness, incoordination, weakness, headache, loss of balance, irritation of eyes, skin, respiratory system

Areas targeted preliminarily for air monitoring and respiratory protection due to the presence of previously identified volatile organic compounds are as follows:

WELL NUMBER	COMPOUND	CONCENTRATION (in ppb)
F-201	Benzene	3,300
F-202	Benzene	1,100
F-204	Benzene	140
F-205	Benzene	5,300
	Ethylbenzene	70,000
F-206	Benzene	6,000
	Ethylbenzene	100,000
F-214	trans-Dichloroethylene	53,000
	Methylene Chloride	2,300,000
	Trichloroethylene	1,300,000
	1,2-Dichloroethane	100,000
	Toluene	140,000
	Chloroform	49,000
	Benzene	120,000
F-217	Vinyl Chloride	620
F-220	Trichloroethylene	420,000
F-222	Benzene	680
F-223	Benzene	600
HM-7	Vinyl Chloride	4,100
	Benzene	140
HM-21	Vinyl Chloride	6,900
	trans-Dichloroethylene	44,000
HM-25	Benzene	350
HM-38	Vinyl Chloride	2,300
	trans-Dichloroethylene	170,000
	Methylene Chloride	89,000
	Trichloroethylene	260,000
	1,2-Dichloroethane	17,000
	Toluene	100,000
HM-50	Vinyl Chloride	191
HM-51	trans-Dichloroethylene	72,000
	Methylene Chloride	180,000
	Trichloroethylene	280,000
	1,2-Dichloroethane	30,000
	Toluene	41,000
	Chloroform	5,000
HM-53	Benzene	780
HM-56	Benzene	110
HM-63	Vinyl Chloride	350
HM-78	Benzene	8,300
HM-82	Trichloroethylene	25,000
HM-94	Trichloroethylene	19,000
Drain Pipe	Vinyl Chloride	7,100
	trans-Dichloroethylene	93,000
French Drain 1	Vinyl Chloride	4,700
	trans-Dichloroethylene	93,000

French Drain 2	Vinyl Chloride	1,800
Tower Influent	Vinyl Chloride	2,100

Conventional industrial hygiene monitoring will be conducted when, in the judgment of the HS&S Department, an activity may produce airborne concentrations in excess of 50 % of accepted exposure limits. Monitoring must also be done to document concentration of chemicals in the work environment and to identify when exposures approach the exposure limits requiring use of PPE. The data will be compared with the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold limit values (TLVs) and OSHA permissible exposure limits (PELs). The most restrictive exposure limit will be enforced.

1.4 PHYSICAL HAZARDS

The hazards associated with this project include the physical risks associated with sampling activities, drilling activities, heat stress, excessive noise levels, and flammable atmospheres.

Engineering controls (e.q., guarded moving parts) shall be used to control the physical hazard posed by drilling operations. Protective equipment shall also be used to minimize these hazards.

Wearing chemical protective clothing poses potential heat stress hazards. Work practices and procedures to monitor for and control heat stress will be followed.

Noise levels greater than 84dB(A) are expected to be generated from air craft, drilling rigs, air compressor, and heavy construction equipment. Noise levels will be evaluated by use of sound-level meters. Worker noise exposure will be determined using noise dosimeters. Hearing protection will be worn by all employees working in noise levels of 84dB(A) or greater. Noise levels will be monitored on a bi-weekly basis, except when working around runways or engine test areas. Monitoring of these areas will be performed on a daily basis. Procedures for the use of sound level meters are provided in Appendix D, this plan.

Other physical hazards associated with AFP 4 are as follows:

- Underground utilities, overhead power lines, energized electrical systems, and pressurized equipment;
- Buried tanks, gas/hazardous substance pipelines;
- Aircraft, truck, and vehicular traffic;
- Radar and microwave transmissions;
- Snakes, and insects when performing activities off of the facility.

1.5 HAZARDS ASSOCIATED WITH FLIGHT OPERATIONS

Personnel conducting fieldwork at AFP 4 may be subject to hazards associated with flight operations. Aircraft testing is conducted near the runways and flight line at Carswell Air Force Base. Microwave and radar transmissions pose a danger on and near the radar range. Field personnel are urged to remain aware of the activity status of runways and the radar range, and to inform AFP 4 security personnel of time and locations of proposed field work.

1.6 SUMMARY OF PROPOSED ACTIVITIES

A summary of proposed work activities in support of the RI/FS at AFP 4 is presented in Appendix A of this plan. Details of the procedures to be employed for each activity are found in the Sampling and Analysis Plan (Volume II). Locations of each area described are shown on Plate I (in pocket).

1.7 PROPOSED SCHEDULE

A proposed schedule for completion of all work activities is shown in Appendix B of this plan. Scheduling of work activities was in part controlled by a need to protect worker health due to extreme climatic conditions present in the summer months (heat and humidity) at AFP 4. Heavy work such as monitoring well drilling has been proposed for the fall to avoid heat stress, exhaustion, or stroke. Delays in obtaining final approval of the RI/FS Work Plan and associated documents may result in further schedule delays. These delays will, however, lessen the likelihood of adverse health problems from climatic conditions.

2.0 ASSIGNMENT OF RESPONSIBILITIES

All personnel who are involved in operations that treat, excavate, trench, handle, sample, dispose of, or otherwise have a potential for exposure to contaminated materials shall follow this Health and Safety Plan.

All personnel are responsible for adherence to the established safety procedures identified in this plan and the ES&H manuals during the performance of the work. In no case may work be performed in a manner that conflicts with the intent of or the inherent safety and environmental cautions expressed in this document. After due warnings, personnel who violate safety procedures will be dismissed from the site and subject to disciplinary action. All field personnel shall be properly trained in Health and Safety regulations associated with handling hazardous materials and the safe operation of equipment. All personnel will be trained as necessary according to the specifications set forth by 29 CFR 1910.120 and this document.

2.1 KEY PERSONNEL

The following is a list of the key personnel for RI/FS fieldwork activities at AFP. Following the list of personnel are descriptions of the duties and responsibilities of the individual or organization they represent:

Project Manager:	John Ludlam
Field Team Leader:	Dave Traub
HS&S Supervisor:	Syd Pincock
Alternate:	Kerry Briar

2.2 PROJECT MANAGER

The Project Manager is responsible for field implementation of the Health and Safety Plan. This responsibility includes communicating site requirements to all personnel, field supervision, and consultation with the HS&S Department Supervisor regarding appropriate changes to the Health and Safety Plan. The Project Manager is responsible for informing the HS&S Department Supervisor of any changes in work plans so that they may be appropriately addressed in revision of this plan and further hazard assessments.

2.3 FIELD TEAM LEADER

The Field Team Leader reports directly to the Project Manager and will be responsible for directing all field activities in support of the RI/FS at AFP 4. To ensure compliance with this plan and to protect worker health and safety, the Field Team Leader will be responsible for conducting daily health and safety briefings for all field personnel prior to the start of work. The Field Team Leader is also responsible for issuing work assignments in a manner that personnel are only assigned work tasks for which they are properly trained. If additional training is required, the Field Team Leader will provide such training to workers prior to start of work. The Field Team Leader will also coordinate each days activities with the on-site Health and

Safety (HS&S) Department Supervisor so that proper screening of the work site can be made prior to worker entry and any hazards are properly identified and addressed.

2.4 HEALTH, SAFETY & SECURITY (HS&S) DEPARTMENT SUPERVISOR

The HS&S Department Supervisor is responsible for coordination of the general site Health and Safety Plan and of addenda to this plan that are specific to each site. This plan complies with established site-specific procedures in all respects and includes medical surveillance, training requirements, hazard assessment, personnel protective equipment, field implementation, and audits. The HS&S Department Supervisor will update and change this plan, if warranted by changed conditions, and shall have the only authorization to effect such changes. Agency liaison on matters relating to safety and health will be handled by the HS&S Department Supervisor or his designee. Daily monitoring activities for health and safety will be performed by properly trained HS&S technicians who will report directly to the HS&S Supervisor.

2.5 TECHNICIANS/SUBCONTRACTORS

Technicians, subcontractors, and other personnel on site will be responsible for understanding and complying with all site requirements. Health and Safety requirements will be included in subcontracts. The written requirements will be copied and distributed to personnel working on site and individuals receiving the written requirements will be required to sign off as having received the document.

3.0 MEDICAL PROGRAM

3.1 PHYSICAL EXAMINATION

As required by UNC policies and procedures, all personnel on site will have successfully completed a preplacement or periodic/update physical examination. This examination has been designed to comply with OSHA 1910.120 requirements for hazardous waste site operations.

The UNC Medical Surveillance Program Examination consists of:

- Medical and Occupational History Form (detailed questionnaire for new employees, short questionnaire for periodic exams)
- Physical Examination
- Complete Blood Count with Differential
- SMAC 23
- Urinalysis (dipstick and microscopic)
- Chest X-ray
- Pulmonary Function Test (FEV/FVC)
- Audiogram
- Electrocardiogram
- Visual Acuity

All subcontractor personnel who have potential for exposure to hazardous materials shall have successfully completed an examination similar to the preplacement physical. The cost for medical surveillance will be paid by the subcontractor. All physicals will be approved by a physician who can demonstrate experience in Occupational Medicine.

3.2 MEDICAL RECORDS

Medical and personnel exposure monitoring records will be maintained in accordance with the requirements of 29 CFR 1910.20 and will be kept for 30 years after termination of employment. Employee confidentiality will be maintained.

3.3 INJURY AND ILLNESS TREATMENT

- A physician familiar with occupational medicine will be identified before job startup. This physician will be familiar with effects of the chemicals on site and will be used as a consultant in the event of a job-related illness.

- If an injury/illness is the result of a chemical exposure, a supervisor shall promptly initiate the steps necessary to identify the chemical(s). Chemical identification shall be accomplished through use of monitoring equipment (photoionization detectors in conjunction with detector tubes and/or conventional Industrial Hygiene monitoring) and any prior sampling be made available to the treating physician.

- **Any injury/illness not limited to a first-aid response requires that the Project Manager immediately notify the HS&S Department.** This notification allows the coordination of internal resources to assist the treating physician in rendering appropriate care.

- Any employee of UNC or a subcontractor who is suspected of having an overexposure to the chemicals on site will be given another physical examination. Any employee or subcontractor who develops a lost-time illness or sustains a lost-time injury will be re-examined. The physician will certify that the employee is fit to return to work by completing the "Physician's Recommendation for Return to Work." If necessary, activity restrictions will also be specified on the "Physician's Recommendation to Return to Work."

4.0 TRAINING PROGRAM

All safety hazards at the site will be communicated and individuals will receive instructions on the requirements of the Health and Safety Plan. Training will include familiarity with Material Safety Data Sheets, which will be available for each contaminant. This training will be designed to address the requirements of OSHA Hazard Communication Standard (29 CFR 1910.1200) and the OSHA Hazard Waste Operations and Emergency Response Standard (29 CFR 1910.120).

4.1 PRE-PROJECT TRAINING

All employees and contractors who work on site shall have successfully completed a formal training program that will include:

- Basic Safety Training - This course stresses fundamentals such as the cause and prevention of slip, trip, and fall hazards; safe lifting techniques; heat stress illnesses and their prevention.

- Hazard Protection - This course deals with the identification, recognition, and safe work procedures for toxic materials. The use and limitations of applicable protective clothing and decontamination procedures are an important part of this course.

- First Aid and Cardiopulmonary Resuscitation (CPR) - At least half of the employees will have completed the standard Red Cross First Aid and CPR courses. A minimum of at least two certified employees will be on site at all time.

- Health Hazard Awareness - Information will be available concerning on-site hazardous materials to which employees may be exposed. The information will include routes of exposure, toxic effects, appropriate protective equipment, medical surveillance, and the specific nature of jobs which could result in exposure to chemicals on site.

- Work practices and engineering controls to minimize risk.

- Hearing Conservation Program as defined in the training program.

- Respirator Training - The use, limitations, and inspection of air purifying respirators and self-contained breathing apparatus (SCBAs) will also be covered. Respirator fit tests will be given to all personnel. These tests will consist of a qualitative fit using irritant smoke in a plastic containment structure.

All employees will have received a minimum of 40 hours of initial off-site instruction. On-site supervisors shall have completed at least 8 additional hours of specialized training on managing hazardous waste operations. This

training includes familiarization with the Fort Worth Air Force Plant 4 Safety and Emergency Procedures. Each employee will also have received three days of on-the-job training.

4.2 TAILGATE SAFETY MEETINGS

Daily "tailgate" Safety meetings will be conducted at the beginning of each shift or whenever new employees or contractors arrive at the job site once the job begins. At these meetings, health and safety considerations and the necessary protective equipment for the day's activities will be discussed. This meeting will be conducted by the Field Team Leader and documented on Safety Meeting Roster (UNC Form 1554). Each employee present will sign the form.

4.3 MATERIAL SAFETY DATA SHEETS

Complete MSDSs, will be available in the work area for those materials known to be present. Additional MSDSs may be required in the event of discovery of additional materials on site. This information will be presented at the next "tailgate" meeting. MSDSs will also be provided for materials brought on site for use during field work. MSDSs for contaminants previously identified at hazardous waste sites at AFP 4 are presented in Appendix D of this plan.

4.4 TRAINING RECORDS

All training that is conducted on site will be documented on the appropriate forms and retained in the employee's job file. The formal documentation of training will be maintained by UNC Geotech, Human Resources Department.

5.0 AIR MONITORING

5.1 AREA MONITORING

Area air monitoring will be conducted with direct reading instruments for explosive limits, oxygen, and volatile organic compounds (VOCs) at drill sites, monitoring wells and during soil sampling activities. Monitoring for explosive limits and oxygen deficiency is to be conducted by a combustible gas/oxygen meter. Monitoring for VOCs is to be conducted using a photoionization detector (PID). VOCs will be monitored in the breathing zone of workers. Monitoring equipment is maintained and calibrated in accordance with procedures issued in the Environmental, Safety, and Health Desktop Procedures Manual, (see Appendix D, this plan).

Air monitoring will be conducted continuously. These results will be recorded and documented in the HP Technician's logbook. Action levels for area and breathing zone air monitoring conducted with direct reading instruments are as follows:

(Breathing Zone) VOCs	>1 part per million (ppm) above background (detected with PID) if benzene or vinyl chloride is present
(Breathing Zone) VOCs	>10 ppm if benzene or vinyl chloride is not present
(Area) Oxygen	<20 percent
(Area) Flammable Atmospheres	>10 percent of the lower explosive limit (LEL)

If action levels are equaled or exceeded, work will stop immediately and personnel will move upwind and let the area vent for a minimum of 5 minutes. At the end of the 5-minute waiting period, air quality measurements will be taken. If concentrations have not been reduced below action levels, instrumentation will be used to determine if benzene or vinyl chloride is present. If benzene or vinyl chloride is detected, air purifying respirators will be required for re-entry into the area. If benzene or vinyl chloride is not detected, work may continue without respirators unless the breathing zone readings exceed 10 ppm. If the breathing zone exceeds 10 ppm, the level of protection will be re-evaluated.

In extreme cases, a particular operation may be delayed and restarted under new working Health and Safety guidelines or work may be abandoned totally. No one shall enter any confined space such as tanks, underground vessels, rail cars, etc. without first having the atmosphere checked for percent oxygen, combustibles, and any other suspected contaminants. In any case,such entries require that a confined space entry permit be obtained from the General Dynamics Safety Department.

5.2 PERSONNEL EXPOSURE MONITORING

Personnel exposure monitoring will be provided during all activities conducted in contaminated areas. Results will be used to assess exposures and govern personnel protective equipment. Hazards to be monitored include exposure to contaminants, particulates, gases, vapors, and heat stress. Cold stress in not anticipated to be a problem for employees at AFP 4. However, all UNC Geotech HS&S employees will be trained in the recognition of cold stress symptoms and will be familiar within the treatment of cold stress victims. Specific procedures to be used for the above monitoring activities (except cold stress) are provided in Appendix D, this plan.

Conventional Industrial Hygiene monitoring shall also be conducted when, in the judgment of the HS&S Department, an activity may produce airborne contaminant concentrations in excess of action limits (50 % TLV-TWA).

Personnel air monitoring will be conducted to determine actual exposures to airborne heavy metal contaminants. Actual exposures will be based on the time spent in contaminated areas. All personnel will be required to sign in and out of areas on UNC Form 1733. The data will be compared with ACGIH TLVs and OSHA PELs. The effects of these solvents will be considered as additive, and TLVs will be computed as such.

Noise monitoring will be conducted in accordance with the UNC Manual 103 Section 8.5 and will be followed in all phases of work at AFP4.

Heat stress will be monitored by the Wet Bulb Globe Temperature Index (WBGT) technique. The WBGT will be compared to the TLV's recommended by the ACGIH. A work/rest regimen will then be established in accordance with ACGIH/NIOSH guidelines.

Monitoring for organics will be conducted using a PID, and personnel sampling will be conducted using charcoal tubes. In addition, personnel sampling for heavy metals and silica will be collected on sampling cassettes and submitted for analysis.

All personnel exposure monitoring records will be maintained for a period of 30 years beyond termination, in accordance with 29 CFR 1910.20.

6.0 PERSONNEL PROTECTIVE EQUIPMENT AND PROCEDURES

6.1 STANDARD PROCEDURES

If the action limits specified in Section 5.1 are exceeded, respiratory protection may be required. Therefore, the following standard procedures need to be understood by all on-site personnel:

- The respiratory protection used on site will be in compliance with OSHA, 29 CFR 1910.134.

- Only properly cleaned, maintained, National Institute for Occupational Safety and Health/Mine Safety and Health Administration (NIOSH/MSHA)-approved respirators (half-face, full-face, or positive air pressure units) shall be used.

- Selection of respirators, as well as any decisions regarding upgrading or downgrading of respiratory protection, will be made by the HS&S representative or their designee.

- Air-purifying cartridges shall be replaced at the end of each shift or when loadup or breakthrough occurs (i.e., breathing becomes difficult or odors are detectable).

- Only employees who have had pre-issue respirator fit tests and annual fit tests thereafter will be allowed to work in atmospheres where respirators are required. Fit test documentation will be kept as part of each employee's training documentation records.

- If an employee demonstrates difficulty in breathing during the fit testing or during respirator use, he or she shall have a medical examination to determine whether a respirator can be worn while performing the required activities.

- No employee shall be assigned to tasks requiring the use of respirators if, based upon the most recent medical examination, a physician determines that the employee will be unable to function normally wearing a respirator or that the safety or health of the employee or other employees will be impaired by use of a respirator.

- Contact lenses are not to be worn while using respiratory protection devices.

- Air-supplied respirators shall be assembled according to manufacturer's specifications regarding hose length, couplings, valves, regulators, manifolds, etc.

- Facial hair (e.g., beards) prohibits proper face fit and effectiveness of respirators. Persons required to wear respirators must not have beards, sideburns, etc. which will interfere with the respirator-to-face seal. All personnel wearing

respirators will be required to be clean shaven prior to each day's shift.

- Regular eyeglasses cannot be worn with full-face respirators.
- Where respirators are designated for protection against contaminants, the employees shall be permitted to change canisters or cartridges whenever an increase in breathing resistance is detected.
- Positive pressure self contained breathing apparatus, or positive pressure air-line respirators equipped with and escape air supply, will be used when chemical exposure levels present will create a substantial possibility of immediate death, immediate serious injury, or impair the ability to escape.
- Protective clothing will be determined based on site specific chemical and physical hazards, as discussed below.

6.2 PROTECTIVE CLOTHING

6.2.1 Contamination Zone

For all workers in the Contamination Zone, as well as for equipment decontamination workers, protective clothing for this site investigation work will be as follows:

- Disposable polyethylene-coated Tyvek coveralls
- Nitrile outer gloves with inner latex surgical gloves
- Neoprene boots
- Goggles worn at all times in the work area (Contamination Zone)
- Hardhat, safety glasses, and steel-toed boots
- Sleeves taped to gloves and cuffs taped to boots

6.2.2 Upgrading or Downgrading of Selected Protective Equipment

Upgrading or downgrading of selected protective equipment will be the decision of the HS&S representative and will be based on assessment of exposure potential. Employees will be protected to the maximum at the onset of the activity until actual contaminant exposure is established. This may be through respiratory protection, clothing, eye protection, etc.

7.0 SITE ACCESS CONTROL

7.1 SECURITY

The work area at Fort Worth Air Force Plant 4 will be marked off with barricades and barricade tape as necessary during drilling, augering or coring. Signs will be posted around the area reading, "AUTHORIZED PERSONNEL ONLY."

Visitors to the site will abide by the following:

- All visitors to the sites will be instructed to stay outside the Contaminated Zone and remain within the Clean Zone during the extent of their stay. Visitors shall be cautioned to avoid skin contact with contaminated or suspected contaminated surfaces. During visitation, hand-to-mouth transfers should be reduced with special precautions not to eat, drink, smoke, chew gum, or chew tobacco. The use of alcohol or drugs on the job is prohibited.

- Visitors requesting to observe work conducted in the contaminated Zone and Decontamination Zones must wear all appropriate personnel protective devices before entering the contaminated zones. Visitors will be required to sign in and out of the job site. If respiratory protective devices are necessary, visitors who wish to enter the Contaminated Zone must produce evidence that they have had a complete physical examination, respiratory protection training, including respiratory fitting, within the past 12 months.

- Visitor access to the Contaminated Zone must be cleared by the Field Team Leader or Project Manager.

8.0 DECONTAMINATION

8.1 PERSONNEL DECONTAMINATION

Personnel-protective equipment worn on site will not be worn off site without prior decontamination. All site personnel shall utilize a step-off decontamination sequence whenever they leave the site. If site conditions require that the level of protection be upgraded, the decontamination procedure will be modified by the HS&S Department.

The decontamination station at any of the sites will include suitable receptacles for the disposal of used protective clothing. Polyethylene bags may be used for this purpose provided they are sealed daily. Contaminated protective clothing will not be removed from the decontamination area until it has been properly bagged.

Adequate facilities for washing hands will be available at the decontamination station. Tubes of hand cream, rinse water, and clean rags for drying are sufficient. Hands will be washed prior to eating or drinking and before leaving the site at the end of each shift. Personnel will shower at the first opportunity after completion of daily site activity.

All breaks must be taken in a clean area. Employees shall wash their hands and faces with soap and water before proceeding to the designated break area. Employees are encouraged to drink plenty of fluids during breaks, i.e.: water or Gatorade for electrolyte replacement.

8.1.1 DECONTAMINATION FOR LEVEL B PROTECTION

STATION 1:	Segregated equipment drop	1. Deposit equipment used on site (tools, sampling devices and containers, monitoring instruments). Segregation at the drop reduces the probability of cross-contamination.
STATION 2:	Boot cover and glove wash	2. Scrub outer boot covers and gloves with decon solution.
STATION 3:	Boot cover and glove rinse	3. Rinse off decon solution from Station 2 using copious amounts of water.
STATION 4:	Tape removal	4. Remove tape around boots and gloves and deposit in container with plastic liner.
STATION 5:	Boot cover removal container	5. Remove boot cover and deposit in container with plastic liner.
STATION 6:	Outer glove removal liner	6. Remove outer gloves and deposit in container with plastic liner.

STATION 7: Suit and safety boot wash	7. Wash chemical-resistant splash suit, SCBA, safety boots. Scrub with long-handled brush and decon solution. Wrap regulator in plastic to keep out of water. Wash backpack assembly with sponges/cloths.
STATION 8: Suit, SCBA, boot and glove	8. Rinse off decon solution using copious amounts of water.
STATION 9: Tank charge	9. If worker leaves Exclusion Zone to change air tank, this is the last step in the decontamination procedure. Worker's air tank is exchanged, new outer gloves and boot covers are donned, and joints are taped. Worker returns to duty.
STATION 10: Safety boot removal	10. Remove safety boots and deposit in container with plastic liner.
STATION 11: SCBA Backpack removal	11. While still wearing face piece, remove backpack and place on table. Disconnect hose from regulator valve.
STATION 12: Splash suit removal	12. With assistance from a helper, remove splash suit. Deposit in container with plastic liner.
STATION 13: Inner glove wash	13. Wash inner gloves with water.
STATION 14: Inner glove rinse	14. Rinse inner glove with water.
STATION 15: Face piece removal	15. Remove face piece. Deposit in container with plastic liner. Avoid touching face with fingers.
STATION 16: Inner glove removal	16. Remove inner gloves and deposit in container with plastic liner.
STATION 17: Inner clothing removal	17. Remove inner clothing. Place in container with plastic liner. Do not wear inner clothing off site.
STATION 18: Field wash	18. Wash hands and face before leaving site.
STATION 19: Redress	19. Put on clean clothes.

8.1.2 DECONTAMINATION FOR LEVEL C PROTECTION

STATION 1:	Segregated equipment drop	1. Deposit equipment used on site (tools, sampling devices and containers, monitoring instruments, radios, clipboards, etc.) on plastic drop cloths. Segregation at the drop reduces the probability of cross-contamination.
STATION 2:	Boot cover and glove wash	2. Scrub outer boot covers and gloves with decon solution.
STATION 3:	Boot cover and glove rinse.	3. Rinse off decon solution from Station 2 using copious amounts of water.
STATION 4:	Tape removal	4. Remove tape around boots and gloves and deposit in container with plastic liner.
STATION 5:	Boot cover removal container	5. Remove boot cover and deposit in container with plastic liner.
STATION 6:	Outer glove removal	6. Remove outer gloves and deposit in container with plastic liner.
STATION 7:	Suit and safety boot wash	7. Wash chemical-resistant splash suit, SCBA, gloves, and safety boots. Scrub with long-handled brush and decon solution. Wrap regulator in plastic to keep out of water. Wash backpack assembly with sponges/cloths.
STATION 8:	Suit, SCBA, boot and glove	8. Rinse off decon solution using rinse copious amounts of water.
STATION 9:	Tank charge	9. If worker leaves Exclusion Zone to change air tank, this is the last step in the decontamination procedure. Worker's air tank is exchanged, new outer gloves and boot covers are donned, and joints are taped. Worker returns to duty.
STATION 10:	Safety boot removal	10. Remove safety boots and deposit in container with plastic liner.

8.1.2 DECONTAMINATION FOR LEVEL C PROTECTION - CONTINUED

STATION 11: SCBA backpack removal	11. While still wearing face piece, remove backpack and place on table. Disconnect hose from regulator valve.
STATION 12: Splash suit removal	12. With assistance from a helper, remove splash suit. Deposit in container with plastic liner.
STATION 13: Inner glove wash	13. Wash inner glove with decon solution.
STATION 14: Inner glove rinse	14. Rinse inner glove with water.
STATION 15: Face piece removal	15. Remove face piece. Deposit in container with plastic liner. Avoid touching face with fingers.
STATION 16: Inner glove removal	16. Remove inner gloves and deposit in container with plastic liner.
STATION 17: Inner clothing removal	17. Remove inner clothing. Place in container with plastic liner. Do not wear inner clothing off site.
STATION 18: Field wash	18. Wash hands and face before leaving the site.

8.1.3 EQUIPMENT LIST FOR DECONTAMINATION LEVEL B AND C

STATION 1:
a. (4) 55-gal plastic containers
b. Plastic liners
c. Plastic drop clothes

STATION 2:
a. #10 Wash tub
b. Decon solution/detergent water
c. 2-3 long-handled, soft-bristled scrub brushes

STATION 3:
a. #10 Wash tub
b. High-pressure spray unit
c. 2-3 long-handled, soft bristled scrub brushes

STATION 4:
a. (1) 55-gal plastic container
b. Plastic liners

STATION 5:
a. (1) 55-gal plastic container
b. Plastic liners

STATION 6:
a. (1) 55-gal plastic container
b. Plastic liners

STATION 7:
a. #10 Wash tub
b. Decon solution/ detergent water
c. 2-3 long-handled, soft-bristled scrub brushes

STATION 8:
a. #10 Wash tub
b. High-pressure spray unit
c. 2-3 long-handled, soft-bristled scrub brushes

STATION 9:
a. Air tanks/canisters
b. Tape
c. Gloves, shoe covers

STATION 10:
a. (1) 55-gal plastic container
b. Plastic liners
c. Bench or stool
d. Boot jack

STATION 11:
a. Rack
b. Drop clothes
c. Bench or stool

STATION 12:
a. (1) 55-gal plastic container

STATION 13:
a. #10 Wash tub
b. Decon solution
c. Table

STATION 14:
a. #10 Wash tub
b. Water
c. Table

STATION 15:
a. (1) 55-gal plastic container
b. Plastic liners

STATION 16:
a. (1) 55-gal plastic container
b. Plastic liners

STATION 17:
a. (1) 55-gal plastic container
b. Plastic liners

STATION 18:
a. Basin, water, soap, towels
b. Table

STATION 19:
a. Dressing trailer
b. Tables, chairs, clothes
c. Lockers

8.2 EQUIPMENT DECONTAMINATION

Before leaving the site, potentially contaminated equipment will be decontaminated or containerized. Verification that equipment leaving the site has been adequately decontaminated is the responsibility of the Project Manager.

Potentially contaminated disposal materials (Tyvek coveralls, gloves, etc.) will be placed in plastic bags, drummed on site, and disposed of by Air Force personnel (following a review of subsurface/groundwater data).

Results of the sample data for soils and groundwater will be applicable to the disposal of protective clothing. After receipt and verification, analytical data from the site investigation will be furnished to the Fort Worth Air Force Plant 4 Civil Engineering contact to determine proper disposal of these materials.

8.3 INJURY/ILLNESS DECONTAMINATION

Based on the available information, the type of action required should be decided and the necessary steps implemented. Some actions may be done concurrently. No one should attempt emergency response or rescue until backup personnel and evacuation routes have been identified. Rescue/response may include these actions:

- **Enforcing the Buddy System:** Allow no one to enter a contamination, confined space, or hazardous area without a partner. At all times, personnel in the Exclusion Zone should be in the line-of-sight or communications contact with the supervisor or designee.

- **Survey Casualties:**

  1. Locate all victims and assess their condition.
  2. Determine resources needed for stabilization and transport.

- **Assessment:** Assess existing and potential hazards to site personnel and to the off-site population. Determine:

  1. How to respond.
  2. The need for evacuation of site personnel and off-site population.
  3. The resources needed for evacuation and response.

- **Allocate Resources:** Allocate on-site personnel and equipment to rescue and incident response operations.

- **Request Aid:** Contact the required off-site/on-site personnel or facilities, such as the ambulance, fire department, and police.

- **Control:** Bring the hazardous situation under complete or temporary control; use measures to prevent the spread of the emergency.

- **Extricate:** Remove or assist victims from the area.

- **Decontaminate:** Use established procedures to decontaminate uninjured personnel in the decontamination area. If the emergency makes this area unsafe, establish a new decontamination area at an appropriate distance. Decontaminate victims before or after stabilization as their medical condition indicates (Decision Aid For Emergency Decontamination, Figure 8.1).

- **Stabilize:** Administer any medical procedures that are necessary before the victims can be moved. Stabilize or permanently fix the hazardous condition. Attend to what caused the emergency and anything damaged or endangered by the emergency (e.g., drums, tanks).

- **Transport:** Take measures to minimize chemical contamination of the transport vehicle and ambulance and hospital personnel.

- **Evacuate:**

  1. Move site personnel to a safe distance upwind of the incident.

  2. Monitor the incident for significant changes. The hazards may diminish, permitting personnel to re-enter the site, or the hazards may increase and require public evacuation.

  3. The coordinator for hazardous chemical emergencies shall inform public safety personnel when there is a potential or actual need to evacuate the off-site population.

8.4 TESTING FOR DECONTAMINATION EFFECTIVENESS

After the decontamination procedure in Section 8.1 is followed, a Health and Safety (HS&S) representative will conduct a visual inspection of personnel prior to leaving a site. He/she will look for discolorations, stains, corrosive effects, visible dirt or alterations in clothing fabric and also note any visible contamination of the skin. If any evidence of residual contamination is noted, wipe testing will be performed on both inner and outer clothing and the skin. These wipe samples will be sent to the laboratory and analyzed for the suspected contaminants at the site. In the absence of visual evidence of contamination, one set of wipe samples will be collected from a randomly selected worker at each hazardous waste site which will include a wipe from the outer clothing surface, inner clothing surface, and the skin. The samples will be sent to the laboratory for analysis of suspected contaminants at the site.

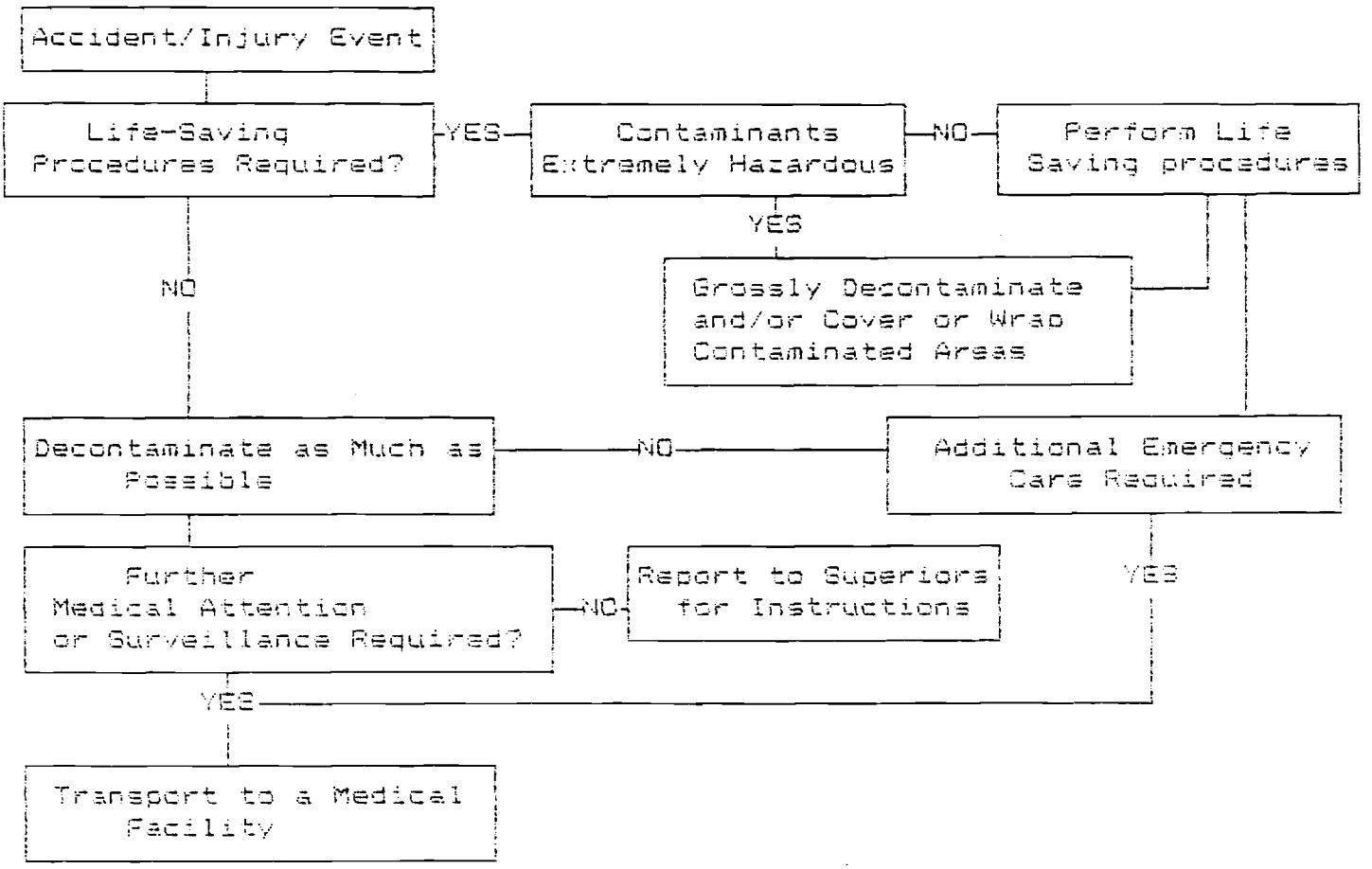


Figure 8-1 Decision Aid for Emergency Decontamination

9.0 GENERAL WORK PRACTICES

9.1 SAFETY

- Each employee shall acknowledge in writing the receipt of and understanding of this Health and Safety Plan. This documentation will be maintained on site by the site HS&S representative.

- At least one copy of this plan will be available at each work location.

- Legible and understandable precautionary labels will be affixed prominently to containers of contaminated scrap, waste, debris, and clothing. Each label will include the contractor's name, contract title, and contract number.

- Removal of contaminated soil from protective clothing or equipment by blowing, shaking, or any other means which will disperse contaminants into the air is prohibited.

- No food or beverages shall be present or consumed in the contaminated areas. No tobacco products shall be present or used, and cosmetics shall not be applied in the contaminated areas.

- Transportation and disposal of contaminated materials shall comply with all applicable local, state, and federal regulations. These items will be addressed by the transporter and disposer.

- Containers shall be moved only with the proper equipment and shall be secured to prevent dropping or loss of control during transport.

- Emergency equipment shall be located in the clean area in readily accessible locations.

- All trenching, shoring, and excavation work must comply with all federal OSHA rules.

- During the operation, all employees shall be required to wash their hands and faces before eating, drinking, smoking, or applying cosmetics.

- All personnel shall be required to field wash as a minimum at the end of their shift before leaving the job site. Each employee shall wash their hands and face during breaks.

- All personnel shall avoid contact with potentially contaminated substances. Walking through puddles or mud, kneeling on the ground, etc. should be avoided whenever possible.

- All electrical equipment shall comply with the National Electric Code (1990 Edition).

- Excessive equipment shall not be placed on potentially contaminated surfaces.

- Monitoring equipment shall not be placed on potentially contaminated surfaces.

- All personnel on site shall use the buddy system. Field personnel must watch each other for signs of toxic exposure. Indications of adverse effects include but are not limited to:

  - Changes in complexion and skin discoloration
  - Changes in coordination
  - Changes in demeanor
  - Excessive salivation and pupillary response
  - Changes in speech pattern

- Field personnel shall be cautioned to inform each other of non-visual effects of toxic exposure such as:

  - Headaches
  - Dizziness
  - Nausea
  - Blurred vision
  - Cramps
  - Irritations of eyes, skin, or respiratory tract

- Prompt remedial action shall be taken whenever an inadvertent release of a hazardous material occurs.

- Provision will be made for cleaning gross contamination from boots and suits in the Contamination Zone.

- Appropriate action to provide secure footing will be taken at all locations where personnel will be working.

- Site drilling, coring and augering will comply with the following rules:

  - Before drilling or excavation work, the existence and location of underground pipes, electrical equipment, etc. must be determined. This procedure will be done, if possible, by contacting the appropriate utility company and General Dynamics Safety Department to mark the location of the lines. The UNC locator will review all outside utility locators work and utility maps for verification of underground utilities. The UNC locator will verify all locates with appropriate equipment, and verify that each individual location is clear of all underground utilities.

- Operations must be suspended and corrective action taken if the ambient airborne concentration of flammable vapors exceeds 10 percent of the LEL when drilling. A combustible gas indicator shall be available to make this determination.

- Combustible gas readings of the general work area will be made if necessary.

9.2 HEAT STRESS

Heat stress may be of concern depending upon the ambient temperature. The heat stress of employees on site will be monitored by the Wet Bulb Globe Temperature Index (WBGT) technique. This method will require the use of a heat stress monitoring device, such as the Wibget Heat Stress Monitor (Reuter Stokes). Area monitoring will be conducted.

The WBGT will be compared to the TLVs outlined in the ACGIH TLVs manual and a work/rest regimen established, as necessary, according to the WBGT obtained. Note that 3 to 5°C must be added to the WBGT due to the wearing of impermeable protective clothing. Once the initial work/rest regimen has been established, physiological monitoring (heart rate) will be conducted by the HS&S Coordinator or their designee to adjust the work/rest regimen.

One or more of the following control measures can be used to help control heat stress:

- Adequate liquids will be provided to replace lost body fluids. Employees must replace water and salt lost from sweating. Employees must be encouraged to drink more than the amount required to satisfy thirst. Thirst satisfaction is not an accurate indicator of adequate salt and fluid replacement.

- Replacement fluids can be a 0.1 percent salt water solution, commercial mixes such as Gatorade or Quick Kick, or a combination of these, and fresh water. Salt tablets will not be used.

- A work regimen that will provide adequate rest periods for cooling down must be established. This may require additional shifts for workers or earlier/later work schedules.

- Cooling devices such as vortex tubes or cooling vests can be worn beneath protective garments.

- All breaks are to be taken in a shaded rest area.

- Employees shall remove impermeable protective garments during rest periods.

- Employees shall not be assigned other tasks during rest periods.

- All employees shall be informed of the importance of adequate rest, acclimatization, and proper diet in the prevention of heat stress.

9.2.1 Signs and Symptoms of Heat Stress

- Heat rash may result from continuous exposure to heat or humid air.

- Heat cramps are caused by heavy sweating with inadequate electrolyte replacement. Signs and symptoms include:

  - Muscle spasms
  - Pain in the hands, feet, and abdomen

- Heat exhaustion occurs from increased stress on various body organs including inadequate blood circulation due to cardiovascular insufficiency or dehydration. Signs and symptoms include:

  - Pale, cool, moist skin
  - Heavy sweating
  - Dizziness
  - Nausea
  - Fainting

- Heat stroke is the most serious form of heat stress. Temperature regulation fails and the body temperature rises to critical levels. Immediate action must be taken to cool the body before serious injury and death occur. Competent medical help must be obtained immediately. Signs and symptoms are:

  - Red, hot, usually dry skin
  - Lack of or reduced perspiration
  - Nausea
  - Dizziness and confusion
  - Strong, rapid pulse
  - Coma

9.3 CONSTRUCTION SAFETY

All construction work associated with this project will comply with 29 CFR 1926. All proposed activities will be reviewed with the HS&S Department prior to initiation.

9.4 SUBCONTRACTOR SAFETY

Any subcontractors used during this project will be required to adhere to the applicable requirements of this Health and Safety Plan.

10.0 EXCAVATION SAFETY

All excavation activities shall be conducted in compliance with Federal OSHA regulations set forth in 29 CFR 1926, Subpart P. As a minimum, the following rules shall be strictly observed:

- Excavation into which employees may be required to descend shall be sloped (1-to-1), benched, or shored if they are greater than 5 feet in depth for average soils.
- Excavation spoils shall be a minimum of 2 feet from the edge of the excavation.
- No employee will work adjacent to any excavation until a reasonable examination of same has been made to determine that no conditions exist exposing them to injury from moving around.
- Trees, boulders, and other surface encumbrances located so as to create a hazard to employees involved in excavation or in the vicinity thereof, at any time during operations, will be removed or made safe before excavating is begun.
- At any time entry into an excavation is required, a standby person shall be available.
- Excavation will be inspected by an UNC Geotech-qualified person after every rainstorm or other hazard-increasing occurrence, and the protection against slides and cave-ins will be increased if necessary.
- Appropriate access methods, such as ladders, will be used to enter the excavation. Under no circumstances will an employee be permitted to ride backhoe buckets or other similar equipment to enter or exit the excavation.

11.0 EMERGENCY PROCEDURES

11.1 PURPOSE

- The purpose of the emergency procedures is to minimize the impact of any emergency or unusual occurrence upon the health and safety of personnel performing activities.
- These procedures also provide the preparedness and identify the manpower and equipment resources available to cope with industrial and natural emergencies.
- Specific responses to accidents, injuries, or natural emergencies are contained in this section. More detailed information is contained in the General Dynamics Emergency Plan.

- The periodic rehearsals of the procedures contained in this section shall be documented as part of the overall training program for site operations.

- The responders and key people affected by the use of this procedure shall provide written comments and critique of its effectiveness. This information shall be used by the GD Project Manager to evaluate and modify this section.

11.2 KEY PERSONNEL

- The key personnel at the work locations are those with authority and training to respond to accidents and unusual conditions. Those personnel include the:

  a) Project Manager

  b) Health and Safety Technician

  c) Team Leader

- Local Responders

a) EMT / AMBULANCE	(817) 335-4357	White Settlement, Tx
	(817) 777-3081	General Dynamics
b) FIRE	(817) 246-1761	White Settlement, Tx
	(817) 777-3473	General Dynamics
c) POLICE	(817) 246-7070	White Settlement, Tx
	(817) 777-2567	General Dynamics

(note: White Settlement Police and Fire will respond to a 911 call)

d) CONSULTING PHYSICIAN	(714) 259-0620	Joe Fedoruk

- The key personnel shall respond to emergencies according to the specific procedures found in the HASP and the General Dynamics emergency plan.

- Succession of Authority

- The succession of authority at the site until relieved by the on-scene Emergency Director is as follows:

  a) Project Manager or their designee

  b) Field Team Leader

  c) Health and Safety Technician

  d) General Dynamics Emergency Response Personnel

11.3 EQUIPMENT

In an emergency, equipment will be necessary to communicate with local responders, rescue and treat victims, to protect response personnel, and to mitigate hazardous conditions on site.

11.3.1 COMMUNICATION

Communications at General Dynamics AFP 4 includes telephones, portable radios and voice communication.

- Telephone service shall be provided at the worksite. Communications shall use the Dedicated Emergency Management Notification Telephone System.

- Personnel must have a radio and or telephone per team that may be used to communicate emergency information. These radios are most likely to be used to make the initial notification to the key personnel who shall notify the local emergency responders by telephone.

- Alarms or signal for site evacuation shall be required. An air horn shall be used to signal the appropriate alarm.

11.3.2 Heavy Equipment

Heavy equipment used for day-to-day operations may be required to perform double duty during an emergency. This equipment should be maintained in running condition and with fuel level greater than one-forth full.

Equipment repairs should be conducted when the defect is detected so that the equipment is always available. Park similar pieces of equipment in separate locations to help prevent losing both pieces to the same event.

11.3.3 Personal Protective Equipment

To meet the needs of any accident, personal protective equipment must be kept in reserve and maintained for emergency use. This equipment may be from the same stock that is used for daily operations provided the portion of stock reserved for emergency use is not depleted.

The next level of protection from that used for routine operations must be available. For example, if Level C is the maximum routine level of protection used, then Level B protective equipment must be on hand for emergency use. This may include maintaining SCBA units on a site using only filter respirators.

11.3.4 Other Equipment

Each site must also maintain first aid and decontamination equipment necessary to treat injured persons. The minimum equipment on hand must include:

b) Fire extinguisher and blanket

c) Pressurized eye wash and quick drench shower.

d) 10 gallons of water, in portable containers

e) Decontamination solutions appropriate for the on-site hazards.

f) Reference books containing basic first aid procedures.

g) A wire basket use to transport a victim over rough terrain.

h) Containers to hold contaminated materials.

i) Air Horn.

The Project Manager or their designee is responsible for the correct placement of the emergency equipment on the site.

11.4 RESCUE TEAM

A rescue team shall be required when work is performed in areas that are immediately dangerous to life or health (IDLH). The rescue team shall standby near the Exclusion Zone ready to rescue any workers whose health and safety is endangered. This will require the rescue team to be fully dressed for the conditions in the Exclusion Zone.

11.5 ALARMS

Figure 11-1 shows evacuation routes from area and safe areas of refuge. Figure 11-2 shows the location of the nearest hospital. In the case of an emergency where alarms are sounded, these location maps will be used as the basis for worker response.

11.5.1 Evacuations

Evacuations shall be signaled by two 5-second blasts of an air horn every 30 seconds, and shall continue for 3 minutes.

11.5.2 Take Cover

The alarm for persons to take the nearest cover is 3 successive blasts of an air horn, 1 second each, about 1 second apart. The series of air blasts shall continue at 20-second intervals for 3 minutes.

11.5.3 All Clear

The signal for all clear is one 5-second blast on the air horn.

Employee Gates, Evacuation Routes and Shelter Areas

Gate No.

1. Main Gate Grants Lane (Auto)
2. Railroad Gate (Auto)
2A. Parking Lot 9 (Ped)
2B. Cherry Lane (Ped) (TV)
3. West Parking Lot (Ped) (TV)
3A. West Parking Lot (Ped)
3B. West Parking Lot Bldg 15 North Entrance (Ped)
3C. West Parking Lot Bldg 15 South Entrance (Ped)
4. Parking Lot 1 (Ped) (TV)
5. Parking Lot 1 & 2 (Ped) (TV)
6. South Entry Bldg 200 (Auto & Ped)
7. Lobby Bldg 200 (Ped)
8. North Entrance Bldg 200 — Cafeteria Gate (Auto & Ped)

Gate No.

9. Northwest Corner Lot 3 (Ped) (TV)
9A. Northeast Corner Lot 3 (Ped) (TV)
10. Lot 3 to Hanger (Auto & Ped)
11. Flight Line (Ped) (TV)
12. Flight Line (Ped) (TV)
15. Lot 1 From Clifford St (Auto)
16. West Lot (Bond) (Ped) (TV)
17. Lot 4 (Ped) (TV)
17A. Northwest Corner Lot 4 PMII Complex (Auto & Ped)
17B. Parking Lot 8 (Ped) (TV)
17C. Southeast Corner Lot 8 (TV)
18. Employment Office Bldg 200 (Ped)
20. Parking Lot 4 — Contractors Only (Auto)
20A. Parking Lot 10 (Ped) (TV)

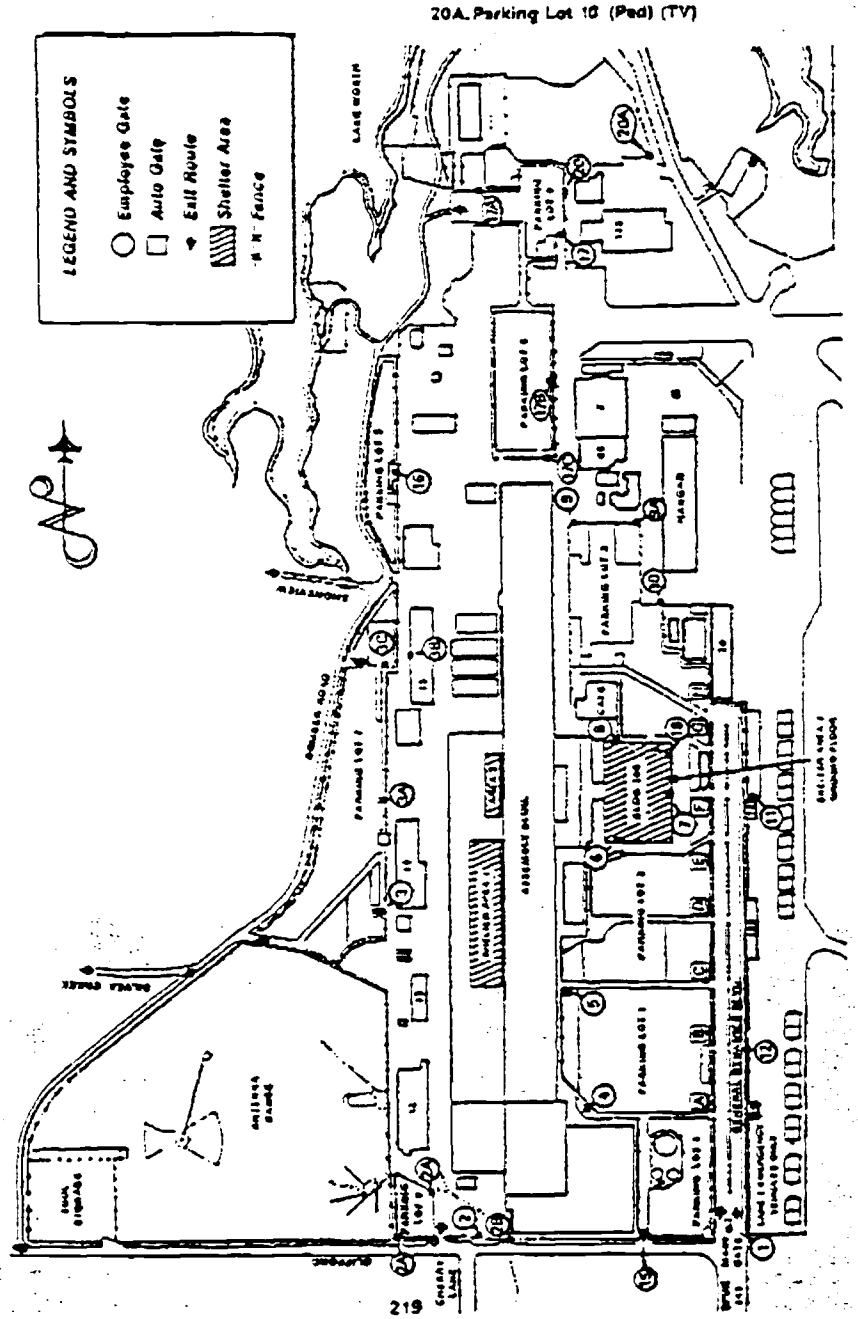


Figure 11-1. Evacuation Routes and Safe Areas

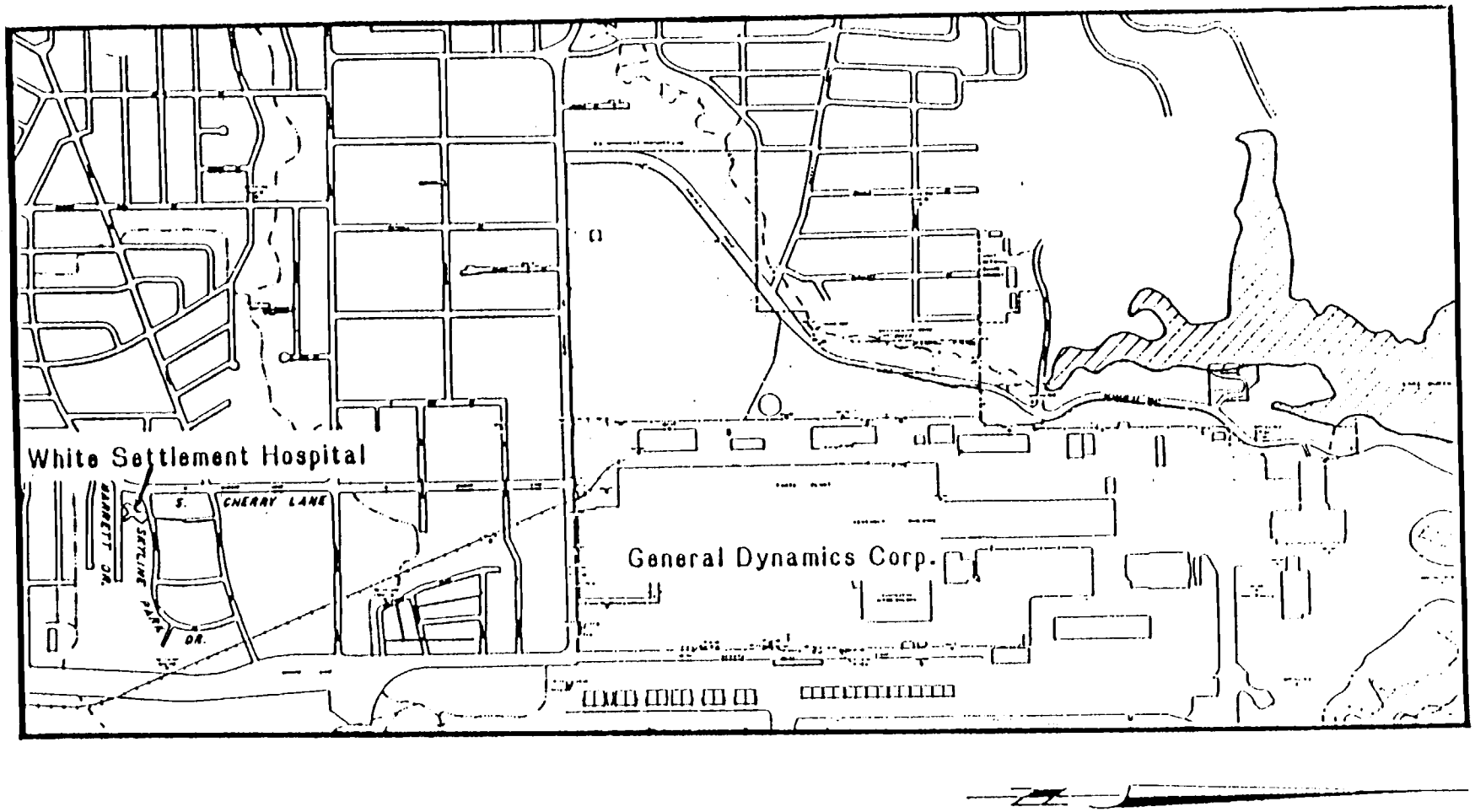


Figure 11-2. Location Map of Nearest Hospital

11.6 NOTIFICATION AND REPORTING

11.6.1 Initial Notification

The employee discovering the emergency is responsible for immediately reporting the situation by the most expeditious means available. The Emergency Decision Tree is shown in Figure 11-2.

11.7 STANDARD EMERGENCY RESPONSE PROCEDURES

11.7.1 Worker Injury

If an employee working in a contaminated area is physically injured, Red Cross First-Aid procedures shall be followed. The types of injuries are varied. This procedure does not specify the method of treatment. This is the function of the first aid and CPR training. This action guide applies to:

a) Fractures, Dislocations, Sprains and Strains

b) Cuts, Scrapes and Bites

c) Heat Illnesses

d) Heart attacks and strokes

e) Seizures

f) Diabetic Emergencies

g) Poisoning

h) Burns, including fire and chemical

The following steps must be taken in the event of an injured employee:

a) Call for medical assistance - General Dynamics Ambulance dial 777-3473, off-site medical facility ambulance (Medstar) dial 335-4357.

b) No Immediate Danger - If the area presents no immediate danger, you should follow emergency action principles and care for the victim at the scene. Your task will be to prevent further injury to the victim. Moving the victim could make the injuries worse. If contamination does not present an immediate danger, the victim should not be moved. An evaluation may be made when emergency medical help arrives.

c) Immediate Danger - If the area presents an immediate danger, that is immediately dangerous to life or health (IDLH), then the victim should be moved. Examples include fire, lack of oxygen, serious traffic hazard, risk of explosion, collapsing material or electrical hazards. Move victims according to the procedures

specified by the American Red Cross. Persons trained and qualified in first aid should direct those not trained.

d) Treating and Decontamination - When an injured person is contaminated, a decision will be required to give priority to the first aid actions or decontamination. The decision tree, Figure 8.1, on page 17 of this HASP, should be used to help make this decision.

e) Decontamination - If decontamination is necessary, follow the procedures contained in this plan. If an injured person is contaminated and is transported to a medical facility, notify the Medical Department to advise the medical personnel.

11.7.2 Chemical Burns

Burns occur when chemicals contact the eyes and/or skin of workers. If this occurs, perform the following:

CAUTION:

THE FIRST TWO STEPS BELOW SHOULD BE PERFORMED QUICKLY

a) Call for medical assistance - The ambulance number is 777-3081 or use the radio for assistance.

b) Flush the Area - Flush the area immediately with large amounts of water. Continue for 15 to 30 minutes. For chemicals in the eyes, lift the lower and upper lids and flush the eyes.

c) Remove any affected clothing or jewelry.

d) Treat for shock.

e) Consult the first aid manual on additional care.

11.7.3 Fire

11.7.3.1 Localized Fire

a) If a localized fire breaks out, the appropriate fire extinguishers shall be used to bring the occurrence under control. If necessary and feasible, a fire blanket, soil, or other inert materials shall be placed on the burning area to extinguish the flames and to minimize the potential for spreading.

b) Notify the General Dynamics Fire Department at 777-3473.

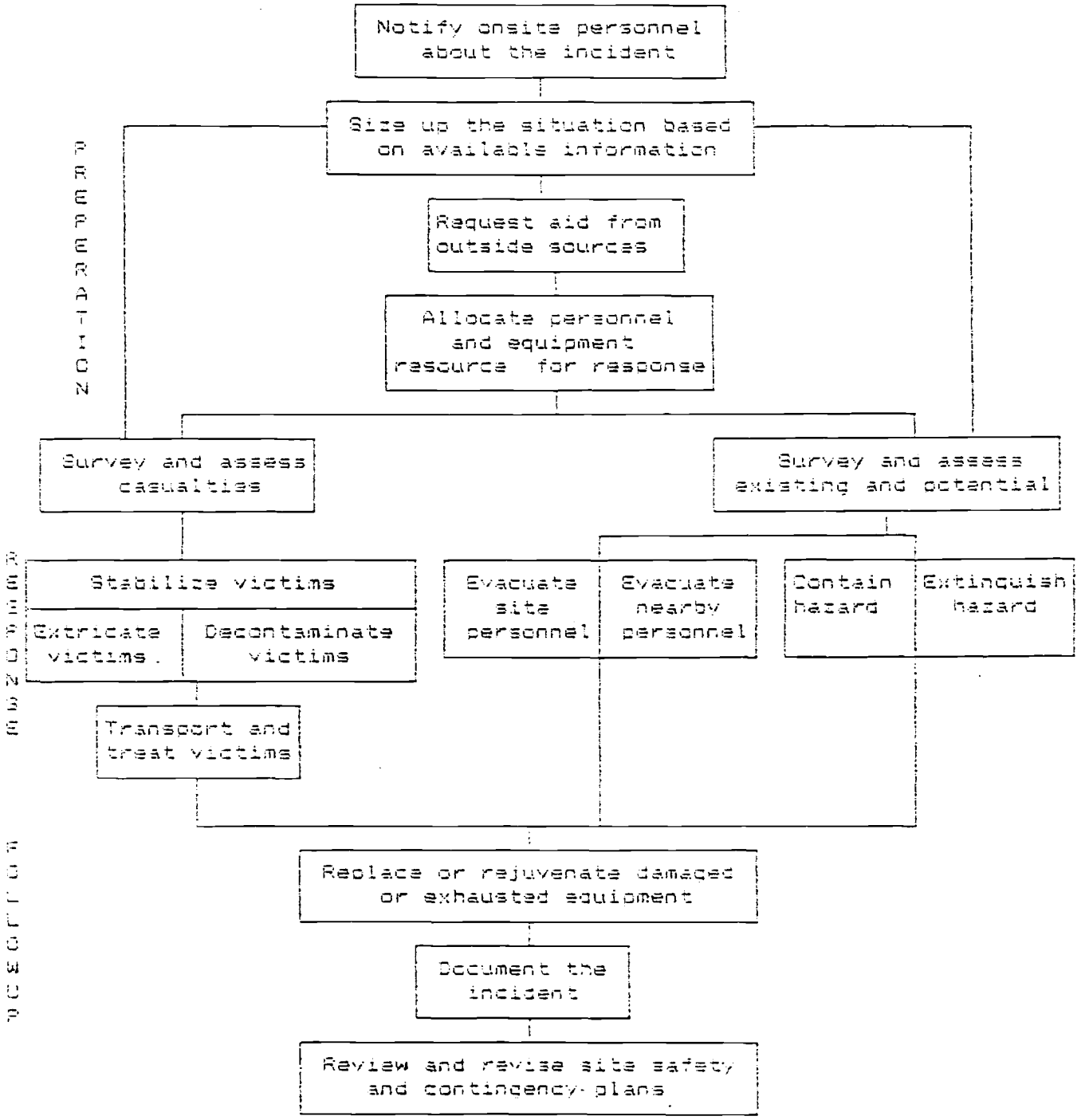


Figure 11-3 Emergency Decision Tree

11.7.3.2 Uncontrolled Fires

a) If an uncontrolled fire develops, call the White Settlement Fire Department at 246-1761 or 911.

b) Immediately evacuate the area and stand clear.

c) If the fire releases potentially toxic gases, all persons in the immediate vicinity must be evacuated. Use the air horn and sound the alarm.

d) Evacuate upwind to avoid chemical exposure to the designated assembly area. Supervisors are to account for all of their personnel.

e) Inform the fire department of the toxic gases, if applicable.

11.7.4 Spills

Handling procedures have been developed to limit potential problems with materials spillage. In the event of a spill at the site, the area will be isolated from traffic by the Field Team Leader of Project Manager. Spilled solids will be removed and loaded into appropriate containers for subsequent placement or taken to original destination. Liquid spills will be contained with absorbent material and then the absorbent will be loaded into appropriate containers for disposal. The General Dynamics Fire Department will be notified of any spill. The AFP 4 "Spills Contingency Plan for Control of Spills and Hazardous Materials " shall be followed in the event of a significant spill.

11.7.5 Natural Disasters

Natural disasters may occur at Air Force Plant 4 due to weather. These include lightning, high winds, and although unlikely, a tornado.

11.7.5.1 Lightning

Persons should not work in open areas, near trees or other equipment outside during lightning storms. Stop work until the storm passes. If possible, clear the site until the storm passes. If there is insufficient time, sound the "take cover" horn, which signifies for persons to enter buildings or automobiles.

11.7.5.2 High Winds

If high winds are forecast, including tornadoes, then the site should be cleared before the winds become hazardous. Workers should be instructed to go to an appropriate shelter. If a rise in winds is sudden, use the "take cover" or "evacuate" horn as appropriate.

11.7.6 Account of Workers

If an evacuation is called, an account of all persons should be made before leaving the site. If a take cover is called, an account should be made for personnel after the all clear.

APPENDIX A. DESCRIPTION OF ACTIVITIES

APPENDIX A - DESCRIPTION OF ACTIVITIES

Field investigation activities proposed for PA/SI and RI/FS sites at AFP 4 are listed below and are summarized in Table 2. Detailed descriptions of activity locations and techniques to be used are presented in the Sampling and Analysis Plan (Volume II).

Assembly Building/Parts Plant

- Soil gas survey at a depth of four feet spaced every 200 feet around entire building perimeter (approximately 75 locations). In areas of positive results for VOCs, additional soil gas samples will be collected to better define the lateral extent of contamination.

- On the basis of the soil gas survey, perimeter locations which had elevated VOCs will be investigated by soil borings and soil samples from the surface to the top of the water table. Estimated number of borings is 25 with an estimated 100 soil samples from the borings. Samples will be analyzed for VOCs, semi-VOCs, total petroleum hydrocarbons, and metals.

- On the basis of the soil gas and soil sample results, specific sites will be targeted as potential source areas within the Assembly/Parts Plant building. Select borings will be made within the building at locations that will yield the desired information but will not have a significant impact on production activities. An estimated 10 borings will be required. Specific locations will be determined after the other surveys are completed. The borings within the building may be completed as groundwater monitoring wells to provide groundwater flow data and groundwater quality data beneath the facility. These wells will be flush mounted.

- To determine extent of off-site migration near the southeast corner of the Assembly Building/Parts Plant facility, from two to four additional upper zone monitoring wells will be completed in an area southeast of Clifford Avenue. Groundwater samples will be analyzed for VOCs, semi-VOCs, metals, total petroleum hydrocarbons, and oil and grease.

Underground Storage Tanks (removed)

- Soil borings will be placed around the perimeter of each of six former underground storage tank locations which, based on previous soil sample results, still contained contaminants in the soil after excavation and backfilling. A total of four borings will initially be required, one adjacent to each side of the former excavation to determine the lateral and vertical extent of contamination. If contamination above MCLs is present in any of the borings, (an) additional boring(s) will be made 50 feet outward from the previous boring until contamination no longer is present in concentrations exceeding MCLs. Borings will extend from the surface to the top of the water table. A maximum of 48 borings are estimated for the six locations. Samples will be collected from 5-foot intervals and analyzed for VOCs, semi-VOCs, and total petroleum hydrocarbons. Ten

percent of the samples will be analyzed for metals.

- If contamination in the soils is found to extend to the water table at any of the former tank locations, one downgradient monitoring well will be installed to monitor upper zone groundwater quality. If no upgradient wells currently exist in the vicinity of a particular site, then an additional well may be required to establish the effect of the site on groundwater quality. If upgradient wells already exist, analytical results will be compared with the results from the downgradient well. A maximum of six downgradient wells will be installed and sampled, one for each removed tank. Groundwater samples will be analyzed for VOCs, semi-VOCs, and total petroleum hydrocarbons.

- If no contamination above MCLs is found from the soil sampling, a "No Further Action" decision paper will be prepared and submitted for regulatory review and concurrence. If contamination is found to be present, the data will be evaluated to determine if additional RI investigations are required.

Landfill No. 1

- A grid will be established across an area of approximately 1000 x 500 feet which encompasses the entire Landfill 1 (West Parking Lot) site. The locations will be marked with paint on the asphalt surface, using a grid spacing of 100 feet. At 50 percent of the grid points, a soil boring will be drilled and composite soil samples will be collected from 5 foot intervals from the surface to the water table. This will result in approximately 25 borings and 75 soil samples which will be analyzed for VOCs, semi-VOCs, oil and grease, and metals. These borings and soil sample analyses will be used to help define the lateral and vertical extent of contamination at Landfill 1.

- From the results of the initial sampling, an evaluation will be made as to whether additional data are required to better define areas of contamination. The remaining grid points previously established will be used as necessary to fill in data gaps.

- Slug-withdrawal tests will be performed on existing monitoring wells that were properly completed and not previously tested. Aquifer tests may also be repeated on monitoring wells HM-10, F-216, and F-217 if the results of previous tests appear inconsistent. The combined results will be used to characterize the hydraulic parameters of the upper zone at Landfill 1.

- Contaminant transport modeling will be performed using new and existing hydrologic data and water quality data to determine if the present french drain system is adequate to intercept contaminants migrating from the Landfill towards Meandering Road Creek.

Landfill No. 3

- A grid will be established on 100 foot centers across Landfill 3. Soil borings will be drilled and sampled at grid points to help

define the lateral and vertical extent of contamination. The borings will be drilled from the surface to the top of the Walnut Formation and composite soil samples will be collected for each two foot interval to the top of the water table. The soil samples will be analyzed for VOCs, semi-VOCs, oil and grease, and metals.

- Selected soil borings (4-6) will be used as temporary monitoring wells for water level measurements and two rounds of groundwater sampling. The data from the temporary wells will be used to provide water quality and hydrologic data to be used in contaminant transport modeling. The samples will be analyzed for VOCs, semi-VOCs, total petroleum hydrocarbons, and metals.

- Slug-withdrawal tests will be performed on existing wells at Landfill 3 that were properly completed and not previously tested to determine hydraulic parameters of the upper zone. These data will be combined with water level and groundwater quality data for contaminant transport modeling.

- Groundwater from seeps downgradient of the landfill along Meandering Road Creek will be sampled to estimate the amount and relative concentrations of contaminants discharging from the upper zone into the Meandering Road Creek drainage. The seeps will be analyzed for VOCs, semi-VOCs, total petroleum hydrocarbons, and metals.

- Free product, where present, will be sampled using a teflon bailer and the sample will be analyzed to identify the type(s) of product present and, if possible, the relative age of the product.

- Channel soil and sediment will be sampled perpendicular to the Meandering Road Creek drainage to determine contaminant distribution from the point of upper zone discharge to the present stream channel. Approximately 10 samples spaced 10 feet apart will be collected from the surface to a depth of two feet starting immediately below the groundwater seeps extending to the creek in an area west of monitoring well F-214. These samples will be analyzed for VOCs, semi-VOCs, oil and grease, and metals.

Landfill No. 4

- Five soil borings along the base of the landfill in the Meandering Road Creek floodplain will be drilled to a depth of 10 feet and samples will be collected from 2-4, 4-6, 6-8, and 8-10 feet below the surface. The samples will be analyzed for VOCs, semi-VOCs, oil and grease, and metals.

- If no contaminants are present above background levels, a "No Further Action" decision document will be prepared and submitted to regulators for review and concurrence.

EDTA No. 2

- Four soil borings will be drilled 25 ft to the north, south, east and west of monitoring well HM-51, which is located near the approximate

center of FDTA No. 2 to determine the extent of contamination. Composite soil samples will be collected from the surface to top of the water table at two foot intervals (0-2, 2-4, 4-6). Grab samples for VOCs will taken immediately from each core prior to compositing. The samples will be analyzed for VOCs, semi-VOCs, and total petroleum hydrocarbons.

- The soil borings will be deepened to the top of the Walnut Formation following soil sampling and groundwater samples will be bailed from the borings and analyzed for VOCs, semi-VOCs, and total petroleum hydrocarbons.

- If contaminants are present in soils from the borings, up to four additional borings will be drilled outward from the contaminated borings to better define the lateral extent of contamination. Soil samples would be collected as previously described.

FDTA No. 5

- Four soil borings are needed to help define the lateral extent of soil contamination related to FDTA No. 5. The soil borings will be located 50 feet north, south, east and west of monitoring well HM-25 which is located near the reported center of the training area. Composite soil samples will be collected from 5 foot intervals from the surface to the water table estimated to be approximately 30 feet. The composite samples will be analyzed for semi-VOCs, oil and grease, and metals. The composite samples will be analyzed for semi-VOCs, oil and grease, and metals. Samples for VOCs will be grab samples collected immediately after removal and prior to compositing.

- The west and east soil borings will be drilled below the water table and will completed as monitoring wells. Groundwater samples will be taken after completion and for one additional monthly round. The samples will be analyzed for VOCs, semi-VOCs, metals, total petroleum hydrocarbons, and oil and grease. The western well will be used to determine if upgradient sources are contributing to contamination found in the existing well HM-25. The eastern well will be used to assess the contribution of FDTA No. 5 to downgradient groundwater contamination.

- Water-level measurements and slug tests will be performed on the new monitoring wells to aid in the determination of flow directions and hydraulic parameters of the upper zone at FDTA No. 5.

FDTA No. 6

- Four to six soil borings will be drilled around the perimeter of the excavated portion of FDTA No. 6. A fifth boring will be placed in the approximate center of the excavation. The perimeter borings will be drilled to the base of the upper zone and samples will be collected in 2-foot intervals (0-2, 2-4, 4-6 ft). The boring within the excavation will be drilled to the base of the upper zone and a sample will be collected from the 4-6 ft interval. All samples will be analyzed for VOCs, semi-VOCs, oil and grease and metals.

- If water is encountered in any of the soil borings, a groundwater sample will be bailed from the hole and analyzed for VOCs, semi-VOCs, and total petroleum hydrocarbons.

Chrome Pit No. 3

- One upgradient and one downgradient monitoring well will be installed to assess the contribution of contaminants to the upper zone by the Chrome Pit No. 3 versus potential upgradient sources. Samples will be collected following completion and again after one month. Groundwater samples will also be collected from existing wells. All samples will be analyzed for VOCs, semi-VOCs, metals, and cyanide.

- Water-level measurements and slug tests will be performed on new monitoring wells in the vicinity of Chrome Pit No. 3. Slug tests will also be performed on any existing wells in the area that were properly completed and not previously tested to determine flow directions and hydraulic parameters for groundwater and contaminant transport modeling.

Die Yard Chemical Pits

- Eight soil borings will be drilled around the periphery of the excavated area of the former die yard chemical pits to determine both lateral and vertical extent of contamination In addition, two borings will be drilled in the central portion of the excavated area to determine if contaminants are present below the excavated portion of the die yard pits area. For the perimeter borings, samples will be collected at 5 ft intervals. Samples for VOCs will be grab samples from each interval. The remaining samples will be composites of each 5 ft interval. The samples from the borings within the excavated area will be collected only from the 15-20 and 20-25 ft intervals. All samples will be analyzed for metals, cyanide, VOCs and semi-VOCs.

- One of the two soil borings on the east side of the die yard pits area will be completed as an upper zone monitoring well to evaluate the groundwater quality immediately downgradient of the former pits. A groundwater sample will be collected after completion and then again after one month along with samples from existing well HM-24 which is upgradient of the site. The samples will be analyzed for VOCs, semi-VOCs, metals and cyanide.

- Aquifer tests will be performed on the new well to determine the hydraulic parameters of the upper zone in the Die Yard area.

FSA No. 1

- Installation of a free product recovery system will be conducted by the operating contractor (General Dynamics, Inc.) and free product will be removed and disposed of while other RI activities are being conducted.

- A soil gas survey, based on a grid spacing of 10 feet will be conducted over the FSA No. 1 area to better define the extent of contamination (will show both soil and groundwater contamination).

- On the basis of the results of the soil gas survey, up to 10 soil borings will be drilled at grid points near the suspected outer extent of contamination. Samples will be collected from 5 ft intervals beginning with the 5-10 ft interval extending to the water table. The samples will be analyzed for VOCs, semi-VOCs, total petroleum hydrocarbons and metals.

- Five of the ten borings will be completed as upper zone groundwater monitoring wells. The location of these wells will generally correspond to the maximum limits of the zone of contamination. Groundwater samples will be collected after completion and then monthly for two more sampling rounds. The samples will be analyzed for VOCs, semi VOCs, total petroleum hydrocarbons, and total metals.

- If floating product is observed in any of the new monitoring wells, the wells will be added to the product recovery system for free product removal.

- Aquifer tests will be performed on all new monitoring wells. Results will be compared and combined with aquifer test data from existing wells at FSA No. 1. These data will be used to define the hydraulic parameters of the upper zone in the area of FSA No. 1. Water-level measurements will be taken monthly for three months on the new wells to help determine groundwater flow directions.

FSA No. 2

- A soil gas survey will be conducted as a screening tool, based on a grid with a 20 ft spacing, to help delineate the extent of fuel contamination in soils surrounding FSA No. 2.

- On the basis of the approximate extent of contamination outlined by the soil gas survey, five soil boring locations will be selected to better define the lateral and vertical extent of contamination. Soil samples will be collected from the surface to the top of the water table (estimated 15 feet) in three-foot intervals (0-3, 3-6, 6-9, etc.). Samples for VOCs will be grab samples from each interval. The remaining samples will be composites of each three-foot interval. The composite samples will be analyzed for semi-VOCs and total petroleum hydrocarbons.

- One upgradient and one downgradient monitoring well will be installed to better define the source and extent of groundwater contamination at FSA No. 2. A sample will be collected from each well after completion and again after one month and analyzed for VOCs, semi-VOCs, total petroleum hydrocarbons, and metals.

FSA No. 3

- Installation of a free product recovery system by General Dynamics, Inc. and initiation of product recovery prior to completing other RI activities.

- A soil gas survey, based on a grid spacing of 20 feet, will conducted as a screening tool across the FSA No. 3 area to help delineate the lateral extent of soil contamination.

- Based on the soil gas survey, from 5 to 10 soil borings will be drilled at grid points located on the outer margin of the zone of contamination. Soil samples will be collected at three-foot intervals from the surface to the top of the water table and analyzed for VOCs and semi-VOCs, and total petroleum hydrocarbons.

- Two additional monitoring wells will be installed to the east and two will be installed to the west of FSA No. 3. Where possible, a soil previously drilled will be completed as a monitoring well. Groundwater samples will be collected after completion and again after one month. If floating product is observed in the new monitoring wells, the wells will be added to the product recovery system.

- Aquifer tests will be performed on new monitoring wells and the results will be compared to and combined with existing aquifer test data to determine the hydraulic parameters of the upper zone at FSA No. 3. Water-level measurements will be taken prior to each round of sampling for groundwater flow data. The results will be used for groundwater and contaminant transport modeling.

Former Fuel Storage Area

- Four soil borings will be drilled 25 feet north, south, east, and west of existing monitoring well HM-8 to determine the lateral and vertical extent of contamination previously identified at that location. Soil samples will be collected from 5-foot intervals. Samples for VOCs will be grab samples from each interval. The remaining sample will be from composites of each 5-foot interval. The samples will be analyzed for semi-VOCs, total petroleum hydrocarbons, and oil and grease.

- An additional groundwater sample will be collected from monitoring well HM-14 and analyzed for nickel to confirm results of previous sampling.

Jet Engine Test Stand

- Four soil borings will be drilled around the perimeter of the jet engine test stand to better define the lateral and vertical extent of contamination. The borings will be drilled to the top of the water table and soil samples will be collected from 5-foot intervals. Samples for VOC analysis will be grab samples from each interval. Remaining samples will be composites of each interval. The samples will be analyzed for VOCs, semi-VOCs, total petroleum hydrocarbons, and oil and grease.

- One of the soil borings will be completed as a monitoring well. Groundwater samples will be collected from the new well and four existing "temporary" monitoring wells located downgradient of the jet engine test stand which were installed as part of a previous FSA No. 3 investigation. The samples will be analyzed for VOCs, semi-VOCs, TPH, and metals. The results will be compared with soil sample results to determine if contamination at the jet engine test stand may have the same source as that observed at FSA No. 3.

- Aquifer tests will be performed on the new well and existing wells that were properly completed.

Wastewater Collection Basins

- One soil boring immediately downgradient (east) of the chemical process building's wastewater collection basins and 25 feet north of monitoring well HM-47 will be drilled to the top of the water table. Soil samples will be collected from 5-foot intervals from the surface to approximately 30 feet. Samples will be analyzed for VOCs, semi-VOCs, and metals. The sampling will help determine if leakage has occurred from the basins to the adjacent soils.

- The soil boring will be deepened following soil sampling and completed as an upper zone monitoring well. Groundwater will be collected after completion and development and then again after one month. The samples will be analyzed for VOCs, semi-VOCs, and metals. The results will compared with results of groundwater samples from upgradient monitoring wells and well HM-47 to determine if the wastewater collection pits are a source for upper zone groundwater contamination.

- Aquifer tests will be performed on the new monitoring well and well HM-47 to determine the hydraulic parameters of the upper zone in the area of the collection pits. Water-level measurements will also be taken prior to each sampling to determine groundwater flow directions at the site.

East Parking Lot/Flight Line TCE Plume

- Obtain results of IRP investigations performed by/for Carswell AFB and enter information such as boring and monitoring well locations, analytical results, water-level measurements, aquifer tests, etc. into the AFP 4 data base for the purpose of groundwater modeling.

- With Carswell AFB review and approval, drill additional groundwater monitoring wells downgradient from the eastern most Carswell well containing TCE in the flight line area. Sampling would be performed and the samples analyzed for VOCs, chromium, and total petroleum hydrocarbons for two rounds of monthly sampling.

Site-Wide Investigations

Lake Worth

- Surface water samples collected every 400 ft along the shoreline of Lake Worth adjacent to AFP 4. Samples will be analyzed for VOCs, semi-VOCs, oil and grease, total petroleum hydrocarbons, and metals.

- Near-shore (approximately 10 feet from shoreline) lake bottom sediment samples will be collected from the lake bottom surface to a depth of two feet. Samples will be collected every 400 feet along the shoreline adjacent to AFP 4. The samples will be analyzed for VOCs, semi-VOCs, oil and grease, total petroleum hydrocarbons and metals. Samples collected near the former NARF site will be analyzed for radionuclides.

Air Quality Monitoring

- On the basis of a review of previous meteorologic data for AFP 4, two sites will be selected to monitor upwind and downwind air quality of AFP 4. Samples will be collected for VOCs and airborne particulates. Data will be collected from the two stations concurrently with RI/FS field activities to provide baseline air quality data.

Continuous Groundwater Elevation Monitoring

- Groundwater elevation monitoring in upper zone aquifer and Paluxy aquifer system at two separate locations -- one near Lake Worth, one distant from Lake Worth.

Paluxy Aquifer System Characterization

- Subsurface boring, logging, and monitoring well construction to provide lithologic and hydrologic data at additional locations.

- Aquifer testing on new and existing wells in the Paluxy aquifer system. Hydraulic response in other formations will be monitored to evaluate interconnectedness.

- Core analysis to determine vertical hydraulic conductivity, total organic carbon content, and organic partition and distribution coefficients.

- Groundwater sampling and analysis samples will be analyzed for VOCs, semi-VOCs, and metals.

Archaeological Survey

- Review of existing historical information available from local libraries, historical societies, and previous archeological surveys of the AFP 4 area.

- Surface archaeological survey conducted in known or suspected archaeological sites based on the literature search to be performed

by an experienced archeologist.

Ecological Survey

- Inventory of flora and fauna in areas adjacent to AFP 4. List will be compared with list of threatened or endangered species.

- Collection of tissue and/or organs from select biota for trace contaminant analysis.

Meandering Road Creek Survey

- Surface water sampling and analysis for VOCs, semi-VOCs, metals, total petroleum hydrocarbons, and oil and grease.

- Sediment sampling and analysis for VOCs, semi-VOCs, metals, total petroleum hydrocarbons, and oil and grease.

- Sampling and analysis of groundwater from seeps along the Meandering Road Creek drainage. Samples will be analyzed for VOCs, semi-VOCs, metals, total petroleum hydrocarbons, and oil and grease.

- Measurements of water quality parameters will be made at each water sampling location (pH, conductivity, temperature).

Background Sampling

- Collection of two soil samples at one foot intervals (0-1 and 1-2) at each background location. Samples will be analyzed for VOCs, semi-VOCs, metals, total petroleum hydrocarbons, and oil and grease.

- Collection of one soil gas sample from a depth of four feet at each background location for analysis for VOCs.

Leachability Testing

- Collection of at least one soil sample from each type of hazardous waste site to be analyzed for TCLP.

Common Ions

- Collection of groundwater samples at approximately 20 percent of the proposed sample locations for laboratory analysis of common ions. Alkalinity, DO, and Eh will be measured in the field at these locations. Sample locations will be selected on the basis of a minimum of one sample from each study area.

APPENDIX B. PLANNED ACTIVITY AND DURATION

APPENDIX B - PLANNED ACTIVITY AND DURATION

The following is the proposed schedule for the completion of field activities at AFP 4 in support of the RI/FS. This schedule is based on the timely review and approval of the RI/FS planning documents for AFP 4.

Task	Proposed Schedule
PA/SI Investigations:	
Land surveying	June 4 - 13, 1990
Utility Location	June 11 - 15, 1990
Soil Gas Surveying	June 18 - 27 and July 9 - 18, 1990
Soil borings and Soil Sampling	September 10 - 19, 1990 September 24 - October 3, 1990
RI/FS Investigations:	
Surface water, seep, stream sediment, and stream channel sampling	September 10 - 19, 1990
Lake water, lake sediment and biota sampling	September 24 - October 3, 1990
Air Monitoring	September through November, 1990
Monitoring well drilling, soil borings and soil sampling, groundwater sampling, surveying	September 24 - October 3, 1990 October 8 - 17, 1990 October 22 - 31, 1990
Groundwater sampling (new wells - 2nd round), aquifer tests	October 22 - 31, 1990 November 5 - 14, 1990 November 19 - 28, 1990
Continuous water -level monitoring (Paluxy aquifer)	September, 1990 - January, 1991

APPENDIX C. MATERIAL SAFETY DATA SHEETS

APPENDIX D. HEALTH AND SAFETY FIELD MONITORING PROCEDURES

APPENDIX D. HEALTH AND SAFETY FIELD MONITORING PROCEDURES

(From UNC Geotech ES&H Desktop Procedures Manual)

5.3 Calibration of Low Volume Air Sampling Pumps
5.4 Respirable Dust Sampling
5.5 Combustible Gas Indicator, MSA Model 260 Combination Combustible Gas and Oxygen Detection Instrument
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5.24 SIP 1000 Organic Vapor Analyzer Airborne Particulate Monitoring
5.27 Industrial Hygiene Evaluations for Chemical/Physical Hazards

HSSIH-0001 Airborne Metals Sampling
HSSIH-0002 Operation of Air Systems International Model HV-108-5 High Volume Air Sampler
HSSIH-0003 Operation of Gilian LFS 113D Low-Volume Air Sampler
HSSIH-0004 Colorimetric Indicator Tubes and Pumps - Draeger
HSSRP-005 Respirator Field Inspection and Maintenance

5.3 Calibration of Low Volume Air Sampling Pumps

This procedure describes the methodology for the calibration of low-volume air-sampling pumps by the "bubble-tube" technique and with the MSA Model A pump calibrator. This technique is the primary standard to the determination of flow rate for an air-sampling pump.

The flow rate at a specific setting must be determined for an air-sampling pump before the pump is placed in use. If changes are made to the pump or the sampling system, the air-sampling pump must be recalibrated accordingly.

Bubble-Tube Technique

Equipment and Material

- o Air sampling pump to be calibrated (MSA Flow-Lite, Model G, or equivalent)
- o 1000 ml burette
- o Stopwatch (accurate to 0.1 second)
- o Tygon tubing approximately 18 inches long, 5/16-inch inside diameter, 1/2-inch outside diameter (2 required)
- o Glass or plastic beaker, approximately 400 ml
- o Air filter
- o In-line filter holder
- o Liquid detergent
- o Air-Sampler Calibration Data Sheet (form UNC-1558)

Procedure

1. Mix approximately 25 ml of water with approximately 75 ml of detergent in a beaker.

2. Pour the solution into a burette (stopcock closed), swirl the solution inside of the burette to ensure wetting of the interior walls, then drain the solution back into the beaker.

3. Open the stopcock on the burette, and connect Tygon tubing to the burette and filter holder. Connect the second piece of tubing to the other end of the filter holder and to the sampling pump to be calibrated.

4. Insert the appropriate filter into the filter holder.

5. Record the following information on the Air Sampler Calibration Data Sheet:
   - o Date
   - o Technician
   - o Air-sampling pump model number and serial number
   - o Air filter type and size
   - o Burette volume

6. Start the sampling pump. Adjust the rotameter to the desired flow-rate setting by sighting across the middle of the rotameter float.

7. Momentarily immerse the open end of the burette in the detergent-water solution to generate a soap bubble. Sight across the lowest burette graduation; when the soap bubble traverses this mark, start the stopwatch.

8. When the soap bubble traverses the highest burette graduation, stop the stopwatch.

9. Record the rotameter setting and the traverse time on the Air-Sampler Calibration Data Sheet. Repeat steps 7 and 8 twice.

10. Calculate the flow rate at the flow-rate setting. Determine the average traverse time and calculate the flow rate, using the following formula:

$$\text{flow rate (liters/min)} = \frac{\text{volume in liters}}{\text{average traverse time (sec)}} \times 60 \left(\frac{\text{sec}}{\text{min}}\right)$$

11. Adjust the rotameter to another flow-rate setting. Repeat steps 7 through 11

12. Determine the flow rate at a minimum of three different rotameter settings greater than or equal to 1.7 liters/min, if possible.

13. Send a copy of the calibration data to the ES&H files.

MSA MODEL A PUMP CALIBRATOR

Equipment and Material

- o Air sampling pump to be calibrated (MSA Flow-Lite, Model G, or equivalent)
- o Stop watch (accurate to 0.1 second)
- o MSA Model A pump calibrator (see Fig. 5.3-1 for location of parts)
- o Air Sampler Calibration Data Sheet (UNC Form 1588)

Because of the method of utilizing the vacuum gauge in the Model A calibrator, periodic calibration is not required.

Procedure

1. Set the calibrator up in a vertical position on the work bench, assuring that:
   -the liquid trap bottle is empty
   -the rubber aspirator bulb is filled with soap solution
   -the water level in the water saturator is between 1/4 and 3/4 inches
   -the shutoff valve and vacuum adjust valves are open (at least 5 turns each)
   -the vacuum gauge is at "ZERO"

2. With a rubber tube, connect the pump to the VACUUM FITTING of the calibrator.

3. Turn on the pump and allow it to run for several minutes.

4. Adjust the vacuum reading to simulate the pressure drop of the collection device to be used (±.25") such as an impinger, sorbent tube, or filter. Pressure drops from 0 to 20 inches of water can be duplicated. As an alternative, the VACUUM ADJUST valve can be fully opened counterclockwise and the actual collection device connected to the WATER SATURATOR inlet.

5. Gently squeeze the rubber aspirator bulb on the soap film flowmeter until bubbles form and pass up into the tube. Moisten the entire inside of the

flowmeter by passing several bubbles up into it. 55 68

6. Check the vacuum reading and adjust, if necessary, to stimulate the pressure drop of the recommended collection device. If the actual collection device is connected to the saturator inlet, leave the VACUUM ADJUST valve fully open.

   NOTE: It may be necessary to make repeated adjustments of the pump and of the VACUUM ADJUST valve to arrive at a final satisfactory setting. Once the flow rate is set, the pressure drop of a collection device connected to the WATER SATURATOR inlet may be determined by observing the reading on the vacuum gauge with the VACUUM ADJUST valve fully open. With this determination made and noted, subsequent pump calibrations can be made without the need to connect the sample collection device by simulating this pressure drop through the use of the VACUUM ADJUST valve. Determine of the vacuum gauge reading is required daily when used.

7. Set the stopwatch to zero.

8. Gently squeeze the rubber bulb to create one bubble.

9. Start the stopwatch when the bubble passes the lower mark on the flowmeter.

10. Stop the stopwatch when the bubble passes the upper mark on the flowmeter.

11. Record the rotameter setting and the traverse time on the *"Air Sampler Calibration Data Sheet"*. Repeat Steps 8-12 once more.

12. The time it takes the pump to move one liter of air can then be read on the stopwatch and compared with Table 5.3-1 to obtain the flow rate. Under present specifications of the Federal Register (refer to *Theory of Operation)*, any pump producing a flow of 2 lpm $\pm$ 5% with its flow rate indicator set at the 2-lpm mark is considered to be in calibration. This means that a pump tested through this procedure and producing a flow of one liter in 28.6-31.5 seconds with its flow rate indicator set at the 2.0-lpm mark should pass the specification.

To obtain greater calibration accuracy, Table 5.3-1 may be interpolated or the flow may be calculated by using the equation:

$$F = 60/(60t_1 + t_2)$$

Where F = Flow rate in lpm, t_1 = the number of minutes shown on the stopwatch, and t_2 = the number of seconds shown.

For flow rates falling outside the range of 1.56 to 2.14 lpm, the above equation must be used.

Table 5.3-1. Gravimetric Pump Calibration at 2 lpm, Flow Rate versus Stopwatch Time

Time (sec)	Flow (lpm)
28.0	2.14
28.5	2.11
29.0	2.07
29.5	2.03
30.0	2.00
30.5	1.97
31.0	1.94
31.5	1.90
32.0	1.87
32.5	1.85
33.0	1.82
33.3	1.80
33.5	1.79
34.0	1.76
34.5	1.74
35.0	1.71
35.5	1.69
36.0	1.67
36.5	1.64
37.0	1.62
37.5	1.60
38.0	1.58
38.5	1.56

Storage

If the Calibrator will not be transported or placed in a horizontal position. simply close the case to protect the instrument inside. If the Calibrator will be transported, both the VACUUM ADJUST and SHUTOFF valves should be shut off by turning clockwise until the rubber tubing is clamped tight. The LIQUID TRAP should be rinsed out and reinstalled. The WATER SATURATOR bottle must also be emptied. The soap solution in the rubber bulb should be emptied into a storage bottle by carefully removing the bulb from the end of the flowmeter. Contact the Industrial Hygienist or ES&H Instrument Technician with any problems or malfunctions that the calibrator may have.

General Notes

1. The calibration interval for the low-volume air-sampling pumps is 3 months, unless it is being used for asbestos. then it must be calibrated by the sampling technician before and after sampling.

2. Air-sampling pumps must be utilized with the same size and type of filter that is used for calibration. It is permissible to calibrate a pump for several different filter types and/or sizes.

3. Calibration location and conditions (i.e.. altitude. temperature, and pressur should be similar to those conditions encountered during actual sampling.

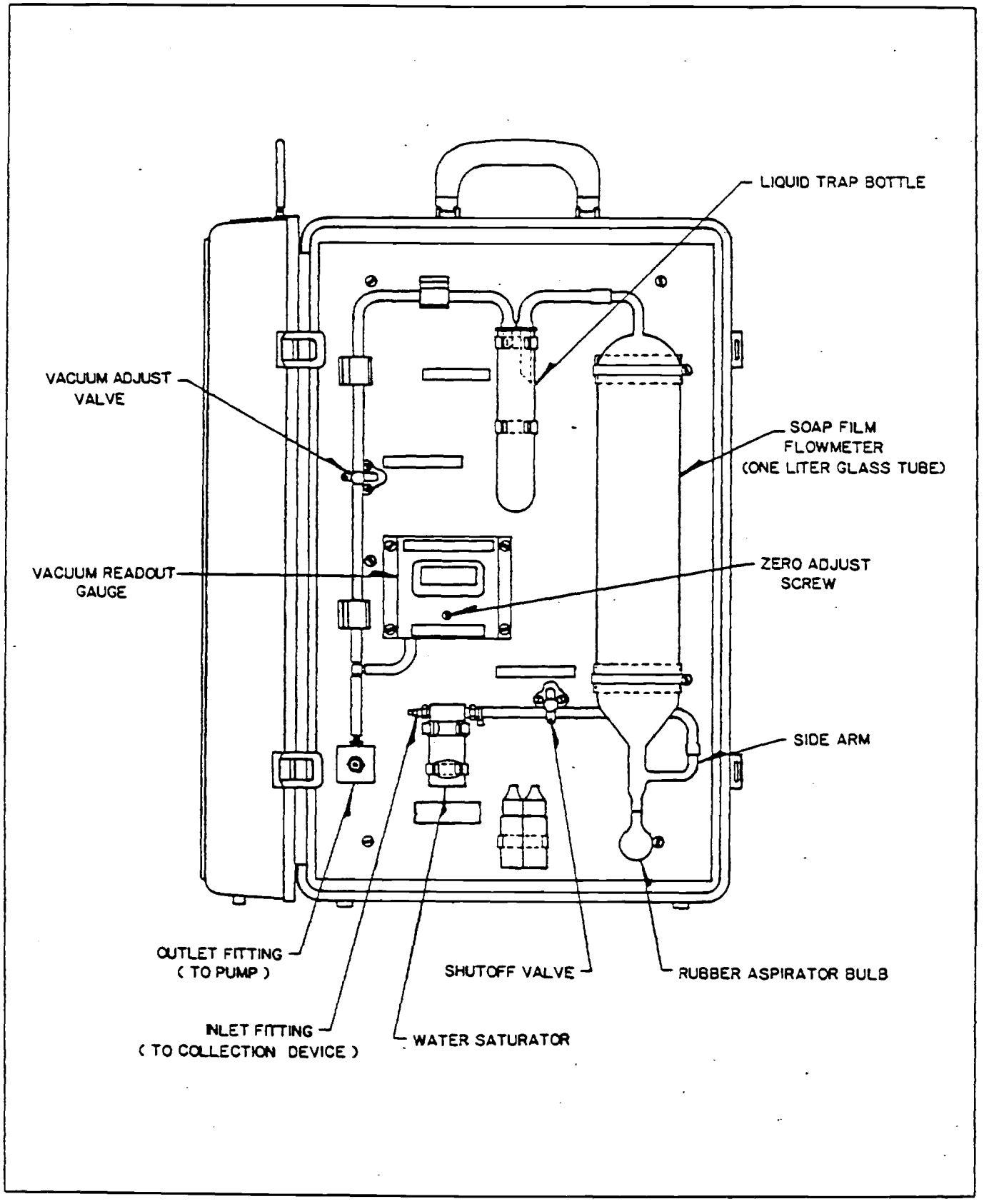


Figure 5.3-1 **Model A Pump Calibrator, Location of Parts**

5.4 Respirable Dust Sampling

Inhalation of respirable dust, particularly that which contains silica, constitutes a potential health hazard. In order to assess the risk to personnel, work areas must be sampled at regular intervals, and the samples analyzed for the respirable fraction of airborne dust, especially silica. Based on the results, appropriate measures can be applied to reduce work exposure to airborne dust to levels that are as low as reasonably achievable.

This procedure describes how to collect respirable dust samples for both routine and investigative evaluation of the air in a work area. Analysis of the filter for respirable silica will be performed by the UNC Petrology Laboratory in accord with procedures set forth in the Handbook of Petrology Laboratory Methods. Results of the analysis will be used to calculate employee exposures for comparison with regulatory standards, and thereby assess the health risk to employees working in the area.

Calibration of the sampling pump used to collect respirable dust samples is described in Procedure 5.3 ***"Calibration of Low-Volume Air Sampling Pumps.***

Equipment and Materials

- o MSA portable air-sampling pump, model G, or equivalent
- o Tygon tubing, 5/16-inch inside diameter, 1/2-inch outside diameter, approximately 36 inches long
- o Cyclone filter holder assembly, 10-millimeter diameter
- o Three-piece filter cassette, 37-millimeter diameter
- o Polyvinylchloride (PVC) membrane filter, 5-mm pore size, 37-millimeter diameter
- o Stopwatch or wrist watch
- o Respirable Dust Sampling Data Sheet (form UNC-1561)

Procedure

1. Submit the PVC membrane filters and filter cassettes to the Petrology Laboratory. The Laboratory will weigh the filters, load them into the filter cassettes, and return the cassettes to the ES&H Office ready for use. Each filter cassette will be assigned a number for tracking purposes.

2. Record the following information on the Respirable Dust Sampling Data Sheet:
   - o DOE-ID Number and Site Address
   - o Name of ES&H Technician
   - o Date of Sampling
   - o Model Number and Serial Number of Air-Sampling Pump
   - o Filter Type
   - o Filter Cassette ID Number

3. Check to ensure that the air-sampling pump has a valid calibration sticker, and that it has been calibrated for use with 5-mm, 37-mm PVC membrane filters. The calibration interval for air-sampling pumps is 3 months. Record the Calibration Due Date on the Respirable Dust Sampling Data Sheet. If the calibration is out of date or otherwise invalid, send pump to E-Lab for recalibration and obtain another pump for use.

4. Load the filter cassette into the cyclone filter holder assembly. Connect the Tygon tubing to the inlet of the cyclone assembly and the air-sampling pump.

5. Adjust the flow rate of the pump, sighting across the middle of the rotameter float, to the rotameter setting which corresponds to a flow rate of 1.7 liters per minute (lpm).

6. Ask the worker to be monitored to wear the sampling pump. Route the Tygon tubing from the pump to the lapel of the worker, and clip the cyclone assembly to the lapel in such a manner as to permit monitoring of the breathing zone of the worker.

7. Turn on the sampling pump and record the Sample Start Time.

8. Record the following information on the Respirable Dust Sampling Data Sheet:
   - o Name of Worker Monitored and Brief Description of Work Assignment
   - o Personal Protective Equipment Worn by Worker (if applicable)
   - o Temperature (^{o}C) and Barometric Pressure (mm Hg)
   - o Ventilation Conditions

9. Check the flow rate periodically during the sampling period. Adjust as necessary to ensure a constant flow rate of 1.7 lpm. If the rotameter has to be adjusted for more than 2 digits, check for low battery voltage and/or send the pump to the electrical department for a check.

10. At the end of the sampling period, note the rotameter setting and turn off the sampling pump. Record Sample End Time.

11. Remove the sampling equipment from the worker and return it to the ES&H Office. Remove the filter cassette from the cyclone assembly and seal the inlet and outlet ends of the cassette with plugs.

12. Determine the total sampling time in minutes and record on the data sheet. Calculate the sample volume (V), in cubic meters (m^3), using the following equation:

$$V = \frac{\text{Flow Rate (lpm)} \times \text{Sampling Time (min)}}{1000\ 1/m^3}$$

Record Sample Volume on the data sheet.

Submitting Samples

1. All silica samples are to be submitted to the Petrology Laboratory for analysis.

2. They are to be submitted in groups of eight, plus two control cassettes <u>only.</u>

3. All cassettes must be labeled with the Sample Ticket number prior to submittal, using a permanent marker.

4. Fill out the *Sample Ticket* with appropriate information as shown in Fig. 5.4-1. Tear the hard copy from the Sample Ticket book, leaving the pink copy.

5. Fill out the *"Request for Petrographic Services"* form with appropriate information as shown in Fig. 5.4-2 5.4-2A.

6. Fill out the *"Chain of Custody"* form as shown in Fig. 5.4-3.

7. Make copies of the *"Respirable Dust Sampling Report"* form after assuring that all data is entered on the top half of the form. Any corrections should be one-lined and initialed. See Fig. 5.4-4.

8. Ensure that all samples are capped, labeled, and placed in a sealable plastic bag.

9. Submit paperwork and samples to Team Leader, who will verify paperwork and sign off the *"Request for Petrographic Services"* form. The samples, along with the *"Request for Petrographic Services", Sample Ticket, and Chain of Custody"* forms, and copies of the work sheet are sent to Ersel Reid or his designee. The Team Leader retains the pink copies in the sample book and original worksheets for 3 months prior to sending to folio.

Sample Analysis

Upon receipt of the analytical results from the laboratory, enter the appropriate information on the Respirable Dust Sampling Report (UNC-1561). Contact the Industrial Hygienist when silica types other than quartz are found. The following formula shall be used for calculating quartz silica exposures:

$$\text{TWA} = \frac{\text{concentration x time exposed (hrs)}}{8}$$

TWA is the time weighted exposure over an 8-hour work period.

Concentration is respirable silica expressed in mg/cu.m. This number is obtained from the Respirable Silica Analysis results from the Petrology Laboratory.

Time exposed - hours that the employee was exposed on the Air Sampling Exposure Log (UNC-1572) for the property involved.

Compare the TWA to the TLV (Threshold Limit Value) of quartz silica. An exposure has not occured if the TWA is less than 0.1 mg/m^3. If the TWA is greater than 0.1 mg/m^3 an exposure has occured. The Industrial Hygienist or designee shall notify the subcontract administrator, who notifies the subcontractor, in writing, of the overexposure. If respiratory protection was worn, an adjustment will have to be made for the respirator protection factor which could reduce the exposure. The Industrial Hygienist will notify UNC employees of exposures. Copies of these exposures will be kept in the ES&H employee training files.

REQUEST FOR PETROGRAPHIC SERVICES

UNC Geotech

From B. Will
Office 613
Project H&S
Area
Number of Samples 10 Sample Nos. (see reverse side)

Request Number
Project Code No.
Date Submitted 10/15/87
Date Required 11/2/87
Site ID G-00397 G-00920 G-01212

ANALYSES REQUIRED

- ☐ Thin-Section Analysis
- ☐ Clay Separation and Analysis
- ☐ Opaque Mineral Analysis by Polished Thin Section
- ☐ Sieve Analysis and Parameters
- ☐ Heavy Mineral Separation and Analysis
- ☑ Airborne Silica
- ☐ Airborne Asbestos
- ☐ Mineral Identification—Describe
- ☐ SEM/EDS Analysis—Describe in detail
- ☐ Other Analysis—Describe in detail

SPECIAL INSTRUCTIONS—Describe in detail

PERTINENT INFORMATION (age, geology, occurrence, opinions, etc.)

☑ Approved
☐ Approved with Modification

C D Wade
Project Leader or Representative

10/15/87
Date

UNC 1708
Rev 10/86

Figure 5.4-2

REQUEST FOR PETROGRAPHIC SERVICES
(continued)

Request Number _____

Field Number	AASSN	Additional Information/Comments
MDA 111		G-00387 Cassette # 59
112		G-00920 # 15
113		G-01212 # 24
114		G-00387 # 36
115		G-00920 # 48
116		G-01212 # 60
117		G-00920 # 72
118		G-00387 # 84
119		Control cassette # 13
120		Control cassette # 18

Figure 5.4-2A

UNC Geotech

Mailing Address
P.O. Box 14000
Grand Junction, CO 81502-5504
Phone (303) 242-8621

Street Address
2597 B¼ Road
Grand Junction, CO 81502-5504

Chain of Sample Custody

Page 1 of 1
Date 10/15/87

1. Project No. 613 2. Project Name H&S 3. UNC Request Nos.

4. Sample No.	5. Sample Type	6. Remarks
MDA-111 thru MDA 120	Airborne Silica	

7. Relinquished By	Date	Dept.	Received By	Date	Dept
C Wade	10/15/87	H&S			

8. Company Name
Received By
Date

UNC 1512 Rev. 10/86 Distribution: Original accompanies samples, copies to relinquishers.

Figure 5.4-3

Respirable Dust Sampling Report

DOE ID No.: G-00387 Address: 550 33 Rd. HP Tech: B. Will

Date: 10/13/87 Worker Monitored: Bill Sorter Job Assignment: Jackhammering

PPE Worn (if applicable): MSA Dust mask

Equipment Data

Pump Model No.: Flowlite Serial No.: 1987 Calibration Due Date: 12/1/87

Filter Type: 37mm/5 μ PVC Cassette Filter ID No.: 72 Sample Ticket No.: MOA 113

Sampling Data and Conditions

Note: Log any time sampler turned off for any reason.

Sample Start Time: 0900 Sample End Time: 1000 Total Minutes: 60

Sampling Flow Rate: 1.7 l pm Sample Volume: 102 Liter Ventilation: Fans used

Pre-Sample Temp: 14 °C Pre-Sample Barometric Pressure: 28.5 in. Hg

Post-Sample Temp: 16 °C Post-Sample Barometric Pressure: 28.5 in. Hg

Altimeter/Barometer Serial # 59785

Analytical Results and Calculations

Circle Type of Silica: quartz tridymite cristobalite fused

The following formulas are used to calculate employee exposure (use space below to calculate):

$$\frac{\text{Employee Exposure Time}}{\text{Total Sample Time}} = \text{Time Ratio}$$

$$\text{Lab Reported Respirable Silica} \times \text{Time Ratio} = \text{Concentration of Employee Exposure}$$

_____ Employee Exposure vs 0.1 TLV for quartz silica

Employee Overexposed: ☐ Yes ☐ No

UNC 1691
Rev. 7/87

Figure 5.4-4

5.5 Combustible Gas Indicator (CGI) MSA Model 260 Combination, Combustible Gas and Oxygen Detection Instrument

This procedure specifies the requirements and methods for using the MSA Model 260.

Precautions and Limitations

This instrument has the capabilities of indicating oxygen deficient or explosive atmospheres. The instrument user must ensure that proper protection is worn, and that safety is not compromised due to monitoring in an Immediately Dangerous to Life and Health (IDLH) situation. The instrument user must also be aware of the following limitations and applications:

1. Be sure to watch the meter continuously while aspirating a sample. If the needle pegs and then returns to zero, the indication is that the atmosphere is either O_2 deficient or that combustible vapors exceed the UEL, creating a very explosive situation. In the second case, the danger is that an O_2 increase can create an explosive mixture.

2. When measuring, take readings with the probe held at ground, waist, and overhead positions to ensure detection of vapors whose densities are greater or lesser than that of air. When inside a building or confined space, take special care to measure high, how, and middle positions and particularly check out room corners and other restricted areas where explosive vapors could become trapped.

3. Do not use in atmospheres other than air. It is not capable of measuring the percentage of vapors in steam or other gaseous atmospheres.

4. The CGI will not indicate the presence of explosive or combustible mists or sprays such as lubrication oil or explosive dusts such as grain or coal dusts.

5. Do not draw liquids into this unit. Be careful when sampling over drums, pools, etc.

6. The following substances may "poison" the detection filament: fuming acids, leaded gasoline, silanes, silicones, silicates and other silicon-containing components. Even minute quantities of these substances will cause inaccurate responses. When it is suspected that these substances have been aspirated, the instrument shall be checked with a calibration kit.

7. The relative humidity must be in the range of 10-90 percent. Weather information can be obtained from the Weather Service, a local airport, or the radio.

8. Do not switch the instrument on/off unless in a known combustible-free atmosphere.

9. When the batteries begin to become drained, the instrument will give sluggish responses.

10. In very cold temperatures, the batteries will drain much quicker because more energy is required to heat the platinum filament.

11. In very warm temperatures, in excess of 125°F, condensation may cause erroneous readings.

12. The explosive limits for most gases and vapors are well above the TLV's for those substances.

13. High boiling point combustible solvents which are tested at normal ambient temperatures will show a relatively low vapor concentration. If the temperature of the solvent is increased, the increased concentration of vapors may become combustible.

14. High boiling point combustible solvents which are sampled in areas warmer than the instrument may be expected to form some condensation in the sampling line and flow systems; as a consequence the concentration may read lower than it actually is.

15. The CGI meter reads only from 0 to 100 percent of the calibration gas, often either methane or propane, LEL. Therefore, when another combustible gas is detected, the exact meter reading is not accurate. To provide an additional safety factor, field crews shall not work where combustible gas is measured above 25 percent of the LEL for a methane or propane calibrated CGI.

Calibration

Before the calibration of the combustible gas indicator can be checked, perform the Operational Precheck must be in operating condition as described in the "Instrument Operation" section of this Procedure. Calibration check-adjustment is made as follows:

1. Attach the flow control to the calibration gas tank.

2. Connect the adapter hose to the flow control.

3. Open flow-control valve.

4. Connect the adapter-hose fitting to the inlet of the instrument. After about 15 seconds, the LEL meter pointer should be stable and within 33-35 percent LEL. If the meter pointer is not in the correct range, stop the flow and remove the right-hand side cover. Turn on the flow and adjus the "S" control with a small screwdriver to obtain a reading, as specified on the calibration sheet.

5. Disconnect the adapter-hose fitting from the instrument.

6. Close the flow-control valve.

7. Remove the adapter hose from the flow control.

8. Remove the flow control from the calibration gas tank.

9. Replace the side cover on the Model 260.

This calibration shall be performed prior each use, daily, or when in service.

Instrument Operation

1. Turn the center "On-Off" control clockwise to the far right "Horn-Off" position. Both meters will move, one or both lights may light, and the green "Horn-Off" lamp will periodically illuminate.

2. Adjust the meter needle on the % oxygen meter by pulling up and turning the "O_2 Calibrate" knob. (The knob is supplied with a clutch to prevent accidental field decalibration). Adjust the needle to read 20.8% O_2, represented by the hash mark located directly below the 21% mark.

3. Adjust the meter needle on the % LEL meter by pulling up and turning on the "LEL Zero" knob. Adjust the needle to read 0% on the meter face.

4. Press the red alarm "Reset" button to deactivate the alarm circuit. If either of the alarm lamps located in the upper corners of the control panel were lit, they will extinguish upon depressing this button.

5. Press the black check button and observe the needle movement on the % LEL meter. The needle should fall within the black battery arc on the meter face. If it fails to reach this level, the battery needs recharging and the operator should notify the instructor.

6. Momentarily hold a finger over the threaded "Air Intake" nipple or over the end of the hose (if attached) and listen and watch the "Flow" indicator for signs of pump laboring.

7. Turn the "O_2 Calibrate" knob counterclockwise while observing the % oxygen meter. At the 19.5% reading, the left alarm lamp will illuminate. Return the needle to zero % LEL. Depress the red "Reset" button to reactivate the alarm circuit.

8. Turn the "LEL Zero" knob clockwise until the needle reads 25%. The right alarm lamp will illuminate. Return the needle to zero % LEL. Depress the red "Reset" button to reactivate the alarm circuit.

9. To operate the unit, place the hose or probe end in the atmosphere to be sampled and wait for the needle deflection to stabilize on the O_2 and % LEL meter.

10. If the unit senses an O_2 deficient (less than 19.5% O_2) or a combustible (greater than 25% LEL) atmosphere, the alarm circuit will activate and remain so until the atmosphere concentrations return to normal levels. When back at normal levels, the red reset button must be pushed to silence and reactivate the alarm.

11. After all readings are at baseline, turn the unit off by turning the function knob counterclockwise to "Off".

5.6 Colorimetric Indicator Tubes and Pumps - Draeger

This procedure specifies the requirements and methods for using Draeger tubes and pumps.

Draeger indicator tubes are used to indicate a specific chemical. Tubes are available in different detector concentrations. While in storage they should be refrigerated. Tubes should not be used that have exceeded their stamped expiration date.

Field Check

All colorimetric indicator tubes and pumps should be field checked prior to use. This field check tests for leaks in the following manner:

1. Insert unbroken tube into pump's tube holder

2. If using a bellows-type pump, squeeze the bellows. After 60 seconds, bellows should not regain its original shape or chain should not be taut. If a pump fails this test, it should be serviced according to manufacturer's instructions.

Operation

The following steps are used for instrument operation:

1. Break off both tips of a fresh colorimetric indicator tube in break-off eyelet on front cover plate or in break-off husk (an accessory).

2. Insert tube into pump head with arrow on tube pointing towards pump.

3. Hold pump between thumb and the base of index finger with front cover plate contacting finger.

4. Insert end of tube into sample atmosphere.

5. Compress the bellows completely with a squeezing motion assuring that the total volume of the bellows is used.

6. Release grip and allow chain to become taut, signifying that 100 cc of air have been pulled through tube. Be sure to keep the tube end in the sample atmosphere during the specified time.

7. Complete steps 4 and 5 as many times as the tube's instructions state.

8. Read concentration of material in air at stained/unstained interface.

5.7 Organic Vapor Meter Monitoring by Photoionization - AID Model 590

The AID Model 590 Organic Vapor Meter (OVM) determines total ionizable organic compounds in air. Air is pumped directly into the instrument in a continuous mode and then the photoionization detector responds to the organic compounds being processed. Most organic materials are detected with varying sensitivities.

The OVM also responds to several inorganic vapors such as HBr, HCl, HF, HI, H_2, H_2Te, NO, O_3, and $COCl_2$. Ionization of these species causes an inflated reading of organic vapors. Organic materials not sensed by the detector are low molecular weight hydrocarbons such as methane, ethane, propane, methyl alcohol, and some of the Freons. These compounds are not detected by the OVM which results in an inaccurately low OVM reading.

The minimum detectable quantity is 0.1 ppm of benzene in air. The reagents are zero air (available through gas suppliers), and 1,3-Butadiene (available through gas suppliers).

The following steps are sufficient for routine use of the OVM. For further information, refer to the AID Operation and Service Manual for the 590 OVM/GC.

Start-Up

1. Operate the OVM from a 110-volt power source or from its internal rechargeable battery.

2. Turn the carrier valve clockwise to close the valve, and push the pressure release button to release pressure on the detector. The unit is inoperable with any pressure on the detector.

3. Position the OVM/GC selector switch on the front panel to OVM.

4. Turn the unit power on using the switch on the rear panel. The LED will light up when power is on. The OVM should now be pumping sample through the port and into the detector.

Calibration

Calibration is required on a daily basis or whenever a new lamp is installed in the unit.

1. Connect the sampling port to the zero air source. Turn the zero adjust knob on the rear panel until the LED reads zero. Disconnect the air source.

2. Connect a known standard, usually 250 ppm 1,3-butadiene, to the sampling port. Adjust the span potentiometer on the rear panel until the LED reads 250 ppm. Disconnect source.

Operation:

The OVM is ready for operation after "Start-up" and "Calibration" as described above. The sampling port tube may be used to locate point sources of vapor emissions or may simply monitor ambient air. Readings are taken directly from

the LED. If the reading is off scale, the range selector switch may be increased until the reading is on scale. In normal use, the lowest range (0-200 ppm) is the most suitable.
cw12

General Notes

Several lamps of varying ionization potentials are available. These lamps may be interchanged depending on the type of vapors present and the sensitivity of each lamp to each respective vapor.

5.8 Calibration of High Volume Air Sampling Pumps by Dry Gas Method

This procedure describes the method for calibrating air sampling pumps by the dry gas technique. This technique is used to determine the flow rate for a high volume air sampling pump.

The flow rate at a specific setting must be determined for an air sampling pump before it is used. If changes are made to the pump or the sampling system, the pump must be recalibrated accordingly.

Equipment and Material

- o Air sampling pump (Staplex)
- o Dry gas meter and filter holder adapter
- o Stopwatch
- o 2- 18" lengths of tygon tubing, 5/16" inside diameter, 1/2" outside diameter
- o Air filter
- o In-line filter holder
- o Air Sampler Calibration Data Sheet (Form UNC-1558)

Procedure

1. Insert the appropriate filter into filter holder

2. Attach it to the dry gas meter by the adapter

3. Record the following information on *Air Sampler Calibration Data Sheet:*
   - o Date
   - o Technician
   - o Air sampling pump model number and serial number
   - o Air filter type and size
   - o Dry gas meter model number and serial number

4. Start the sampling pump. Adjust the rotameter to the desired flow-rate setting by sighting across the middle of the rotameter float and turn off.

5. Read clock setting on dry gas meter.

6. Start sampling pump and stopwatch simultaneously, run pump for 5 minutes, stop pump and record the stopwatch reading. Subtract the second reading from the first reading and multiply the result by the calibration equation on the side of the dry gas meter. Divide the result by 5 to read flow rate.

7. Record the rotameter setting and stopwatch results on the Air Sampler Calibration Data Sheet. Repeat steps 5 and 6 two more times.

8. Calculate the flow rate at the flow rate setting. Add the three results together and divide by 3 to obtain the average flow rate.

9. Adjust the rotameter another flow-rate setting. Repeat steps 5 through 8 again. Determine the flow rate at a minimum of three different rotameter settings greater than or equal to 15-17 giving 9-10 L/min.

General Notes

1. The calibration interval for the high volume air sampling pumps is 6 months, unless pumps are used for asbestos, in which case they must be recalibrated before and after sampling.

2. Air sampling pumps must be utilized with the same size and type of filter that was used for calibration. It is permissible to calibrate a pump for several different filter types and/or sizes. A different calibration sticker must be attached for each different filter type.

3. Calibration location and conditions (i.e. altitude, temperature, and pressure) should be similar to those conditions encountered during actual sampling.

4. Copies of records of the 6-month calibration should be filed in the Measurement and Test Equipment files in the E-Lab.

5.10 HEAT STRESS MONITORING

This procedure deals with the use of the Visa Scientific Heat Stress Monitor for WBGT measurement.

HEAT STRESS COMPUTER (VISTA SCIENTIFIC)

General Information (Description)

The Vista Scientific Cooperation Heat Stress Computer is a Wet Bulb Globe Temperature (WBGT) indicator used for the measurement of environmental connections which may produce heat stress. The WBGT index is an industrial standard method developed by physiologists to monitor heat stress-producing environments.

The instrument housing is constructed of stainless steel for durability and coated with a two-part, pebble-finish paint. The housing comes apart by removing the four screws on the bottom and removing the back plate to give access to the battery compartment and calibration test points. The front panel of the instrument contains a rotary switch to select the desired parameter to be read. Selections are power (Off), Dry Bulb Temperature (DB), Wet Bulb Temperature (WB), Globe Temperature (GT), WBGT Index Indoor (IN), the WBGT Index Outdoor (OUT), and Scan. Each of these parameters will be discussed fully.

On top of the unit, each of the three sensors are mounted by means of the plug-in connector. From left to right are the GT, DB, and WB Sensors. These connectors are interchangeable, and care must be taken that they are inserted in the correct socket in the above order. Each connection point is appropriately marked.

Unit Operation

Compare the reading (WBGT) with the WBGT chart, depending on the type of work. Determination is then made for work/rest requirement. (See Page 5.10-4.)

o Filling the Wet Bulb Reservoir

NOTE: USE ONLY DISTILLED WATER

To fill the reservoir, position the tip of the water bottle nozzle over the wick, located on the wet bulb sensor, and fill the reservoir until the sponge is saturated. The wick will automatically wet by capillary action. Start by wetting the wick also. Avoid touching the cotton wick as natural skin oils will impede good capillary wetting.

Place the instrument or remote assembly in desired location where the measurements are to be taken. Turn on the power switch and allow three (3) minutes for sensors to come to equilibrium. Select the desired temperature to be read by turning the selector switch to the proper position and observe the reading on the digital display.

Avoid handling the wick and glove assemblies. When necessary, use the cotton glove provided in the accessory compartment.

Maintenance

A. Battery Recharging

The Vista Heat Stress Computer is designed for approximately 12 hours of continuous battery operation when the batteries are fully charged. The charger input is found at the rear (Ref. Drawing AB). When the battery voltage is low, the display will indicate "Bat." (Ref. Drawing AB) Charging time for the unit is 12 to 15 hours for full charge.

B. Calibration

The Heat Stress Computer has been factory-calibrated to meet the unit specification. If the user desires to calibrate the unit, the following procedure should be used:

1. Remove the wick from the wet bulb.

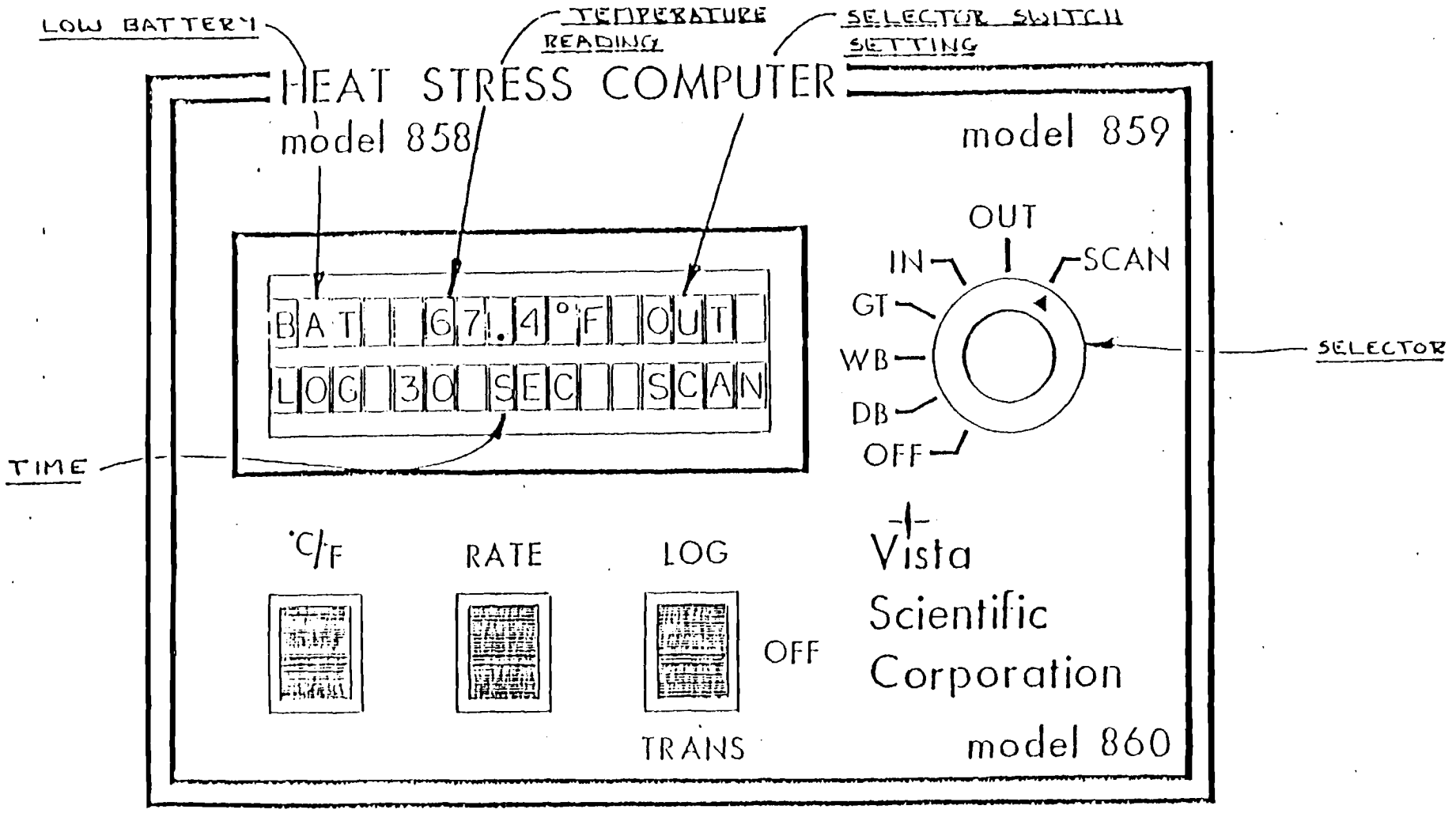
2. Place the unit in a calibration chamber or in a suitable controlled-temperature environment. Remove screws from bottom of unit and slide out chassis to expose the potentiometers required for adjustment. (Ref. Drawing AB for pot locations.)

   A calibration check sensor is available. When inserted in the place of any sensor, the display will read 100.0 F.

3. Place selector switch to "DB" and adjust pot as shown on Drawing AB so that reading being displayed is the same as calibration standard being used. Do the same for Wet Bulb and Globe.

   NOTE: Globe temperature adjustment should be accomplished with as little light as possible.

4. After the adjustments are made, set selector switch to "Scan," and all readings should stay within +/- .2 F.



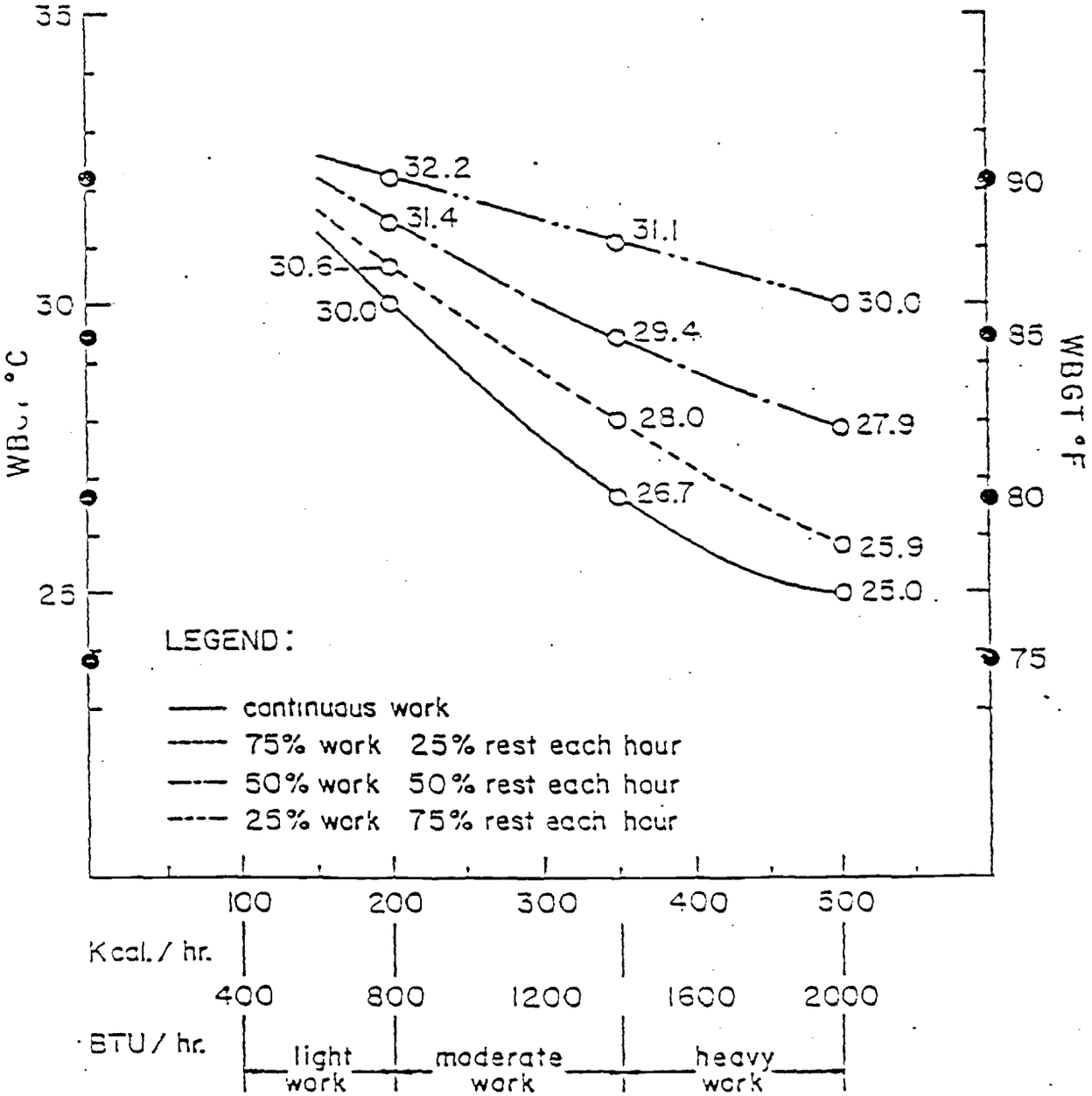
VISTA SCIENTIFIC CORPORATION

85 INDUSTRIAL DRIVE IVYLAND, PA. 18974

DR C.S.R.	DATE 1-3-86	TITLE FRONT PANEL	
CK			
SIZE A	DWG NO REF · DWG # A·A		REV 0
SCALE ~	DO NOT SCALE DWG.		SHEET 1 OF 1

55 88

DRAWING AB



American Conference of Governmental Industrial Hygienists: Cincinnati, Ohio, 1971.

Permissible Heat Exposure Threshold Limit Value.

5.12 PORTABLE PHOTOIONIZATION ANALYZER MODEL ISPI 101 HNU SYSTEMS, INC.

Introduction

This portable instrument is used to detect, measure, and provide a direct reading of the concentration of a variety of trace gases in many industrial or plant atmospheres. The analyzer employs the principle of photoionization. This process involves the absorption of ultraviolet light (a photon) by a gas molecule leading to ionization:

$$RH + hv \rightarrow RH^+ + e^-$$

in which

RH = trace gas
hv = Photon with an energy level equal to or greater than the ionization potential of RH

The sensor consists of a sealed ultraviolet (UV) light source that emits photons with an energy level high enough to ionize many trace species, particularly organics, but not high enough to ionize the major components of air, O_2, N_2, CO, CO_2, or H_2O.

A chamber exposed to the light source contains a pair of electrodes: one, a bias electrode, and the second, a collector electrode. When a positive potential is applied to the bias electrode a field is created in the chamber. Ions formed by the absorption of photons are driven to the collector electrode. The current produced is then measured, and the corresponding concentration is displayed on a meter directly in parts per million (ppm).

To minimize absorption or decomposition of sample gases, a rapid flow of sample gas is maintained through the ion chamber, which is small, made of inert material and located at the sampling point.

The analyzer consists of a probe, a read-out assembly, and a battery charger. The probe contains the sensing and amplifying circuitry; the read-out assembly contains the meter, controls, power supply, and rechargeable battery. The analyzer will operate from the battery for approximately 6-10 hours.

The ISPI 101 is designed for use with interchangeable probes containing lamps of different energies. The analyzer is ready for use simply by connecting the probe to the read-out assembly, calibrating, setting the proper SPAN pot value, and then zeroing the unit.

The standard probe provided with the analyzer contains a 10.2 eV lamp. Optional probes containing lamps of 9.5 and 11.7 eV permit selective determination or exclusion of special species having IP values lower than 9.5 eV in the presence of interfering species with IP values above 9.5 eV. The probe with the 11.7 eV lamp permits measurement of species with IP values up to approximately 11.7 eV. The probes with different lamps are interchangeable in use within individual read-out assemblies for different applications. The amplifier and ion chamber in the probe are selected for the specific eV lamp. Lamps of different eV ratings cannot be interchanged between probes.

Gases with ionization potentials near to or less than that of the lamp will be

ionized. These gases will thus be detected and measured by the analyzer. Gases with ionization potentials higher than that of the lamp will not be detected. The ionization potential of the major components of air, i.e., oxygen, nitrogen, and carbon dioxide, range from about 12.0 eV to about 15.6 eV and are not ionized by any of the three lamps. Gases with ionization potentials near to or slightly higher than the lamp are partially ionized, resulting in low response to the instrument. Ionization potentials for various atoms, molecules and compounds are given in Tables 8-1 through 8-13 in Section 8 of the HNU Instruction Manual.

The amount of ionization of a species of gas exposed to photons, its sensitivity, is a characteristic of that particular species. This is illustrated in Table 4-1 in the HNU Instruction Manual for a number of chemical groupings, and in Table 8-14 for a large number of individual species when exposed to photons from a 10.2 eV lamp.

The species with the higher values are more sensitive to the 10.2 eV photons than are those with lower values. Refer to Table 8-14 in the HNU Instruction Manual for further information.

WARNINGS

1. Do not look at the light source from closer than 6 inches with unprotected eyes. Observe the source only briefly. Continued exposure to ultraviolet energy generated by the light source can be harmful to eyesight. The lamp cannot be observed with the probe extension attached or when the instrument is in the stand-by mode.

2. Any obstruction of the probe extension or at the sample end of the probe will seriously impair ISPI 101 operation. The fan cannot draw a sample across a pressure drop. Efforts should be made to keep dirt, dust, grease (e.g., from pipe joints) and other matter from obstructing the flow.

3. The instrument measures gases in the vicinity of the operator and a high reading when measuring toxic or explosive gases is cause for immediate action for safety.

4. Never open the valve on a gas container without a regulator attached.

5. Turn the function switch on the control panel to the OFF position before disassembly. Otherwise, high voltage of 1000 V DC will be present in the probe assembly.

6. The ISPI 101 is suitable for uses in Class I Division 1 ABCD areas except when using the charger.

7. The Read-out Unit should **NEVER** be opened except by a service person trained and certified by HNU Systems, Inc.

8. Do not use the instrument in the rain or other precipitation, as it will not pick up volatiles under those conditions.

Precautions and Limitations

Environmental Sensitivities

Temperature, humidity and air particulates are factors in the proper operation

of this instrument.

Detection Range	0.1 to 2000 ppm
Minimum Detection Level	0.1 ppm
Maximum Sensitivity	0 to 20 ppm FSD at SPAN = 9.8 (full scale deflection) 0 to 2 ppm FSD at SPAN = 0.0
Repeatability	∓ 1% of FSD
Linear Range	0.1 to 400 ppm
Useful Range	0.1 to 2000 ppm
Response Time	Less than 3 seconds to 90% of FSD
Ambient Humidity	up to 90% RH (relative humidity)
Operating Temperature Ambient (10.2 and 9.5 eV lamps)	-10 to 40° C.
Operating Time on Battery (continuous use)	Approximately 6 - 10 hours; at lower temp. time is reduced due to effect of cold temp. on the battery
Recharge time from full discharge	Full recharge: 12 - 14 hours. Unit can be left on the charger and be continuously recharged whenever the unit is not in use (the analyzer will not operate while the unit is on the charger: an Intrinsically Safe feature).
Recharge current	Max. 0.4 amps at 15 V DC
Battery Charger Power	120 V AC, single phase, 50-60 Hz, 1.5 Amps 230 V AC, single phase, 50-60 Hz, .75 Amps

NOTE: The above specifications apply when the instrument is equipped with 10.2 eV Probe with SPAN set at 9.8 and measuring benzene. Values will vary for other compounds and conditions. The HNU is sensitive to interferences from the following physical/environmental conditions: overhead electrical powerlines, transmissions from some hand-held portable radios, temperature extremes, humidity, machinery emitting exhaust fumes, battery acid, and any other volatile organics that the HNU could detect. The lamp lens will need to be cleaned when working in dusty areas, or areas with heavy particulates in the air. Both the lamp lens and the ion chamber need to be cleaned when in areas of high humidity or precipitation. Water should not be sucked into the instrument.

Operating Procedures

The following procedures are to be used in operating the analyzer:

1. Unclamp the cover from the main read-out assembly.

2. Remove the inner lid from the cover by pulling out the two fasteners in order to access the charger, adapter, straps, and probe extension.

3. Connect the probe cable plug to the 12-pin keyed socket on the read-out assembly panel. Carefully match the alignment slot in the plug to the key in the connector. Screw down the probe connector until a distinct snap and lock is felt.

4. Screw the probe extension into the probe end cap. The probe may be used without the extension if desired.
5. Set the SPAN control for the probe being used (10.2, 9.5, or 11.7 eV) as specified by the initial factory calibration or by subsequent calibrations.

6. Turn the function switch to the **BATT** (battery check) position. The needle on the meter will go to the green zone if the battery is fully charged. If the needle is below the green arc or if the Low Battery Indicator comes on, the battery must be recharged before the analyzer is used. No measurements can be taken while charging.

   NOTE: To ensure accurate readings, the ISPI 101 is designed to operate ONLY when the battery voltage is greater than 11 V DC. A low battery will cause the analyzer to shut off automatically.

7. Set the SPAN pot to the desired value based on the gas to be used.

8. Turn the function switch to **STANDBY** position. Turn the zero adjustment until the meter needle is at zero.

9. Turn the function switch to the appropriate operating position. Start with the 0-2000 position and then switch to the more sensitive ranges. The UV light source should be on, confirmed by removing the probe extension and briefly looking into the probe to observe a purple glow from the lamp. Do not look at the light source closer than 6 inches.

10. The analyzer is now operational.

11. Hold the probe so that the extension is at the point where the measurement is to be made. Using a fan, the instrument measures the concentration by drawing the gas in at the end of the extension, through the ionization chamber, and out the handle end of the probe.

    NOTE: The fan will not operate against a pressure drop, i.e., it will not withdraw a sample from a duct with gas moving away from the probe. The ISPI 101 is designed for ambient (relatively still atmospheres) operation.

    WARNING: Stand up wind from the source whenever sampling. The instrument measures gases in the vicinity of the operator and a high reading when measuring toxic or explosive gases is cause for action for operator safety.

12. Take the reading or readings as desired, taking into account that air currents or drafts, equipment, vehicles, or environmental interferences in the vicinity of the probe tip may cause fluctuations in readings. Change the ranges as required. Check that the probe you are using will measure the ionization potential of the chemical/source that you are sampling for.

13. Check the battery condition as required. If the Low Battery Indicator comes on, turn the analyzer off and recharge. Measurements cannot be taken while charging.

14. After completion of use, check the battery condition as described in #6.

15. Turn the function switch to the OFF position.

16. When not operating the analyzer, leave it in its assembled condition and connected to the battery charger.

17. When transporting the unit, disassemble the probe and its extension from the read-out assembly and return the equipment to its stored position.

18. In case of emergency, turn the function switch to the OFF position.

Battery Charge

Check the battery charge as described above in # 6, during each period of operation. If the battery is low, as indicated by the meter reading, it is necessary to recharge it.

To charge the battery, locate the Battery Charge Adapter Cable, (which is comprised of a 1/4-inch phone plug on one end and a mini phone jack on the other). Press the 1/4-inch phone plug onto the mating read-out assembly jack installed on top of the ISPI 101 battery charger case. Attach the charger cable with the mini-plug into the mini-jack of the battery charger adapter cable. The charger can then be plugged into a 120 VAC or 230 VAC (as specified by charger) single phase, 50-60 Hz outlet. Recharge the unit in a non-hazardous atmosphere.

The analyzer cannot be operated during this recharging period. Leave the function switch in the OFF position during charging. After the charging period, the battery charger can be detached from the analyzer and reassembled in the reverse order as described above.

Rechecking the battery's newly charged condition can be accomplished with the analyzer assembled, the probe attached and the function switch set to the BATT position. The meter should deflect to the green region.

> ***NOTE 1:*** The probe assembly must be attached to the analyzer during the battery check. Without following this procedure, the instrument will not indicate the correct battery condition.
>
> ***NOTE 2:*** The instruction on the cover of the battery charger instruct the user to *"place output plug into jack on the left side of bezel."* This is incorrect. The output plug should be attached to the charger adapter cable as explained above.

Calibration

The ISPI 101 Analyzer is designed for trace gas analyzer in ambient air and is calibrated at HNU with certified standards of benzene, vinyl chloride and iso-butylene. Good instrumentation practice calls for calibration on the species to be measured in the concentration range to be used. This procedure assures the operator that the analyzer is operating properly and will generate reliable data.

Some general points to consider when calibrating the ISPI 101 are that the

analyzer is designed for operation at ambient conditions and therefore the gas standards used for calibration should be delivered to the analyzer at ambient temperatures and pressure and at the proper flow rates.

The instrument shall be internally calibrated with benzene on an annual basis. This shall be accomplished by the Industrial Hygienist and/or designee. Calibrations with benzene of any other toxic or hazardous gases must be done under a hood. Reference will be made to calibration checking with isobutylene. This shall also be referred to as a calibration. Isobutylene is used as a reference gas and the instrument is calibrated externally by adjusting the external span control knobs. Isobutylene is a non-toxic gas, therefore these calibrations do not have to be done under a hood.

The frequency of calibration should be dictated by the usage of the analyzer and the toxicity of the species measured. If the analyzer has been serviced or repaired, calibration should be done to verify operation and performance. When using the instrument at possible hazardous waste sites or in situations involving unknown chemicals, the instrument should be calibrated daily in a "clean" non-hazardous area.

The calibration results, along with instrument field readings must be recorded in the orange health & safety log book.

Best operation of the analyzer is accomplished by its calibration for the gas to be measured. In cases where it becomes necessary to operate with a gas for which it has not been calibrated and recalibration is not possible, correction can be made to the meter reading. One method is to multiply the meter reading by a correction factor. This equation and accompanying photoionization sensitivities can be found in section 8.4 and Table 8-14 respectively in the HNU Instruction Manual. This is to be used only when measuring a <u>known</u> solitary gas. It cannot be used with gas mixtures. Consult sections 8.1 and 8.3 of the HNU Instruction Manual for calibration with a special mixture or with an alternate gas.

<u>Probe</u>

1. Identify the lamp by the probe label. If a question exists, disassemble the probe and inspect the lamp. The energy of the lamp is etched into the glass envelope. If the lamp appears to need cleaning, see the Section titled, "*UV Lamp and Ion Chamber Cleaning*".

2. Connect the probe to the read-out assembly. A small "click" will indicate that the probe is fitted securely into the instrument.

3. The calibration cylinder should be consulted for the proper value (ppm) for the probe being calibrated. Refer to the following Section titled, "*Calibration Checking with Isobutylene*".

4. Check the Ionization Potential (IP) of the calibration gas to be used. <u>The IP of the calibration gas must be at or below the IP of the lamp.</u>

5. Proceed with the calibration as described below.

<u>Calibration Checking with Isobutylene</u>

The calibration of the analyzer can be rapidly checked by the use of an HNU

small disposable cylinder containing isobutylene and a regulator. Consult Section 3.4 of the HNU Instruction Manual for internal calibrations with benzene.

1. Battery check - with the probe attached, turn the function switch to BATT. The needle should be in the green region. If not, recharge the battery.

2. Zero set - with the probe attached, turn the function switch to STANDBY. In this position the lamp is OFF and no signal is generated. Set the zero point with the ZERO set control.

3. Connect the analyzer to the regulator and cylinder with a short piece (butt connection) of tubing. The calibration gas in the cylinder consists of a mixture of isobutylene and zero air. Isobutylene is nontoxic and safe to use in confined areas. There are no listed exposure levels at any concentration.

   The regulator sets and controls the flow rate of gas at a value preset at the factory. This will be about 100 - 200 cc/min.

   It is important that the tubing be clean since contaminated tubing will effect the calibration reading. Do not use the cylinder below about 30 psig as readings below that level can deviate up to 10% from the rated value. Notify the instrument technician when a cylinder is at 30 psig so additional gas cylinders can be ordered. Safely discard the disposable cylinder when empty.

4. Open the valve on the cylinder until a steady reading is obtained. This should take 30-60 seconds.

5. Turn the function switch to the range position and note the meter reading. Adjust the SPAN control setting as required to read the ppm concentration of the standard for the probe being used. The span should not have to be adjusted below 3.0. Notify the instrument technician if this is the case. This indicates that either the lamp is dirty, the lamp needs to be replaced, or the instrument needs to be calibrated internally with benzene.

6. Shut off the cylinder as soon as the reading is established.

7. Record and maintain this new SPAN setting.

Maintenance

Introduction

User maintenance of the analyzer consists of cleaning the lamp and ion chamber, and replacing the lamp or ion chamber. Other component parts or subassemblies may be serviced only by a service person trained and authorized by HNU Systems, Inc. HNU Systems has made this policy to maintain the Intrinsically Safe properties of the ISPI 101.

> ***WARNING:** Turn off the function switch on the control panel to the OFF position before probe disassembly. Otherwise, high voltage of 1000 VDC will be present in the probe assembly.*
>
> ***Do not look at the light source from closer than 6 inches with unprotected eyes. Observe the source only briefly. Continued***

exposure to ultraviolet energy generated by the light source can be harmful to eyesight. The lamp cannot be observed with the probe extension attached.

Do not interchange lamps of different eV ratings in a probe. Amplifier and other components are selected for a specific eV lamp. A probe with the wrong lamp will not operate properly.

Cleaning Procedure for ISPI 101 Lamps and Ion Chamber

During periods of operation of the analyzer, dust or other foreign matter could be drawn into the probe, forming deposits on the surface of the UV lamp or the ion chamber. This condition is indicated by meter readings that are low, erratic, unstable, non-repeatable, or drifting, or apparently due to moisture sensitivity. These deposits interfere with the ionization process and cause erroneous readings. Check for this condition monthly or more often as required. Cleaning can be accomplished as follows:

Lamp Removal

1. Remove 5/32" hex screw (exhaust screw) with Allen wrench provided. Slide the innards out of the probe shell.

2. Remove the probe from the unit. Hold the probe upright, cable down. Remove the two cross-headed screws that hold the black end cap. Carefully remove the end cap. Remove the two screws holding the ion chamber on, and lift the chamber off of the probe.

3. Loosen the small set screw in the side of the lamp housing, place your hand over the end of the probe and tilt. The lamp will fall into your hand. Notice the eV number etched on the lamp.

Lamp Cleaning: 10.2 and 9.5 eV

1. Put a small drop of HNU Cleaning Compound (Part #80-PA 101534-A1) (or GLEEM™ toothpaste on the lens of the lamp (the small glass circle on the metal end).

2. Using a nonlinting tissue, rub in a circular motion until all residue is removed.

3. Rinse with hot, clean tap water, and dry with nonlinting tissue.

4. If the lens is still not clean, repeat Steps 1, 2, and 3.

Lamp Cleaning: 11.7 eV

1. Clean the lens only (the small glass circle on the metal end) with Freon™ or any chlorinated organic solvent to remove any deposits, using a non-linting tissue.

2. Do **NOT** use HNU Cleaning Compound, water, or any water-miscible solvent on these lamps.

Ion Chamber Cleaning

1. Remove the "O" Ring from the side opposite the wire mesh and save.

2. Agitate the whole assembly in a beaker of methanol or acetone, or place the beaker and contents in an ultrasonic bath for ten minutes.

3. Remove the beaker and shake out the surplus solvent. Dry overnight at room temperature or bake for two hours in a drying oven at 100°C. Do not dry at temperatures over 100°C. Allow chamber to cool completely before reinstalling.

4. In an emergency, careful use of a hair dryer is permissible.

Reassembly

1. Hold the probe upright, cable down, and replace the lamp with the lens uppermost. Tighten the set screw in the lamp housing after insertion.

2. Replace the "O" Ring in the groove in the ion chamber (side opposite the wire mesh).

3. Place the ion chamber over the lamp with the wire mesh side on top. Make sure all the connection pins, screw holes, and the vent hole in the ion chamber are correctly aligned. (The small vent hole in the ion chamber lines up with the vent hold in the probe, which has a small black "O" Ring around it). Secure the chamber with the two screws.

4. Replace the probe cap, noting the alignment of screw holes. Replace the two screws and tighten evenly.

5. Replace the lamp housing in the probe shell, aligning the exhaust ports and the amplifier board connector. Secure with the hex exhaust screw.

6. Reattach the probe to the analyzer and check the analyzer operation.

7. If performance is still not satisfactory, replace the lamp.

The unit is now ready to be used.

Lamp Replacement

> ***CAUTION: Do not interchange lamps of different eV ratings in a probe. Amplifier and other components are selected for a specific eV lamp. A probe with the wring lamp will not operate properly.***

To replace the lamp, disassemble the probe, remove the old lamp, install a new one of the same eV rating and reassemble. Record this on the HNU's Data Sheet which is located in the top drawer Equipment Files in Room 212.

> ***WARNING: Turn off the function switch on the control panel to the OFF position before probe disassembly. Otherwise, high voltage of 1000 VDC will be present in the probe assembly.***

Lamp eV Power Change

If different applications for the analyzer would require lamps of different eV power, then separate probes, each with its own eV lamp must be used. A single read-out assembly will serve for any of the probes. A change in probe will require resetting of the ZERO control and the SPAN control. Calibration should be checked to verify proper operation.

Probe Assembly/Disassembly

> ***WARNING: Turn off the function switch on the control panel to the OFF position before probe disassembly. Otherwise, high voltage of 1000 VDC will be present in the probe assembly.***

Disassemble the probe by first removing the exhaust screw at the base of the probe adjacent to the handle using the 5/32" hex key (Allen wrench). Disconnect the probe cable connector at the read-out assembly. Grasp the end cap in one hand and the probe shell in the other, gently pull to separate the end cap and the lamp housing from the shell.

Hold the lamp housing with the black end cap upright. Loosen the screws on the top of the end cap, separate the end cap from the lamp housing. Remove the two screws on the ion chamber and separate the chamber from the lamp housing. To remove the lamp, locate the lamp retaining screw on the side of the lamp housing and remove.

> ***CAUTION: Care must be taken so that the lamp does not fall out of the lamp housing when the retaining screw is removed.***

Place one hand over the top of the lamp housing and tilt slightly. The light source will slide out of the housing.

Reassemble the probe by first sliding the lamp back into the lamp housing and aligning the screw hole in the lamp retaining ring with the aperture on the side of the lamp housing, then install the lamp retaining screw and tighten.

> ***CAUTION: Overtightening this screw may break the lamp. DO NOT OVERTIGHTEN.***

Place the ion chamber on top of the lamp housing, making sure that the contacts and the vent hold are properly aligned. The ion chamber fits only one way; secure it with the two screws.

If the ion chamber is to be replaced, always use one identical to the one being removed. Check the aperture (small: 3.0 mm, used with the 10.2 eV lamp; large: 6.0 mm, used with the 9.5 and 11.7 eV lamps) at the top of the ion chamber and materials of construction (gold-plated or Teflon™) to ensure proper replacement. See Parts List.

Check the ion chamber electrodes (on the side with NO mesh): the collecting electrode (a disk about 1" in diameter) must not touch the polarizing electrode (the central pin). If they do, call HNU Systems, Inc.

Place the end cap on top of the ion chamber and replace the two screws. Tighten the screws only enough to seal the "O" Ring.

CAUTION: DO NOT OVERTIGHTEN THESE SCREWS

Line up the pins (pogo contacts) on the base of the lamp housing with the pins inside the probe shell. Gently slide the housing assembly into the probe shell.

The end cap should meet the probe shell evenly after final assembly. If not, the ion chamber may be installed wrongly.

CAUTION: DO NOT FORCE the assembly into the shell. It fits only one way.

If the probe does not reassemble readily, remove it from the shell and check pin alignment. Check to ensure pogo contacts are not bent. Refasten the exhaust screw at the base of the probe.

Align the 12-pin probe connector to the read-out assembly and reconnect with a twisting motion until a click occurs. The lamp should light if the function switch is turned to any position except **STANDBY**.

Read-out Unit

WARNING: The read-out Unit should NEVER be opened except by a service person certified and authorized by HNU Systems, Inc. Leave the case on the Read-out Unit, which is fitted with a tamper-proof seal.

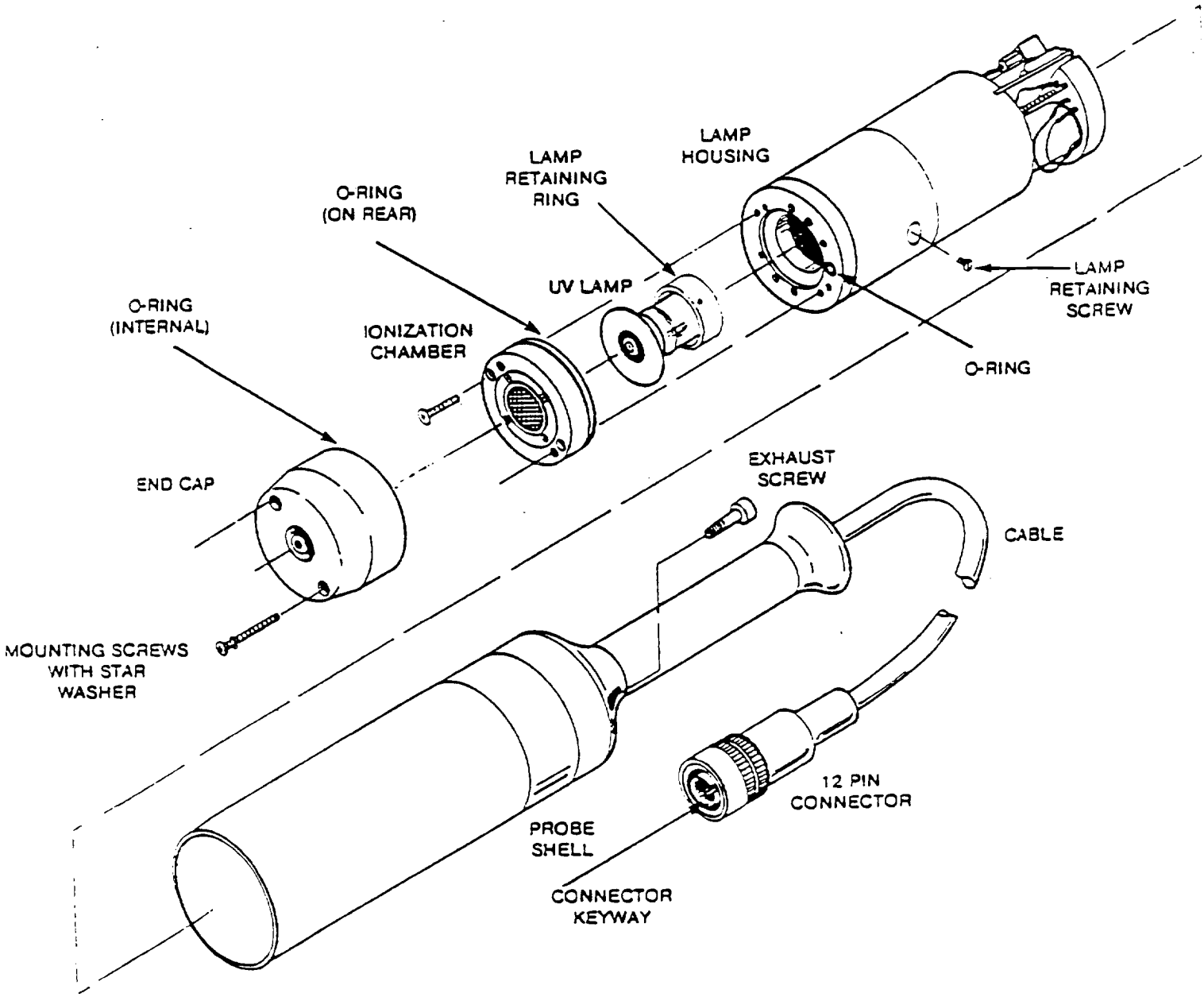


FIGURE 5-1
PROBE ASSEMBLY

5.13 CHARCOAL BADGE SAMPLING

This procedure is for breathing zone sampling of workers for organics. This method is accomplished by means of diffusion rather than pulling a volume of air with a pump.

Operation

1. Remove badge from sealed package.
2. Attach to worker's collar as close as possible to the breathing zone with grid-side out.
3. Record sample start time.
4. Sample 8 to 10 hours whenever possible.
5. Remove badge from worker's collar at end of sample period.
6. Record sample stop time.
7. Pull badge apart.
8. Remove capsule from badge.
9. Place capsule in supplied pouch and seal.
10. Submit to laboratory for analysis, requesting needed vapors. This badge is approved for organics as listed on the attached page.
11. If suspected organics are encountered that are not on the attached page, contact the Industrial Hygienist for guidance.

Acetone
Acrylonitrile
Allyl Alcohol
Allyl Chloride
Amyl Acetate
iso-Amyl Acetate
sec-Amyl Acetate
Amyl Alcohol
iso-Amyl Alcohol
sec-Amyl Alcohol
Amyl Butyrate
Amyl iso-Butyrate
Amyl Formate
iso-Amyl Formate
Amyl Propionate
Benzene
Benzonitrile
Benzyl Acetate
Benzyl Alcohol
Benzyl Chloride
Bromoform
Butoxyethanol
Butyl Acetate
iso-Butyl Acetate
sec-Butyl Acetate
tert-Butyl Acetate
Butyl Alcohol
iso-Butyl Alcohol
sec-Butyl Alcohol
tert-Butyl Alcohol
Butyl Ether
iso-Butyl-iso-Butyrate
iso-Butyl Formate
Butyl Glycidyl Ether
Butyl Propionate
iso-Butyl Propionate
p-tert Butyl Toluene
Camphor
Carbon Disulfide
Carbon Tetrachloride
Cellosolve
Cellosolve Acetate
Cellosolve, Methyl
Chlorobenzene
Chlorobromomethane
Chloroform
Cumene
Cyclohexane
Cyclohexanol
Cyclohexanone
Cyclopentane
p-Cymene
Diacetone Alcohol
1,2-Dibromoethane
(Ethylene Bromide)
Dibutyl Phthalate
o-Dichlorobenzene
Dichlorodifluoromethane

1,1-Dichloroethane
1,2-Dichloroethane
(Ethylene Dichloride)
Dichloroethyl Ether
Dichloromethane
(Methylene Chloride)
Diethyl Phthalate
Diethylene Glycol
Diethylene Glycol Monoethyl
Ether
2,2-Dimethylbutane (neo-Hexane)
Dioxane
Ethyl Acetate
Ethyl Acrylate
Ethyl Benzene
Ethyl Bromide
Ethyl Butyl Ketone
Ethyl Butyrate
Ethyl Ether
Ethyl Formate
Ethyl Propionate
Ethylene Chlorohydrin
Ethylene Glycol Monoethyl Ether
(Cellosolve)
Ethylene Glycol Monoethyl Ether
Acetate (Cellosolve Acetate)
Ethylene Glycol Monomethyl Ether
(Methyl Cellosolve)
Ethylene Glycol Monomethyl Ether
Acetate (Methyl Cellosolve Acetate)
Glycidol (Glycide)
Heptane
Hexane
Isophorone
Mesitylene
Mesityl Oxide
Methyl Acetate
Methyl Acrylate
Methylal (Dimethoxy Methane)
Methyl Amyl Ketone
Methyl Butyl Ketone
Methyl Butyrate
Methyl iso-Butyrate
Methyl Chloroform
Methyl Cyclohexane
Methyl Cyclopentane
Methyl Ethyl Ketone
Methyl Formate
Methyl Isobutyl Carbinol
Methyl Isobutyl Ketone
2-Methyl Pentane (Isohexane)
3-Methyl Pentane
Methyl Propionate
Methyl Propyl Ketone
a-Methyl Styrene
Methylene Chloride
Nitrobenzene
Octane
Pentane
iso-Pentane (2-Methylbutane)
Perchloroethylene
(tetra-Chloroethylene)

Phenyl Ether (Diphenyl Oxide)
Phenyl Glycidyl Ether
Propyl Acetate
iso-Propyl Acetate
Propyl Alcohol
iso-Propyl Alcohol
iso-Propyl Benzene (Cumene)
iso-Propyl Ether
iso-Propyl Glycidyl Ether
Propylene Dichloride
Pyridine
Stoddard Solvent
Styrene
1,1,1,2-Tetrachloro-2,2-difluoroeth
1,1,2,2-Tetrachloro-1,2-difluoroeth
1,1,2,2-Tetrachloroethane
Toluene
1,1,1-Trichloroethane
1,1,2-Trichloroethane
Trichloroethylene
1,1,2-Trichloro-1,2,2-trifluoroet r
Vinyl Chloride
Vinyl Toluene
Vinylidene Chloride
m-Xylene
o-Xylene
p-Xylene

5.14 MAINTENANCE CHECKLIST FOR HNU PHOTO IONIZATION DETECTOR

The purpose of this checklist is to provide information confirming HNU maintenance and that it is in operable condition. The maintenance checks will be conducted monthly by the ES&H Instrument Technician.

Materials and Equipment

- HNU photo ionizer
- HNU maintenance checklist
- Calibration gas cylinder and regulator
- Allen wrench

Procedure

1. Accurately complete checklist items as listed below. Procedures for instrument maintenance and calibration can be found in the HNU Instruction Manual.

2. Check for physical damage to the instrument.

3. Clean the lamp lens.

4. Perform a calibration check with Isobutylene. Clean lamp lens again if the span has to be adjusted below 6.0. If the span has to be adjusted below 3.0, call HNU Service Representative as the lamp needs to be replaced, or the instrument needs to be calibrated internally with benzene.

5. The ion chamber needs to be cleaned only if it gets damp or if there is a lot of humidity in the air. To ascertain if it needs cleaning, blow into the probe. If you get a negative deflection of the needle/meter reading, then the chamber needs to be cleaned.

6. Note the date of completed checklist on the instrument

7. Supply check - ensure the minimum number of the following are on hand:
   - 3 full tanks of calibration gas (isobutylene). Discard any containing less than 30 psig
   - 1 battery
   - 1 "O" ring for the ion chamber

8. File the HNU Maintenance Checklist in Room 212.

MAINTENANCE CHECKLIST FOR HNU PHOTO IONIZATION DETECTOR

DATE	SERIAL NO.	BATTERY CHECK	CALIBRATION (SPAN SET)	LAMP CLEANED	ION CHAMBER CLEANED	INSTRUMENT CASE APPEARANCE

5.15 Recording Hazardous Waste Monitoring

The purpose of this procedure is to outline guidelines for recording hazardous waste monitoring. Accurate monitoring records need to be kept for possible exposures, to aid in laboratory analysis of unknowns, and for legal purposes. Records will be kept in one of two orange log books which are checked out from the Industrial Hygienist.

Materials

- Orange Logbook
- Water repellent pen

Procedure

On vicinity properties, monitoring for hazardous waste will be done where there is occupational concern for possible exposures, and/or monitoring instrumentation is used to determine the extent of co-mingled tailings.

Monitoring at non-UMTRA properties/possible hazardous waste sites (i.e. Denver Radium Sites, Air Force Sites).

The following shows the format that is to be used in the logbooks. The forms themselves are self explanatory with the exception of the "comments" column. The following should be addressed in this column:

- PPE worn, including respirator type and cartridges
- Condition of the soil: wet/dry
- Sampling medium: color, smell, density (clay or sandy)
- Any weather condition changes, i.e., precipitation, record <u>all</u> wind changes
- Radiological readings
- Interferences with instrument readings; inversion conditions, exhaust from vehicles in the immediate area, incinerators

MONITORING UMTRA SITES FOR HAZARDOUS WASTES

DOE ID #: DATE:
HP TECHNICIAN:
CONSTRUCTION INSPECTOR:
WEATHER:

HISTORY OF SITE:

LAB ANALYSIS:

PERSONNEL:

INSTRUMENTATION USED	SERIAL #	CALIBRATION

TIME	LOCATION	READINGS BACKGROUND	SOURCE	BREATHING ZONE	COMMENTS
					PPE RESPIRATOR SOIL CONDITIONS WEATHER CONDITIONS RAD READINGS EXHAUST IN AREA

MONITORING AT HAZARDOUS WASTE SITES

SITE LOCATION: DATE:
HP TECH:
WEATHER:

PERSONNEL:

INSTRUMENTATION USED	SERIAL #	CALIBRATION

		READINGS			
TIME	LOCATION	BACKGROUND	SOURCE	BREATHING ZONE	COMMENTS
					PPE RESPIRATOR SOIL CONDITIONS WEATHER CONDITIONS RAD READINGS EXHAUST IN AREA

5.16 Operation of Quest Ele Model CA 12A Sound Calibrator and Quest Ele Model M-7B Noise Dosimeter

55 109

This procedure describes the operation of the Quest Electronic Model CA-12A sound calibrator and Quest Electronics Model M-7B Noise Dosimeter. Both are used with the goal of measuring decibels per hour (dB/hr) to determine noise exposure for personnel at the job site.

References

- o UNC ES&H Procedures Manual, Chapter 8.
- o Quest Electronics Model CA-12A Instruction Manual
  Quest Electronics Model M-78 Instruction Manual
- o OSHA 29 CFR 1910.95

Equipment and Material

- o Quest Electronics Model CA-12A sound calibration
- o Quest Electronics Model M-78 noise dosimeter
- o Calibration date record
- o Noise Survey Record

Procedures

1. Turn on the Model CA-12A sound calibrator and observe, if the indicator needle enters the red area replace the battery.

2. To calibrate the Quest Electronic M-7B, place the M-7B microphone adapter into the coupler cavity of the CA-12A with the smooth numbered side facing away from the body of sound calibrator.

3. Place M-7B microphone in adapter carefully and turn the calibrator on. Be sure the "Batt" indicator is not in the red area.

4. Proceed to verify test instrument (M-7B) accuracy by following the calibration procedure for that instrument.

5. To calibrate turn unit on. Press and hold, read button for 5 seconds. The 5-digit display and the indicator light labeled "Batt" should light and remain on for at least 5 seconds to indicate that the battery has sufficient power to operate the M-7B for at least 8 hours. If not, replace battery. Replace battery with 9-volt alkaline battery only!

6. After battery verification of the M-7B with the noise dosimeter on, turn on CA-12. Wait 10 seconds for the M-7B to stabilize. Reset

the dosimeter and time a one-minute period, using a stop watch. At the end of the one minute, turn the calibrator off. At the end of the timed period, the read-out should be between 002.98 and 003.94, based on a ±1dB tolerance with 003.42 being exact. If the count is too high, turn the gain adjust screw (near the microphone cable outlet) slightly counterclockwise. If the count is too low, turn the screw slightly clockwise. Then recheck calibration.

7. To take a measurement, turn the calibrated M-7B on. Be sure to reset the counter and the 115dB(A) indicator and attach the M-7B to either the belt or shirt pocket. The detachable security cover may be used to prevent tampering with the dosimeter. Clip the microphone to the shirt or jacket collar with the wind screen (gray foam accessory) in place over the microphone (used to protect the microphone from wind and debris).

Take the exposure measurement for either a short-term sample or an all-day monitor. If noise levels vary considerably, monitor the noise for the full work day.

At the end of the exposure period, depress the read button. The noise dose for the duration of the period is displayed along with the 115dB(A) indicator if 115dB(A) was exceeded. The "Batt" indicator should light for a minimum of one second, indicating that the battery power was sufficient during the measurement period. Record the measurement. Then turn off M-7B.

Note: 1. The M-7B measures and accumulates noise and produces a continuous reading of the percentage of the allowable exposure to which the wearer has been subjected. The unit can be used for short-term sample tests with the read-out quickly converted both to the equivalent dB(A) sound level and to the maximum time a worker can be in the noise environment. Refer to the conversion chart.

2. Noise levels above 115dB(A) will activate an interval electronic latch and indicated by a small light below the exposure display when the **READ** button is depressed. A one-second time delay prevents activation of the latch impulse noises.

5.17 SAMPLE PUMP CALIBRATION

GILIAN GILIBRATOR CALIBRATION SYSTEM

The Gilibrator is a high accuracy, electronic bubble flowmeter that provides instantaneous air flow readings and cumulative averaging of multiple samples. The system provides a large range through the use of two different flow cell assemblies. A "delete" function on the control unit subtracts erroneous readings to insure accurate data. The control unit also supports a hard copy printout through the use of the printer accessory.

The standard flow cell is used for flow rates from 20 cc per minute to 6 LPM. The high flow cell is used for flows for 2 LPM to 30 LPM.

(PLEASE GO TO NEXT PAGE)

Operating Procedures

1. Initial Set-up

This covers all steps necessary to bring the Gilibrator into operating status. This includes charging, cell mounting, installing soap solution, connecting the printer (optional) and connecting the sampling source.

A) Charging the Gilibrator

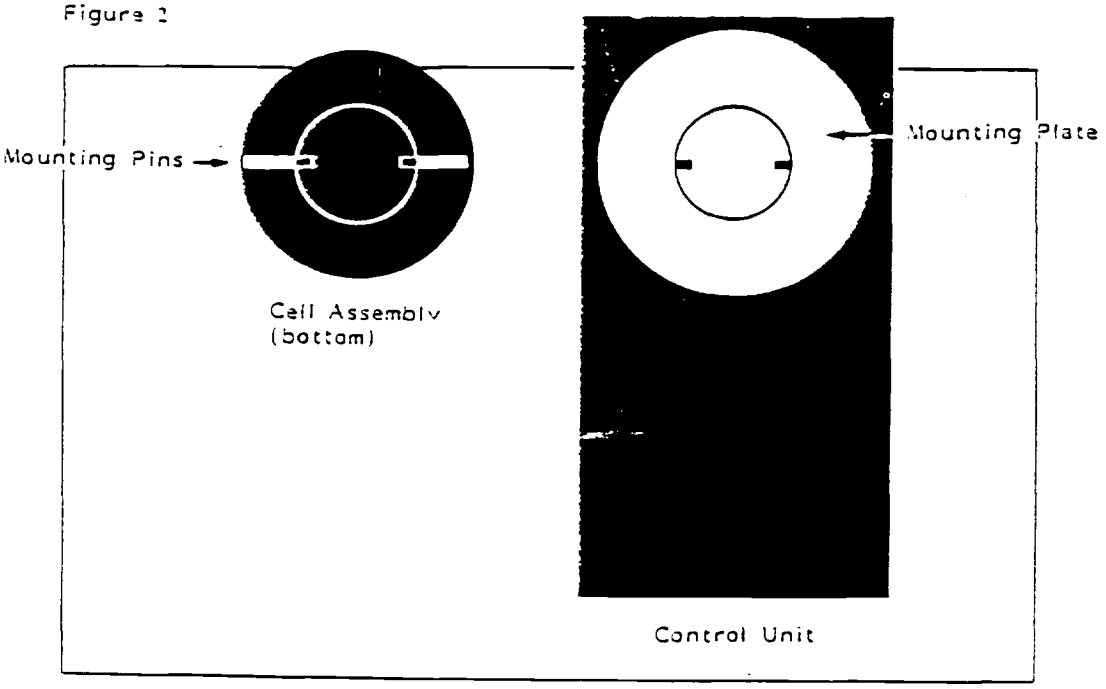
1. Prior to operation, plug the 120V charger into the wall and connect to the Charging Jack (13) on the right side of the Control Unit. The unit's Charging LED (11) will light indicating that the unit is charging properly. Allow the battery system to charge for 14 hours prior to operation.

B) Mounting the Flow Cell Assembly (See fig. 2)

1. Select the Flow Cell Assembly to cover the flow range required.

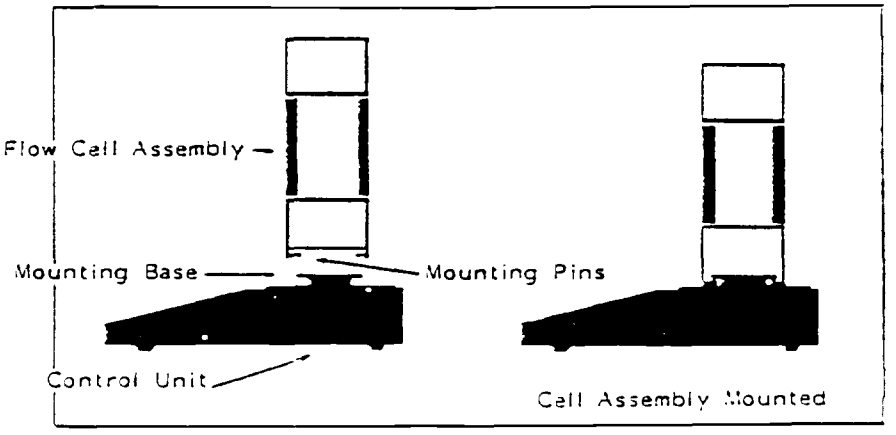
2. The bottom of the Flow Cell Assembly employs a quick mount feature. The base of the Flow Cell Assembly is positioned onto the mounting plate (10) of the Control Unit (14).

Figure 2



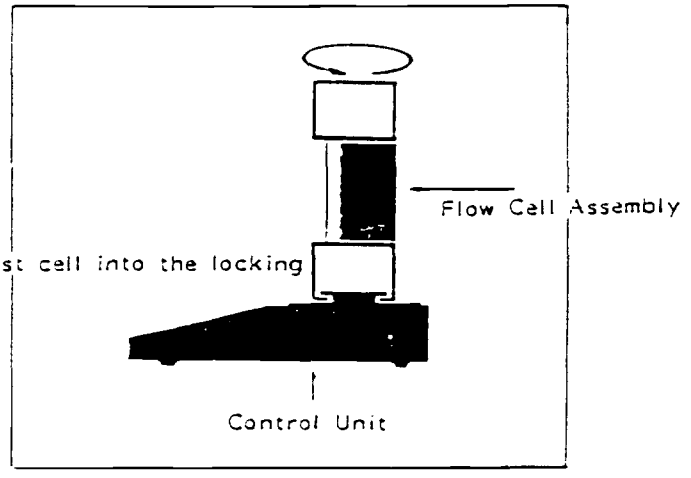
3. Engage the pin of the cell assembly base into the mounting plate of the Control Unit. When the Flow Cell Assembly is properly engaged, the base of the cell will be flush to the mounting plate and the cell assembly will face towards either the right or left side. (See fig. 3)

Figure 3



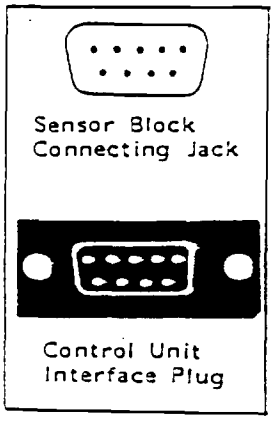
4. Grasp the bottom cell chamber and rotate the cell until it clicks in. CAUTION: **Always engage & disengage the cell by grasping and rotating only the bottom cell chamber.** The cell assembly will now face forward. (see Fig. 4)

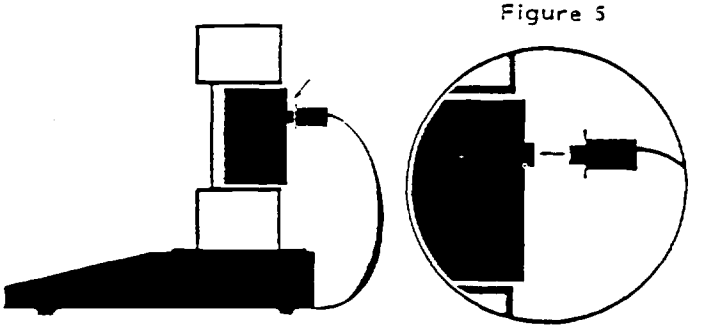
Figure 4



5. Insert the Control Unit's Cable Assembly (5) into the Sensor Block Connecting Jack (6) located on the back of the Sensor Block (8). (See fig. 5)

Figure 5





Connecting the Control Unit's Interface Plug to the Sensor Block's Connecting Jack.

C) Adding the Gilibrator Soap Solution

1. Remove the Storage Tubing (25) from the upper Outlet Boss 26) of the upper cell. Fill the dispenser bottle provided with Gilibrator soap solution. Using the rubber Storage Tubing as a funnel, slowly add soap solution from the dispenser.

2. The amount of soap needed is determined by depressing the Bubble Initiate Button (22) and holding it down in the lower position. Continue to add enough soap solution until the angled edge at the bottom of the Bubble Generator Ring (21) is immersed in the solution. **Do Not Overfill!** (See fig. 6)

3. After filling is completed, the rubber Storage Tubing (25) may be removed completely. Recap the soap dispenser bottle for later use. NOTE: **If the Flow Cell Assembly is not going to be used for a prolonged period of time, reinstall the rubber Storage Tubing between the inlet and outlet bosses (23 & 26). This will prevent evaporation from occurring which may cause the solution's concentrations to alter.**

D) Printer Connection (if applicable)

1. Connect printer cable to Printer Jack connector (18) on the left side of the Control Unit. Be sure to properly match up connectors before engaging.

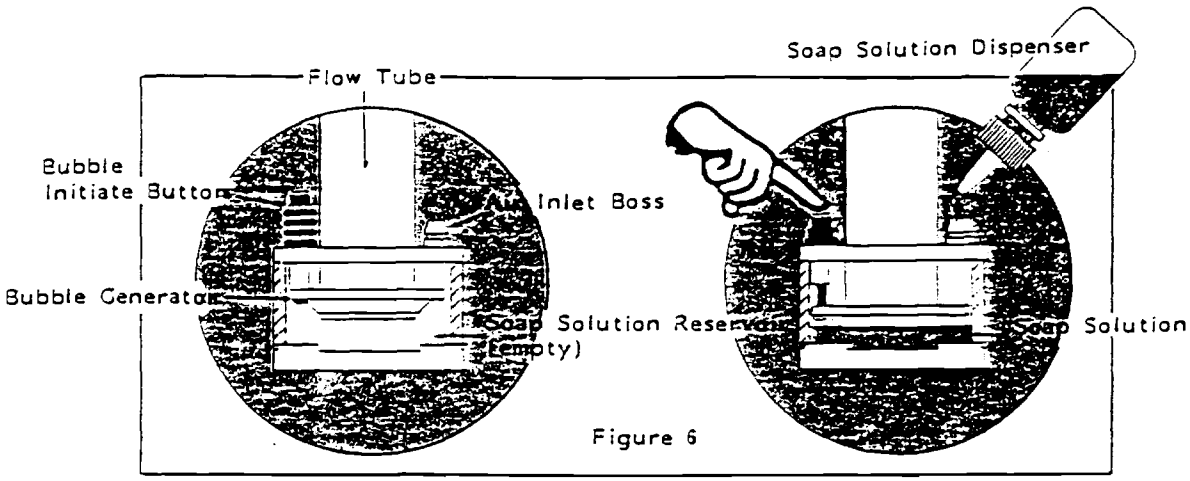


Figure 6

E) Connect the Sampler

1. Connect the air sampler to be calibrated to the Upper Outlet Boss (26) of the Flow Cell Assembly with 1/4" ID tubing. NOTE: An auxillary liquid trap between sampler and flow cell is recommended to prevent moisture carry over into the sampler during continuous calibration periods.

2. Operation

A) Conditioning the Flow Tube

1. Turn on the sampler. Depress the Bubble Initiate Button (22) several times to wet the inner walls of the flow tuce (24). You will not be able to initiate a timing bubble without first "Priming" the flow tube. The operator will develop a feel for bubble generation with practice.

B) Power Up

2. After the Flow Tube walls have been "primed", turn on the Power Switch (12) of the Gilibrator Control Unit (base) and the Printer Module if one is being used. Wait approximately 10 seconds while the system runs through it's check sequence. The Run LED (20) will light at this time as well as a Lo Battery indication and a series of five dashes displayed on the LCD Readout (19). Do not operate the Gilibrator until the Run LED signal extinguishes. Ready operation is indicated by a series of 4 dashes.

C) Bubble Generation

1. For optimum bubble generation, depress the Bubble Initiate Button (22) and hold to initiate 1 bubble up the flow tube. Release the button to initiate a second bubble up the flow tube. This will be the standard procedure to making clean, consistent bubbles at High and Medium flow ranges.

2. As the bubble rises up the Flow Tube (24), it will initiate a timing sequence when it passes the lower sensor (Run LED will light) and culminate the timing sequence upon passing the upper sensors (Run LED will extinguish). The timing information is then transmitted to the control unit which will perform all the necessary calculation. A flow reading will instantaneously appear on the LCD display (19).

However, if a bubble breaks before the time sequence is completed, timing will continue until another bubble is generated to trip the second sensors. This will cause an erroneous reading and should be subtracted from the average by hitting the Delete Button (16).

If a Printer Module is used, be sure the printer has completed it's printing sequence before pressing the Delete Button. When the Delete Button is activated, a negative symbol will be displayed on the LCD of the Control Unit and the printer will initiate a line showing this subtraction.

D) Flow Readout

With Printer Option - The printer will print in sequence the flow, average and sample number of each successive bubble reading.

Without Printer Option - The Control Unit will display the actual flow for each sample and will accumulate and average each successive reading.

1. Average (15) - In order to display average and number of samples, depress and hold the Average Button. Releasing the button will display the last flow reading. Repressing the button will display the number of samples accumulated for that averaging sequence and releasing will once again display the last flow reading. Additional pressing and holding will repeat this sequence.

2. Delete (16) - To delete obvious false readings, push the Delete Button which will automatically delete the false information from the average and reset the average and sample number back to the previous reading.

3. Reset (17) - To reinitiate the sequence for additional pumps, hit the Reset Button. This will zero out all sample and average registers within the Control Unit and will cause the printer to index oneline and reprint sequence headings. This denotes the start of a new sequence. The Reset Button is also used if a malformed bubble is generated and has not been been subtracted from the average byuse of the Delete Function.

Storage & Maintenance

1. Storage

A. Take Down
Turn OFF the Control Unit, the sampler and the Printer Module (if applicable).

B. For Daily Use
If Gilibrator is to be used daily, it is recommended that the air sampler be removed and the Storage Tubing be replaced between the upper and lower cell chambers. Plug in the Charger and connect into the Control Unit Charging Jack (13). Recharge overnight for next day usage.

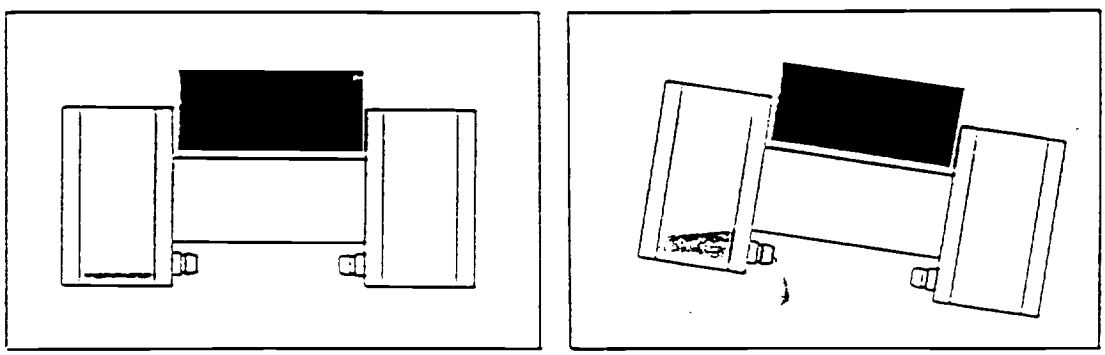
C. Long Term Storage
If the Gilibrator is not to be used for long periods of time, the following steps should be taken to keep the unit in proper working order.

1. Disconnect the Cable Assembly from the back of the Sensor Block on the Flow Cell Assembly.

2. Remove the Flow Cell Assembly from the Control Unit (base). Remove the Cell from the base in the reverse order in which it was mounted.

3. Pour soap solution out of the Bubble Generator through the Lower Inlet Boss (23) By holding Bubble Generator horizontally and with the inlet boss facing down, tilt at a 45 degree angle. Continue until all of soap solution has poured out. (See fig. 7)

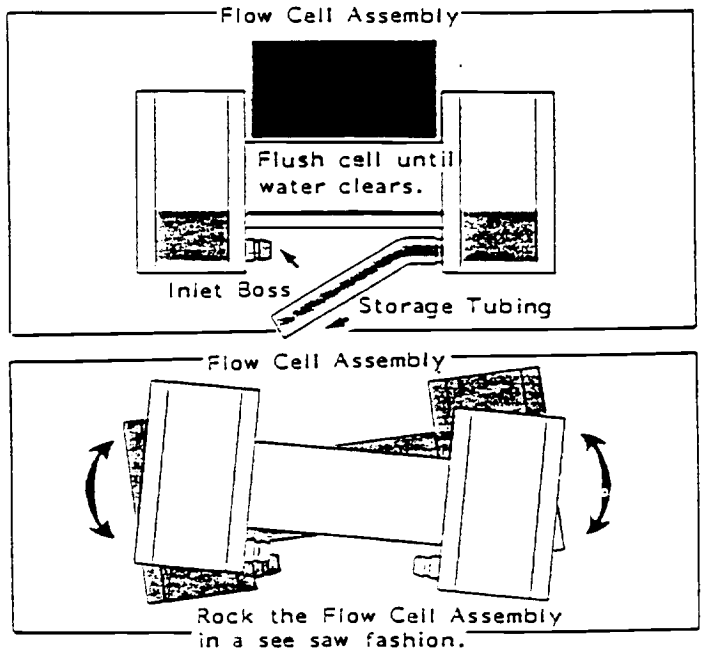
Figure 7



4. Flushing the Bubble Generator Clean - There are 2 methods in which to cleanse the Bubble Generator.

a. The unit may be flushed clean by connecting Storage Tubing to the Upper Outlet Boss and continuously running water through the generator until water runs clear. Maintain a horizontal position with cell bosses facing down and flush for 15 - 30 seconds. Then remove tubing and rock the cell in a see-saw fashion to empty out all excess water. Replace Seal Tubing between the Upper and Lower Cell bosses. (See fig. 8)

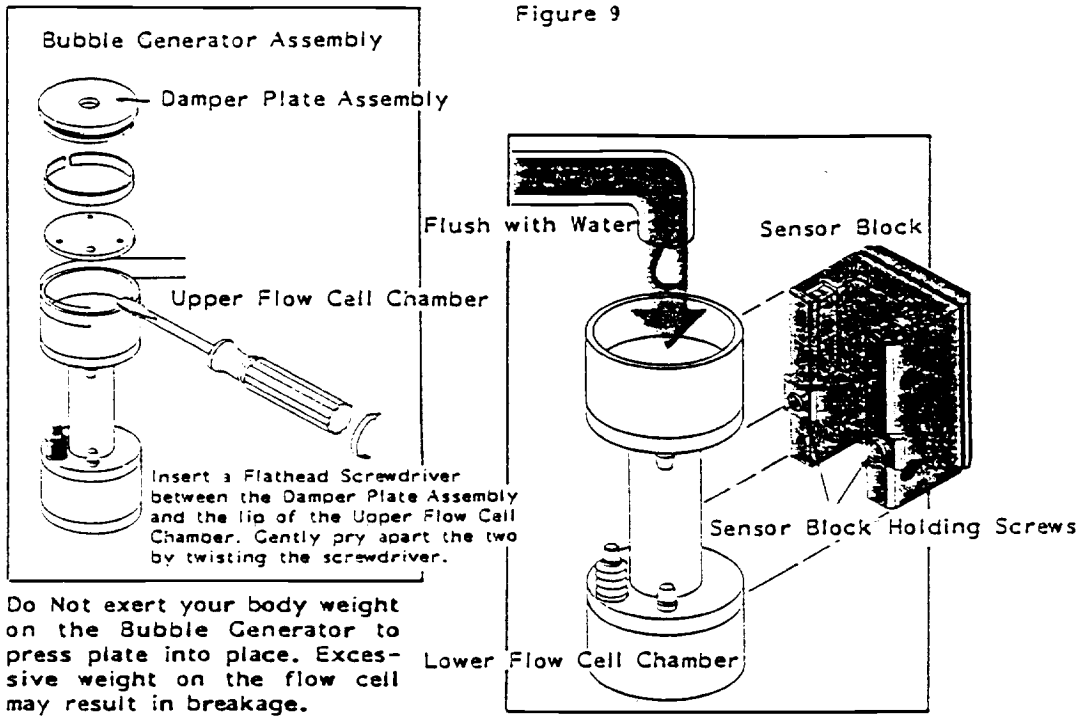
Figure 8



or (see Figure 9)

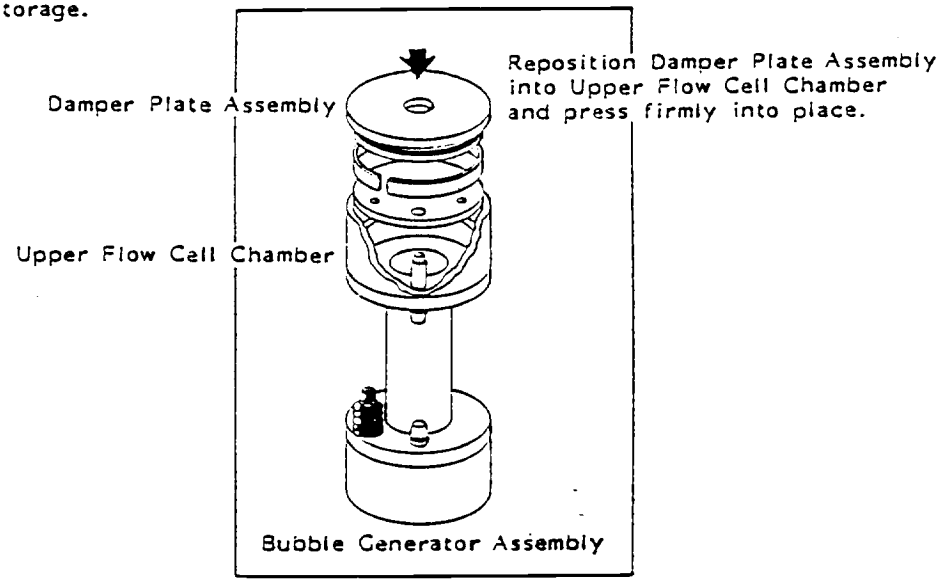
b. Remove the Sensor Block Assembly by loosening the 2 holding screws and sliding the block out from between the Upper & lower cell chambers. Remove Safety Tape. Using a small flat blade screw driver, lift off the Damper Plate (2) using the notch between the upper chamber and the lid. Remove the Spacer (3) and then the Bubble Breaker Plate (4). This gives complete access to the interior of the Flow Cell Tube. Continue to run clear water through the cell until water runs clear. Rock cell to empty out all excess water. Replace the Bubble Breaker Plate (4) and center the Air Outlet Boss (26) with the plates largest hole. Next insert the spacer. To replace the Damper Plate assembly, moisten the O-ring (2b) with soap solution and then press the Damper Plate into the top of the Upper Cell Chamber. Use fingers and firmly sqeeze plate into upper flow cell chamber.

Figure 9



Do Not exert your body weight on the Bubble Generator to press plate into place. Excessive weight on the flow cell may result in breakage.

Replace the Seal Tubing between the Upper and Lower cell bosses for storage.



2. Maintenance

The Gilibrator is designed so that little maintenance is required. The area which may need replacement is the Damper Diaphragm assembly. If the diaphragm becomes ruptured or worn please use the following procedure for its replacement.

a. Removing and Replacing Damper Plate Diaphragm

First, remove flexible Safety Tape (27) from around the lip of the Damper Plate assembly. 1) Using a small flat blade screwdriver, remove the Damper Plate (2) from the Upper Cell Chamber using the notch provided. Remove the large O-ring (2b) and the Pulsation Damper diaphragm (2a). (See fig. 10)

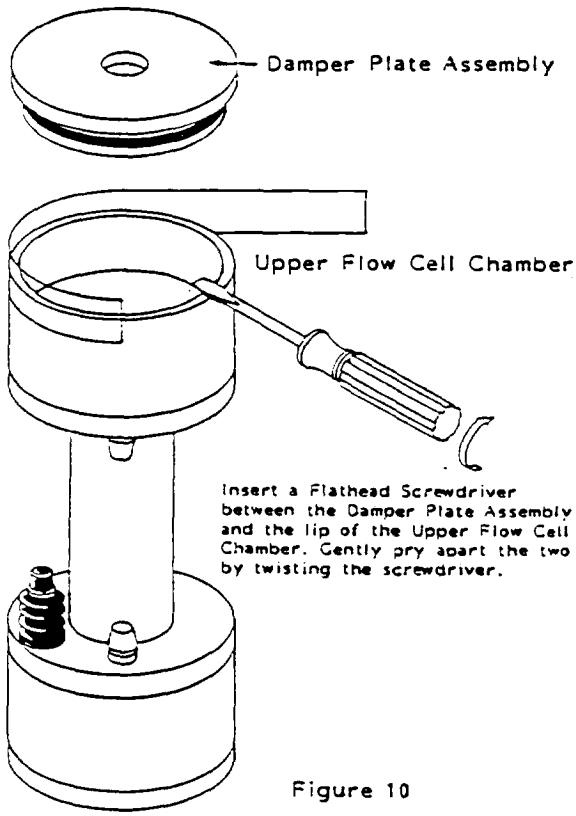
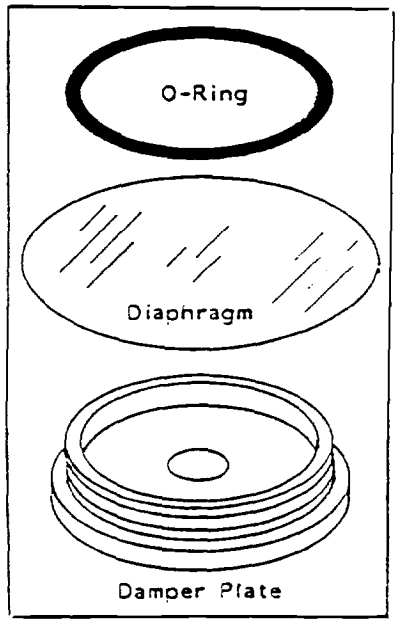


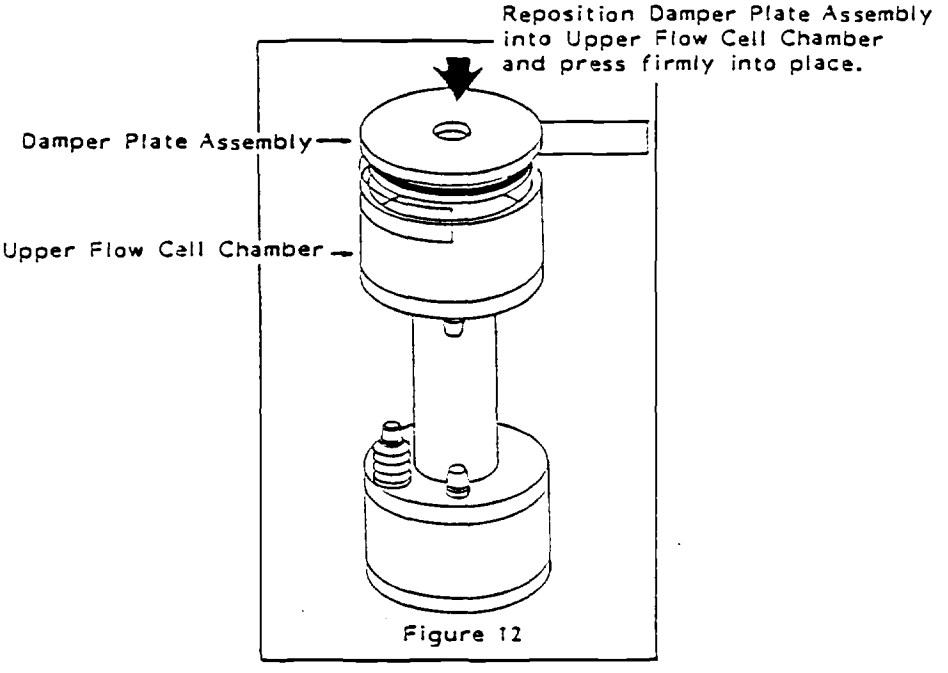
Figure 10

Bubble Generator Assembly

Figure 11



2) To replace, center new diaphragm over Damper Plate aperture and roll O-ring over diaphragm and into the O-ring groove. If wrinkles occur, repeat the procedure to achieve a smooth placement. (See fig. 11)



Bubble Generator Assembly

3) Wet "O"-ring of Damper Plate & press into the Upper Cell Chamber firmly. (see Fig. 12)

4) Replace Safety Tape around lip of plate and the upper flow cell chamber.

b. Leakage Check - The system should be leak checked at 6" H_2O by connecting a manometer to the outlet boss and evacuate the inlet to 6" H_2O. No leakage should be observed.

c. Cleaning - To clean the exterior of the Bubble Generator use a mild detergent and warm water. NEVER USE ALCOHOL, ACETONE OR ANY OTHER HARSH CLEANERS TO CLEAN THE BUBBLE GENERATOR.

d. Transportation - When transporting the Gilibrator, especially by air, it is important that one side of the seal tube which connects the inlet and outlet boss, be removed thereby allowing f o r equalizing internal pressure within the generator. Do Not transport unit with soap solution or storage tubing in place.

CAUTION: Do Not Pressurize the Flow Cell! Excessive pressure may cause cell to rupture resulting in personal injury.

Printer Module Operation
Part # C-800274

1. Introduction

The Gilibrator Printer provides a hardcopy record of all calibration data, identical to data calculated and displayed on the LCD readout of the Gilibrator Control Unit (base).

Handling Precautions

a. Do not use where the temperature is extremely hot or cold.
b. Do not leave in direct sunlight or where it is dusty.
c. Do not operate near liquids or beverage.
d. Do not operate without the heat sensitive roll paper loaded.
e. Use only specified Gilian Replacement Roll Paper (A-400681).
f. Do not attempt to disassemble the unit.

NOTE: The printer should only be used with the Gilian Interconnect Cable provided which supplies the power for the printer. Use of this printer with any other cable may cause permanent damage to the printer and to the equipment from which the cable is connected.
The use of a non-shielded interface cable with the printer is prohibited.

2. General Description (See fig. 13)

The Printer is comprised of the following basic components: The Printer Module (1), Interconnect Cable (2) and the Thermal Roll Paper. A brief description is provided of their use and operation.

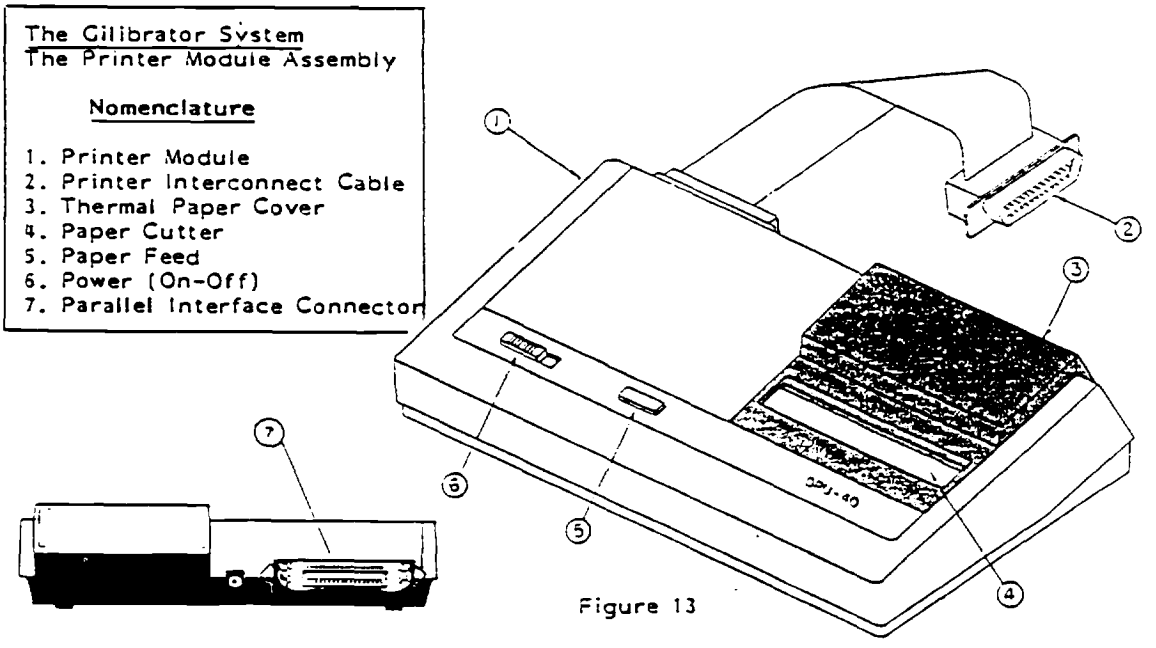


Figure 13

a) Printer Module

1.Power (6) - This switch activates operation of the printer from the Control Unit's power source. The printer will initially print a heading line upon activation.

2.Paper Feed (5) - This switch is used to feed the Thermal Paper continuously. Press it lightly. **Note: Use the Paper Feed switch to feed out the paper. If paper is pulled out by hand, always feed it one line with the Paper Feed Switch before starting printing.**

3.Paper Cutter (4) - This is used to tear of the paper. Tear off by pulling it in the arrow direction only.

b) **Thermal Paper** - A specially treated paper which is activated by the printer head.

c) **Interconnect Cable** (2) - The interconnect cable provides electrical connection between the printer (1) and the Gilibrator Control Unit (14). The printer operates from the same power source as the control unit.

3. Theory of Operation

The Printer Module is powered and interfaced to the Control Unit of the Gilibrator by means of an Interconnect Cable. During a test series, the Control Unit transfers the sum of calculations of a given calibration bubble and provides the flow rate, the sample number and an average of the successive flow rates determined in that calibration series.

The buttons on the Control Unit are used in conjunction with the Printer module during calculation. Delete, Auto Average and Reset buttons are provided to subtract false readings and to initiate new calibration sequences.

Calculations are automatically provided by the Control Unit and transferred to the printer for a hardcopy readout. This is printed onto a thermal sensitive roll paper which advances a single line after printing out each successive reading. These hard copy calculations are retained for calibration records.

4. Operation Procedures

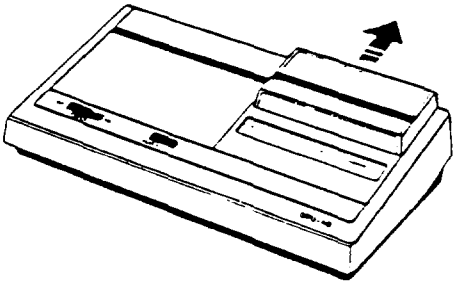
a) Initial set-up

1.Connecting the Printer

a) While the Gilibrator Control Unit is in the OFF mode, connect the large end of the Interconnect Cable (2) to the Printer Modules Parrallel Interface Connector and snap holding clips in place. Connect the smaller end to the Control Unit's Printer connect port. Power is supplied to the printer from the Control Unit's battery system.

2. Turn ON the Control Unit and the Printer Module.

(1) Remove the heat sensitive roll paper cover.



(2) Cut the end of the heat sensitive paper as shown below.

Figure 14

3. Installing the Thermal Paper (See fig. 14)

a. Slide back and remove the Thermal Paper Cover (3) from the printer section. (see Fig. 14)

b. Use the special Gilian heat sensitive roll paper (A-400681).

c. Cut the end of the paper in a half circle or triangular shape.

d. While inserting the end of the paper, press the Paper Feed Switch (5) until the paper is fed out. Replace protective paper cover. (see Fig. 15)

(3) While inserting the end of the heat sensitive roll paper in the direction of the arrow, press and hold the paper feed switch until the paper is fed out. Since the outside of the heat sensitive roll paper is coated with a heat sensitive agent, pay careful attention to the front and back of the paper.

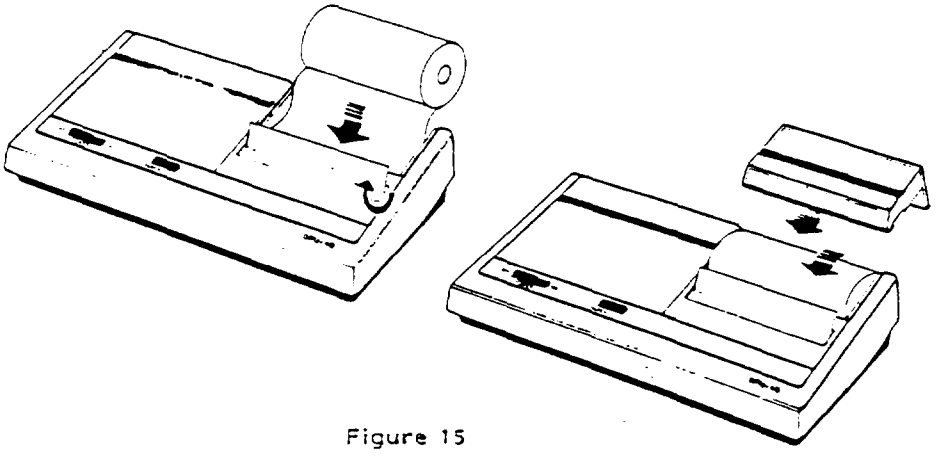


Figure 15

b) Operation

1. Start Sequence

a. Turn the Control Unit ON. The Printer Module will print out an identification heading for the current calibration test. The program version is indicated after the identification line for future reference. See sample below.

b. Initiate a bubble up the Flow Tube and observe the reading on the Control unit and also on the Printer Module. The Printer will print in sequence the flow, average and sample number after each successive reading.

NOTE: If you do not need a hard copy printout from the Printer Module, turn it OFF. This will preserve the battery life of the Gilibrator as the printer is powered by same.

2. The Average, Reset and Delete buttons on the Control Unit are used in conjunction with the printer during calibration. They are as follows:

a) Average - In order to display average and number of samples, depress and hold average button. Releasing the button will display the last reading. Repressing will display the number of samples accumulated for that averaging sequence. Releasing the button will once again display the last flow reading. Additional pressing and holding will repeat this sequence.

b. Reset - To reinitiate the sequence for additional pumps,hit the Reset Button. This will zero out sample and average registers within the Control Unit and will cause the printer to index one line and reprint headings. This denotes the start of a new sequence. The Reset Button may also be used if a malformed bubble is generated and has not been been subtracted from the average by use of the Delete Function.

c.Delete - To delete obvious false readings, press the Delete Button and subtract the false reading from the average. This resets the average and sample number back to the previous reading.

5. Storage & Maintenance

a) Storage (Daily Take Down)

1. Turn the Power of the Printer Module OFF. All data stored in the printer cannot be reviewed once this is done.
2. Turn off the Power of the Control Unit.
3. Turn off the Power of the Sampler being calibrated.

b) Storage (Long Term) - If the Printer Module is not to be used for long periods of time, the following steps should be taken to keep the unit in proper working order.

1. Disconnect the interconnect cable from the Control Unit and from the Printer Module.
2. Store in original packaging or carrying case.

c) Cleaning - Use a damp cloth with warm water. Never use ALCOHOL, ACETONE or any other harsh cleaners.

Specifications for the Gilibrator System

Flow Cell Assembly Ranges Available

High Flow Cell	2 - 30 LPM
Standard Flow Cell	20 cc/min. - 6 LPM
Low Flow Cell	1 - 250 cc/min.

Operational Features

Direct Flow Readings - The easy to read LCD read-out on the Control Unit (base) instantly displays flow readings.

Auto Averaging - A switch on the Control Unit provides Auto-Averaging of the successive flow readings.

Flow Delete Function - A Flow Delete switch allows the user to delete erroneous flow readings from the Auto-Averaging function. For example, if a double bubble or other obvious malfunction is observed, that reading can be subtracted from the auto-average and will automatically reset the average to it's previous value.

Programmable Update - The micro-processor electronic design allows programmable updates to assure a long useful service life.

Mechanical Features

Pulsation Damper - The pulsation damper removes pulsation from the flow source for higher accuracy sampling as well as eliminating pulsations back into the flow source during bubble generation.

Ring Bubble Generator - The Ring Bubble Generator lifts an even soap film from the soap reservoir and provides consistent bubble generation.

Bubble Breaker - The Bubble Breaker design allows the soap film to be drawn away form the end of the flow tube before bursting. This improves flow measurement accuracy by minimizing film residue within the flow tube.

Programmable Update - The electronics design allows programmable updates to assure a long, useful service life.

Accuracy - Better than 0.5%

5.18 MINIRAM PERSONAL MONITOR MODEL PDM-3

1.0 INTRODUCTION

The MINIRAM (Miniature Real Time Aerosol Monitor), manufactured by MIE, Inc., is a light-scattering aerosol monitor which, while operating, continuously senses the combined scattering of particles in the 0.1 to 10 micrometer-size range.

The MINIRAM requires no pump for its operation, as air surrounding the MINIRAM passes freely through the open aerosol sensing chamber as a result of air transport caused by convection, circulation, ventilation, and personal motion.

2.0 APPLICATIONS

The MINIRAM measures the concentrations of any airborne particles, both solid and liquid; and the display indicates this level in the units of milligrams per cubic meter, based on its factory calibration, against a filter-gravimetric reference, using a standard test dust (Arizona road dust). The MINIRAM can be used to measure the concentration of all forms of aerosol, i.e., dusts, fumes, smokes, fogs, etc.

Its small size, weight, and concentration-averaging features permit its use as a personal exposure monitor attached to a belt, shoulder strap, hard hat, etc. Alternatively, it can be used as an area monitor for both indoor and ambient air situations. Test chamber monitoring, visibility measurements, cloud detection (e.g., radio drop sonde), aerosol dispersion studies, etc. are additional applications of the MINIRAM.

3.0 PRINCIPLE OF OPERATION

The MINIRAM has two output connectors. One provides a continuous, real-time analog signal output proportional to the aerosol concentration. This signal can be used for continuous recording (e.g., on a strip chart recorder), telemetry, or control purposes, etc. The other connector provides, during the measurement mode, either an ASCII digital output which is updated every 10 seconds, or a switched output for alarm purposes (depending on the user-selected function). Stored information playback can be accomplished either by means of the MINIRAM's own display or through the digital output jack. During the normal monitoring operation, the liquid-crystal-display indicates the aerosol concentration in the units of milligrams per cubic meter, and the displayed reading is updated every 10 seconds. When operating in the measurement or monitoring mode, other functions can be displayed momentarily, i.e., as long as a corresponding touch switch is pressed. All external controls are performed by pressing one or more of eight (8) sealed touch switches on the MINIRAM panel.

4.0 BEFORE OPERATION

1. Plug charger into A.C. line.

2. Connect charger plug into corresponding MINIRAM receptacle.

3. Leave MINIRAM on charge for a minimum of eight (8) hours before using the instrument without the charger. The instrument may be used at any time if left on A.C.

5.0 OPERATING INSTRUCTIONS

Refer to Figure 1 for the location of control switches, display, and connector jacks. Refer to Figure 2 for the display timing sequences.

5.1 Initial Condition

Assuming that the batteries of the MINIRAM have been recharged, the display may indicate one of the following conditions:

- Blank display: Means the MINIRAM had not been in the measurement mode for 48 hours or more and is in the minimum power off mode.

- "OFF" display: MINIRAM has been in the "off" mode for less than 48 hours.

- Concentration display that changes or "blinks" once every 10 seconds: the MINIRAM is in the measurement mode.

5.2 To Start Measurement Cycle

- If the MINIRAM shows a blanked display (see above), press "OFF," and wait until the display reads "OFF" (approximately 5 seconds after pressing "OFF") before pressing "MEAS" to initiate measurement cycle.

- If the MINIRAM shows "OFF" (see above), press "MEAS" directly to initiate measurement cycle (there is no need to press "OFF" first, in this case).

5.3 MEAS

To start the monitoring operation of the MINIRAM, press "MEAS" (see automatic timing sequence of Figure 2). The first read-out displayed is either "GO" (or "CGO" if "TIME" is also pressed, Section 5.4), followed by the last concentration reading or ".00." Approximately 36 seconds after pressing "MEAS," the first new 10-second averaged-concentration reading is displayed. All subsequent readings are concentration values in milligrams per cubic meter, updated every 10 seconds. Figure 3 shows a typical digital printout of a sequence of 10-second measurements (second data block).

The MINIRAM will now run in the measurement mode for 500 minutes (8 hours and 20 minutes), after which it will stop, displaying the "OFF" reading, retaining in storage the concentration average and elapsed time information. Once the "MEAS" mode has been entered, this sequence can only be interrupted by pressing "OFF;" pressing "ZERO," "TWA," "SA," "TIME," or "ID#" only affects the display during the time these keys are pressed, without affecting the measurement cycle. Pressing "PBK" during this cycle has no effect.

The instrument normally operates in the .00 to 9.99 mg/m3 range. Whenever a 10-second concentration exceeds 9.99 mg/m^3, the MINIRAM display automatically switches to the .0 to 99.9 mg/m^3 range and remains in that range as long as the measured 10-second concentration exceeds 9.99 mg/m^3; otherwise, the MINIRAM reverts to its lower range display.

5.4 MEAS and TIME

If both "MEAS" and "TIME" are pressed at the same time (press "TIME" first and while depressing, it actuates "MEAS"), the MINIRAM will display "CGO" (for Continuous "GO") and will then operate as above (i.e., pressing "MEAS" only), except that after the first 8.3-hour run, it will restart automatically and continue to measure for an indefinite number of 8.3-hour runs (with the battery charger) until the "OFF" key is pressed or until the batteries are exhausted. Concentration averages and timing information for the last seven 8.3-hour runs will remain in storage at any given time.

5.5 OFF

When this key is pressed, the MINIRAM will discontinue whatever mode is underway displaying "GCA,"* followed by the display-segments check ("8.8.8="), and finally "OFF" (see timing diagram of Figure 2). The MINIRAM will then remain in this reduced power condition (displaying "OFF") for a minimum of 10 minutes or a maximum of 48 hours or until the "MEAS" key is pressed to resume the measurement cycle.

If "OFF" is pressed during a measurement run, the display will read "OFF" for 48 hours (unless another key is pressed during that period), after which the display will be blanked. Thereafter, if "OFF" is pressed, the MINIRAM will display the "OFF" reading for only 10 minutes, after which time the display will be blanked again unless another key is pressed during that period.

Every time the "OFF" key is pressed during a measurement cycle, the MINIRAM will store the concentration average and elapsed monitoring time up to the time of that "OFF" command. The duration of the "OFF" period (up to 48 hours), i.e., between two consecutive measurement cycles, is also stored for each of up to 7 cycles.

If the MINIRAM is not reactivated (i.e., pressing "MEAS") within 48 hours of the "OFF" command, it automatically switches to a minimum power level with blanked display; however, all data remains stored in memory for up to approximately 6 months without battery recharging (indefinitely, with charger).

"OFF" must be keyed before any other operating mode can be entered: setting ID#, zero referencing, playing back-stored data, or changing the program code. Display functions, however, can be activated during the measurement mode.

*"GCA," the former manufacturer, is displayed and printed out by the PDM-3, although the instrument is manufactured by MIE, Inc.

5.6 TIME

During the measurement mode, if "TIME" is pressed, the display will show the elapsed time in minutes, to three significant figures, from the start of the last measurement run. The MINIRAM will automatically return to concentration display after the "TIME" key is released.

5.7 TWA

This key stands for Time-Weighted Average. During the measurement mode, if "TWA" is pressed, the display will indicate the average concentration in milligrams/m^3 up to that instant from the start of the last run. The value of TWA is updated every 10 seconds. After releasing the "TWA" key, the MINIRAM display returns to the 10-second concentration display.

5.8 SA

This key stands for Shift-Average. During the measurement mode, pressing "SA" will provide a display of the aerosol concentration up to that moment, averaged over an 8-hour shift period.

The shift-average value corresponds to the exposure from the start of the measurement cycle. Thus, for example, if the MINIRAM has been measuring for 3 hours and the time-weighted average over that period has been 6 mg/m^3 (TWA reading), the shift-average value at that time (SA reading) would be 2 mg/m^3, which is equivalent to an 8-hour exposure to an average concentration of 2 mg/m^3.

The value of SA is updated every 10 seconds. When releasing the "SA" key, the MINIRAM display returns to the 10-second concentration display.

5.9 PBK

With the MINIRAM in the off mode (i.e., not in the measurement mode), the stored information can be played back by pressing "PBK." If the "PBK" key is initially pressed, the display will indicate "P" for one second. If "PBK" continues to be pressed for more than one second, then the stored data is automatically played back through the MINIRAM display. First, the identification number is displayed with the "ID" indicator bar on; next the shift or run number (7 through 1, i.e., starting with the last run) is shown (with the "OVR" indicator bar on as identification); followed by the sampling (i.e., measurement) time in minutes for that run; followed by the off-time between the last and next run (in tens of minutes); finally, the average in mg/m^3.* This sequence is repeated seven (7) times. An average reading of 9.99 indicates that a significant overload condition occurred during that run. The total time required for the complete automatic playback on the MINIRAM display is approximately 70 seconds.

If "PBK" is pressed for less than one second, "PA" will be displayed, and the stored data will be fed out through the digital output jack of the MINIRAM for printout, magnetic storage, telemetry, etc. A printout consists of eight (8) lines of data. Figure 3 shows a typical stored data printout (see data block labeled "Playback of Stored Data"). The first seven (7) lines show the data

for the last seven (7) measurement periods, and the last line shows the identification number (I), the programmable selection code (F), and the zero value for that data block (Z). In addition, a check sum is printed out on the ninth (9) line for modem/ computer data transfer purposes. The first seven (7) data lines are subdivided into four (4) columns. The first column identifies the measurement period (starting with the last or 7th); the next column lists the corresponding duration of each measurement period in minutes; the third column lists the off time between consecutive measurement periods in minutes divided by 10; and the last column lists the average concentration values for each period in mg/m^3.*

Either time-weighted or shift-average values can be printed, depending on the selected programmable code. The example shown on Figure 3 (F=0012) indicates that the TWA values are listed. Although the printout heading will indicate "PDM-2 LISTING" (as shown in Figure 3), this format applies equally to the MINIRAM Model PDM-3.

The speed of the digital transfer to a printer or other digital device can be user-selected through the programmable selection code. For a 300 baud rate, the transfer time for the stored data block is approximately 45 seconds.

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*Either the TWA or the SA values, depending on selected user-programmable code.

5.10 ZERO

The interior walls of the MINIRAM sampling chamber reflect a small amount of the light from the infrared source into the detector. This background level is referred to as the "zero value" and is automatically subtracted from all aerosol concentration readings during the measurement mode. The result is that the displayed readings depend only on the actual dust concentration present within the sensing chamber.

The zero value varies from instrument to instrument as well as with different sensing chambers. It will increase somewhat as the chamber inner walls and windows become contaminated with dust. A zero update should be performed after cleaning the sensing chamber.

Pressing "ZERO" during a measurement period provides momentary display of the stored zero concentration value used by the MINIRAM to correct all digital concentration readings (the analog output signal is not zero-corrected). To update the ZERO value, the MINIRAM must be in its off condition (press "OFF" in case of doubt). Then press "ZERO" and wait until the display again indicates "OFF."

The average of four (4) consecutive 10-second, zero-level measurements will then be stored by the MINIRAM as the new ZERO reference value. (See timing diagram in Figure 2 and digital printout obtained during a typical zero check on Figure 3). When operating the MINIRAM in high particle concentration environments (>5 mg/m^3), the zero value update should be performed approximately every eight (8) hours. At aerosol concentrations below approximately 1 mg/m^3, this update may only be required once a week or even less frequently. The zero update should be performed either within a clean-

air environment (ideally, a clean room or clean bench) for dust measurements in the concentration range below 0.5 mg/m^3, approximately, or by flowing clean air through the sensing chamber of the MINIRAM (e.g., by means of an optional clean-air adapter, MIE Model PDM-1FZ Zero Check Module*) for use at dust concentrations above 0.5 mg/m^3, approximately. Air-conditioned offices (without smokers) usually have concentrations below approximately 0.05 mg/m^3 and can thus be used for zeroing purposes. When measurements are performed under essentially clean air conditions, e.g., in the same environment where the zero check was performed, the MINIRAM readings will indicate 0.00 mg/m^3 with small random fluctuations around that value. Positive values (e.g., 0.02) will thus be indicated on the LCD display. Negative values (e.g., -0.02) are suppressed and are also indicated as 0.00. The digital output, however, does include such negative values, and these will be printed out by a digital printer.

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*Zero Check Module (MIE Model PDM-1FZ)

The Zero Check Module can be used to zero the MINIRAM when a clean air environment is not available. The Zero Check Module should be used when concentrations in the range above 0.5 mg/m^3 are to be measured.

In addition, this accessory can be used to draw a sample stream through the MINIRAM sensing chamber (in lieu of a separate pump) by disconnecting the small tube at the sensing chamber inlet fitting.

This accessory consists of a pump, filter and the necessary tubing to circulate clean filtered air through the MINIRAM. The pump may be powered by the MINIRAM battery charger (or a 5-10 VDC power supply). The battery within the MINIRAM cannot be used to operate the Zero Check Module.

To zero the MINIRAM, first attach the Zero Check Module following the same procedure described for attaching the basic Flow Adapter. Connect the battery charger to the Zero Check Module and to an A.C. source. Allow at least one minute of operation to purge the sample chamber with clean air. Press the "ZERO" button on the MINIRAM and continue operating the Zero Check Module until the final average zero reading is displayed.

5.11 ID#

Pressing "ID#" during a measurement period provides momentary display of the identification number stored within the MINIRAM memory.

The "ID#" key, in combination with other keys, is used for several additional programming functions described in the next section (6.0).

6.0 PROGRAMMABLE FUNCTIONS

6.1 ID# Selection

In order to change the instrument identification number, the MINIRAM must first be in the off mode (i.e., press "OFF"). Then press the "ID#" key, and the presently stored number (between 1 and 999) will be displayed, as well as the ID indicator bar. To increment the identification number, press the "▲" key (same key as TWA), and to decrement the number, press the "▼" key (same key as SA). Any number between 1 and 999 can thus be selected and will remain in storage until the batteries are disconnected, or if the MINIRAM is not recharged over a six-month period.

Pressing the "OFF" key after the above identification number selection will remove the MINIRAM from the ID# selection routine and lock in that number until a new number is selected. A complete ID# lock-out (i.e., a routine to preclude panel-control change of that number) can be accomplished by a separate programmable code selection (see Section 6.2).

6.2 Programmable Selection Code

The programmable code allows the user to panel-select several alternate functions and operating modes.

The program codes to select specific alternate operating modes are:

1 selects the alarm instead of ASCII digital output

2 selects the ID# lock-out

4 selects the TWA instead of the SA to be stored for playback

8 selects a one-second pause after each printer carriage return (for slow printers)

32 selects 110 baud digital output rate instead of 300 baud

64 selects 600 baud digital output rate instead of 300 baud

These numbers are entered as a sum, e.g., to implement ID# lock-out, TWA storage, and one-second carriage return delay, the code number would be 14 (2+4+8).

To enter the desired code (e.g., 14) follow these steps:

- o Press "OFF" key and wait until "OFF" is displayed
- o Press ID# key and set program code to desired number (e.g., 14) by means of the "▲" and "▼" keys.
- o Press "TIME" key (this will show previously entered code).
- o Press "ID#" key again to lock in the new program code, which will then be displayed.

- The preceding steps will cause the ID# to become equal to the programmable selection code. To restore the desired ID# (without affecting the selected code number which is now locked in), use the "▲" and "▼" keys again to select the ID# for the instrument as described in Section 6.1.

- Press "OFF" to exit the ID# selection routine.

- To look at the programmed code number, at any time, start from the off condition; press "ID#," then press "TIME" ("F" will then be displayed momentarily), after which the code number will be displayed. Press "OFF" to exit the code number routine.

If no specific alternate code is entered, the MINIRAM will operate in its standard mode (equivalent to code 12) consisting of the following:

- ASCII digital output

- Panel-selectable ID number (preset to 999)

- Time-Weighted Average (TWA) values in memory storage

- 7-bit ASCII resolution

- 300 baud digital output

- Printer carriage return followed by a one-second delay

6.3 ID# Lock-Out

If the ID# lock-out code has been selected (i.e., a 2 as part of the sum, as described in Section 6.2), then both the ID# and the programmable code can only be displayed (and printed out), but neither of the two can then be changed by means of the panel keys. In this case, in order to change the ID# if the lock-out code has been selected, or to alter the programmable code, the battery must be unplugged momentarily. Disconnecting the battery, however, causes the MINIRAM to lose all stored data and cancels all alternate program codes, which may then be restored following the procedure described in Section 6.2.

6.4 Alarm-Level Adjustment

If the selected program code includes a 1, the MINIRAM will not provide an ASCII digital output but, instead, a switched output (at the digital output connector) which will close every time the measure 10-second concentration value exceeds a presettable threshold concentration level. If a 1 has been included in the code, then the ID# divided by 10 becomes the alarm level in milligrams/m^3. This level can be adjusted following the ID# selection procedure of Section 6.1; that is, using the "▲" and "▼" keys to increment or decrement the number. For example, if an alarm level of 12.5 mg/m^3 is desired (and starting from the off mode), press "ID#," adjust displayed number to 125 with the "▲" and "▼" keys, and press "OFF." This number (e.g., 125) then becomes the ID# as well. It is not possible to enter a separate alarm level and ID# number.

7.0 OVERLOAD AND ERROR CODE INDICATORS

7.1 Bar Displays

There are three bar indicators on the MINIRAM display, identified as "OVR", "ID", and "BAT." If the "OVR" bar is displayed at any time during operation in the measurement mode, the MINIRAM detection circuit has been overloaded. A momentary overload can be caused by the insertion of an object into a sensing chamber, sudden exposure to sunlight, etc. If the cause of overload is eliminated, the "OVR" bar will disappear during the next 10-second display period, unless the overload persists for more than a total of 1-1/2 minutes over an 8-1/3 hour measurement cycle.

The "ID" bar display is activated only for display identification purposes and not for error conditions.

The "BAT" bar is displayed when the battery voltage becomes insufficient, indicating that the charger should be plugged into the MINIRAM.

7.2 Error Codes

The MINIRAM will display and output (at the digital output jack) error code numbers along with the corresponding overload indicator bars on the LCD read-out. These codes will appear only if the problem persists for more than about 30 seconds.

The error code numbers are as follows:

.01: low battery condition

.02: RAM (digital processing)

.03: A/D (signal) overload

If an overload condition persists for more than approximately 1-1/2 minutes, the selected concentration average value (SA or TWA) automatically registers 9.99, and that number will be indicated (or digitally transmitted) upon data playback, signifying an invalid measurement cycle. The "OVR" bar will then remain on for the rest of that run.

8.0 SENSING CHAMBER REMOVAL AND INSERTION

During normal operation of the MINIRAM, the removable sensing chamber (see Figure 1) must be properly inserted, i.e., pushed all the way into the MINIRAM towards the display/control panel end of the instrument. When this chamber is properly positioned, the surface on the opposite end from the display/control panel will be approximately flush with the body of the MINIRAM.

To remove the sensing chamber, gently push it away from the display/control panel end, using both thumbs, sliding it out of its channel. This will expose the shouldered metal button with its small spring-loaded plunger, and the two lenses (illumination and detection lenses). Touching of these lenses should be avoided to prevent their soiling. Lens tissue should be used if cleaning of these lenses becomes necessary. Also, the inside surface of the removable

sensing chamber is coated with a special anti-reflectant paint, and these surfaces should not be touched, if at all possible. (Newer models have a special finish which is not touch-sensitive.)

The removable sensing chamber has two small glass windows which should be kept clean.

The sensing chamber is partially closed at one of its open ends. This end is inserted first when sliding the chamber back into the MINIRAM channel. A small shouldered slot is provided on the underside of the removable sensing chamber for the metal button that serves to retain the chamber.

To reinsert the sensing chamber, simply slide it back into position, making sure that the chamber is moved parallel to the MINIRAM body. Ensure complete insertion, as mentioned above.

9.0 BATTERY PACK REPLACEMENT

The battery pack of the MINIRAM (MIE Part No. PDM-3B) constitutes an intrinsically-safe sealed module that can be removed and replaced. To do so, remove the four central screws from the back of the MINIRAM case (not the two corner screws), gently lift the battery pack up and out, and gently pull apart the battery connector, freeing the battery pack. Reverse order of steps when installing another pack.

CAUTION: All stored data will be lost when disconnecting battery.

After reconnecting battery pack, the "ID" resets to 999, and an automatic zero reference check is performed by the MINIRAM.

Separate battery packs can be used whenever A.C. line power is unavailable to recharge the pack within the MINIRAM. These spare parts can be recharged independently from the MINIRAM by plugging the charger into the charge receptacle which is an integral part of the battery pack (see Figure 1).

Calibration: Unit is to be returned to the factory on an annual basis for calibration.

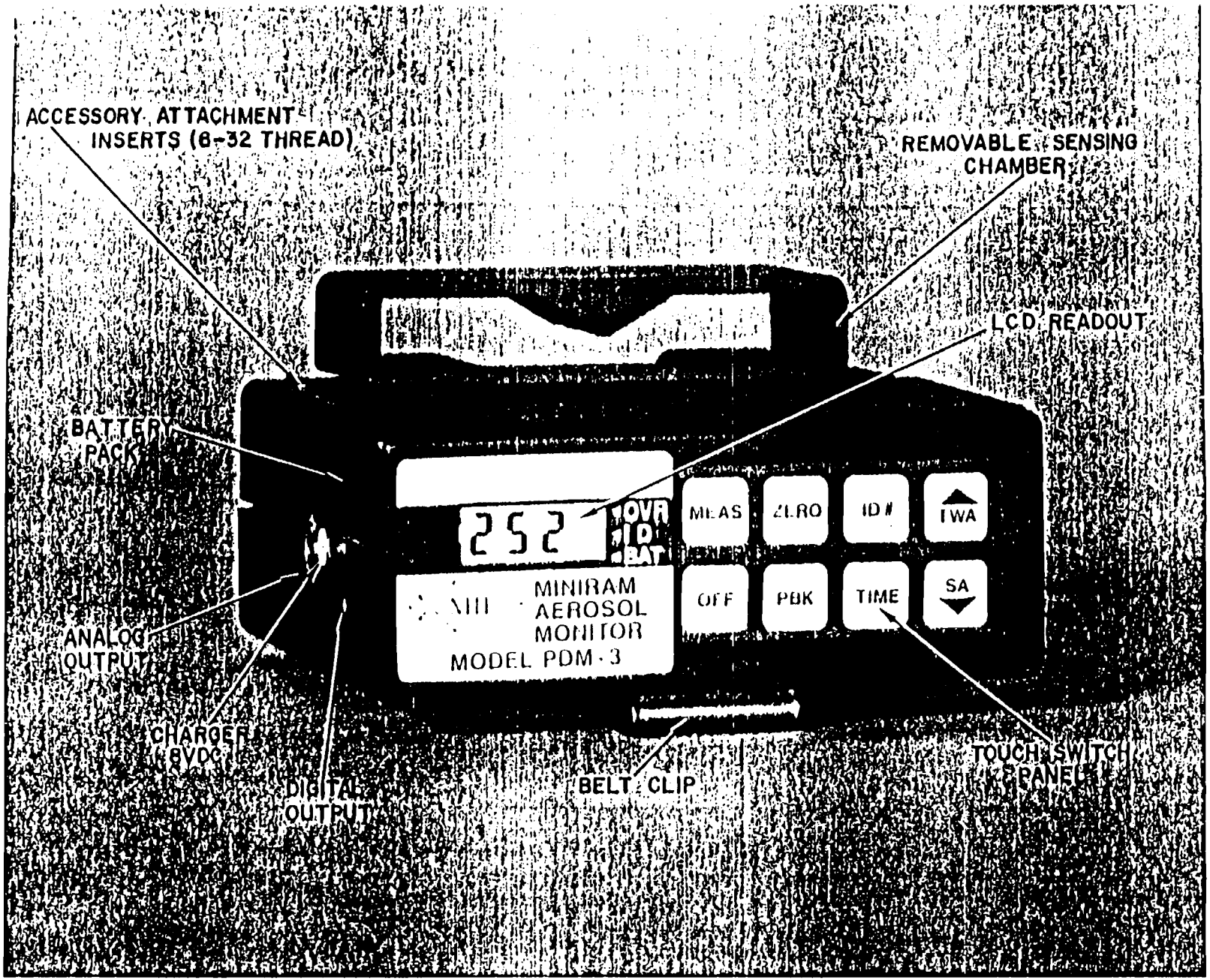


Figure 1. Main view of MINIRAM.

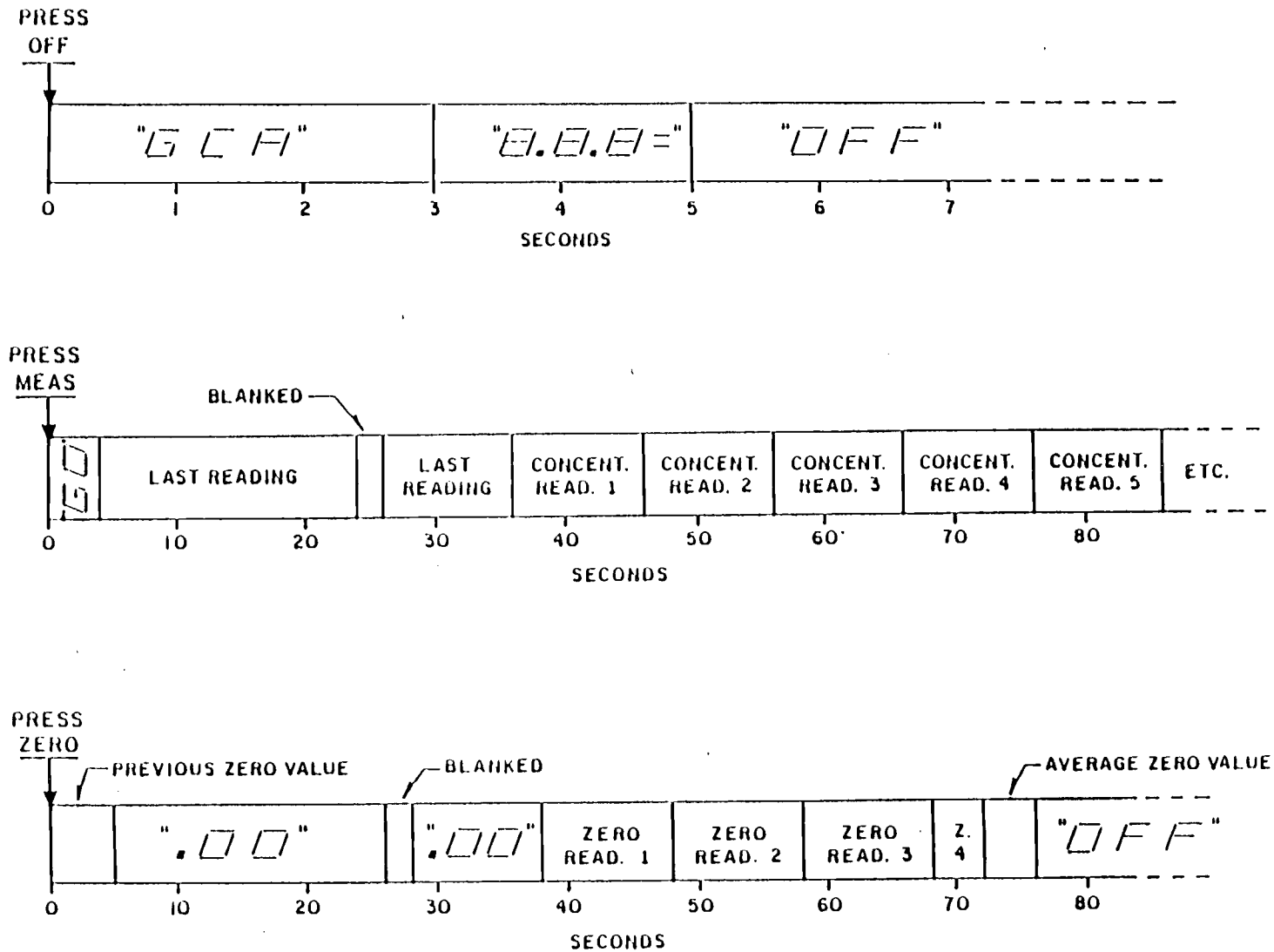


Figure 2. Timing diagram of MINIRAM model PDM-3 when pressing OFF, MEAS. or ZERO (typical times).

Average Zero Value

```
00.62  00.62  00.66  00.57  00.61
```

Zero Check

```
0000  02.05  02.05  02.04  02.05  02.04
 02.05  02.04  02.05  02.04  02.05
0001  02.04  02.05  02.05  02.05  02.04
 02.05  02.05  02.05  02.04  02.05
0002  02.05  02.04  02.05  02.05  02.04
 02.05  02.05  02.05  02.05  02.04
```

Line Number

Continuous 10-Second Printout of Concentration (in mg/m^3)

```
GCA TECHNOLOGY DIV.
BEDFORD MA USA
617-275-5444
PDM-2 LISTING
SHIFT   ON    OFF  CONC
  #    MINS MIN/10 MG/M3
 0007  0004  0000  02.04
 0006  0012  0000  01.61
 0005  0006  0000  01.61
 0004  0004  0000  00.01
 0003  0006  0000  00.00
 0002  0000  0000  00.02
 0001  0000  0001  00.00
I= 0003 F= 0012 Z= 00.61
0057
```

ID Number

Playback of Stored Data

Check Sum

Programmable Selection Code

Zero Value

Figure 3. Typical MINIRAM Model PDM-3 Digital Printout Format.

5.19 GASTECH MODEL GX-86

This procedure specifies the requirements and methods for using the Gastech Model GX-86, which measures combustible gas, oxygen, hydrogen sulfide, and carbon monoxide.

PRECAUTIONS AND LIMITATIONS

This instrument is designed and intended for personnel safety in entering or occupying potentially hazardous confined spaces that may contain Class I, Division 1, Group C and D gases (which include all normal hydrocarbons and combustible gases except hydrogen and acetylene). The instrument is certified to be intrinsically safe against initiation of explosion when used in such environments.

The instrument user must ensure that proper protection is worn and that safety is not compromised due to monitoring in an Immediately Dangerous to Life and Health (IDLH) situation. The instrument user must also be aware of the following limitations and applications:

1. Use of the instrument in Group A or B (acetylene and hydrogen) environments requires special consideration. Likewise, use of the instrument in oxygen-enriched atmospheres is beyond the normal scope of its intended application.

2. Do not attempt to use in oxygen-acetylene mixtures, as found in oxy-acetylene welding and cutting equipment.

3. Watch the display each time you turn the GX-86 on to be sure it goes into normal operation. Then verify detection and alarm functions by breathing out over the open end of detector housing to see that oxygen deficiency indication and alarm action occur. Recheck periodically during the working day.

4. If for any reason the oxygen concentration should exceed 25 percent, an alarm is given to warn of potential fire hazard.

5. Do not draw liquids into this unit. Be careful when sampling over drums, pools, etc.

6. The GX-86 will not indicate the presence of explosive or combustible mists or sprays such as lubrication oil, or explosive dusts such as grain or coal dusts.

7. Each time an extender cable is attached or removed, readjustment <u>must</u> be performed before the instrument is put into use. Failure to do so will result in erroneous readings and possible hazard to personnel.

8. The explosive limits for most gases and vapors are well above the TLVs for those substances.

CALIBRATION

Since this instrument is microprocessor controlled, many of the adjustments, such as the alarm thresholds, are automatic or are factory set. There are only four internal adjustments to be made.

The four internal adjustments are the COMB SPAN, the O_2 ZERO, the H_2S SPAN, and the CO SPAN. A fifth adjustment, COMB 1.5V, is factory set and need not be changed. These are on the main analyzer circuit board next to the battery holder and are available when the battery cover is removed. Carry out the following steps to make these adjustments:

NOTE

1. **Any intermittent audible alarms sounded during this adjustment time may be ignored.**

2. **Instrument is rather slow in responding to adjustment changes. Make a small adjustment, and wait 15 seconds for the effect to show. Clockwise rotation tends to increase reading.**

A. LEL Span

1. Turn instrument on and allow it to warm up and stabilize, preferably for five minutes.

2. Open battery compartment by sliding cover outward. Locate COMB SPAN potentiometer on circuit board. (Left-hand control of the four accessible ones, as viewed from exposed end of battery compartment.)

3. Expose combustibles detector to a known calibrating gas sample. If sample is under pressure (e.g., the GasTech Calibration Kit), the mixture should be allowed to flow directly over the combustibles detector (the one on the far left).

CAUTION

The combustibles measurement is flow-sensitive. Always use a low flow rate, barely audible when escaping from the calibration cylinder. If a flow meter is available, set to 0.8 SCFH (0.4 l/m).

4. Watch combustible display carefully. If reading does not correspond to desired value, adjust it by turning SPAN potentiometer.

5. Recheck zero, and repeat above steps until correct reading is obtained.

6. If reading cannot be set high enough, replace combustibles detector.

B. Oxygen Zero

1. While battery compartment is still open, identify O_2 ZERO potentiometer (the one next in line to the COMB SPAN).

2. Expose oxygen detector to a known oxygen-free sample such as nitrogen, argon or helium.

3. Watch display carefully. If reading does not go exactly to zero, adjust it by turning ZERO potentiometer.

4. If zero adjustment cannot be made, have oxygen cell reactivated.

5. If instrument cannot bring reading to 20.9 percent O_2 during the first cycle after turn-on, replace cell or have it reactivated.

C. H_2S/CO SPAN

Adjustments to H_2S and CO circuits are similar and are presented here together.

1. With the case open, identify the H_2S or CO SPAN potentiometer (right-hand pair).

2. Expose H_2S or CO detector to a known calibrating gas sample, as in A.3 above.

3. Watch H_2S or CO display carefully. If reading does not correspond to desired value, adjust it by turning H_2S/CO SPAN potentiometer.

4. If reading cannot be set high enough, replace detector.

OPERATION

1. Very little preparation is required for this instrument. It should be kept and used in its vinyl carrying case. It may be used with the detector plugged directly into its socket at bottom, or used remotely with the diffusion head extension cable. The cable is attached as follows:

WARNING

Each time an extender cable is attached or removed, readjustment Steps B.1 and B.2 must be performed before the instrument is put into use. Failure to do so will result in erroneous readings and possible hazard to personnel.

a. Temporarily release catches of outer vinyl case to gain access to detector cover.

b. Slide the slotted cover downward and away from the instrument, releasing it by pressing on the spring retainer.

c. Move aside the two spring clips which hold the detector assembly in place.

d. Attach the mating end of the cable to the instrument and lock the spring clips in place.

e. Attach the detector assembly to the opposite end of the cable, lock the spring clips in place, and slide the slotted cover over the detector assembly, being sure it snaps into place.

f. To minimize shock damage, slip the rubber protective boot over the detector assembly.

2. Press the ON switch. A single tone will sound, and the display will indicate a series of statements in the following sequence:

a. BATT. CK (MIN 2.3V), the minimum battery voltage which will operate the instrument.

b. BATT. (X.X V), actual battery voltage (example 2.9V).

c. SELF DIAGNOSIS, microprocessor controlled analysis of readiness of instrument, indicating that preparation for adjustment is occurring.

d. STAND BY, a built-in pause to give microprocessor time to reset circuits.

3. If above readings deviate substantially from ideal, the zero and oxygen span settings may need adjustment. To adjust:

a. Take instrument to a known fresh air location.

b. Press BATT/AIR switch for three seconds.

c. Then. also press PEAK/AIR switch. Instrument will self-adjust to the ideal readings shown above and retain these settings until again readjusted, even after the instrument has been turned on or off repeatedly.

4. The instrument is now ready for use. To reassure that operation is normal, breathe out over detector end of instrument. Oxygen reading should drop down to perhaps 18, and audible and visual alarms should activate.

A quick check of combustibles response can also be made with a controlled source of vapor, such as from a bottle of isopropyl (rubbing) alcohol. While a butane cigarette lighter is an easy way to make a response check, this practice of exposing the sensor to uncontrolled high concentrations has been found to lead to low response and short life, and should be avoided.

5. The display will continuously indicate the gas, oxygen, H_2S and CO concentrations.

If the gas reading (LEL) rises above the first alarm setting, normally 20 percent, the buzzer will sound in a series of pulses with the COMB alarm light. If the reading continues to rise and goes above 50 percent, the alarm tone and light will become steady. Similarly, if the oxygen reading falls below its normal 19.5 percent, the buzzer will sound, and the OXY alarm light will come on in a series of alternating pulses. In addition, when the oxygen content rises above 25 percent, the buzzer will sound a continuous warning (see E.4 below). If the H_2S concentration exceeds 10 ppm, or if the CO concentration exceeds 50 ppm, the buzzer will sound a series of long pulses in synchronism, with the H_2S or CO light. If reading rises to 30 ppm H_2S or 100 ppm CO, both light and tone will become steady.

6. Battery Status

   a. Actual battery voltage is displayed automatically at turn-on, and may be compared with minimum voltage to estimate probable battery life remaining. A new set of batteries reads close to 3.0V, and the minimum operating voltage is 2.2 volts.

   b. When voltage reaches 2.2, the letter "B" flashes intermittently at the left end of the display, accompanied by a pulsing audible tone. When voltage reads 2.1, then the system goes to low battery condition with buzzer sounding continuously and the display showing "LOW BATT."

   c. When the BATT/AIR button is pressed momentarily and released, a single tone is heard, and the display will indicate the battery voltage for five seconds. This test may be made at any time after instrument has been put into operation.

   d. If the battery voltage is below 2.2V prior to turn-on, the instrument will not start.

7. Safety Self-Check

   It is unlikely that during proper operation any malfunctions would occur. However, a continuous "trouble" tone is provided to warn the user under the following conditions:

   a. If any of the detector circuits should fail "open" prior to turn-on. The display will indicate FAIL (HC, O2, HS or CO).

   b. Should either or both of the combustibles elements open up after turn-on. The display will indicate ELEMENT TROUBLE.

   c. Should the oxygen detector circuit fail open after turn-on. Display will indicate 00 OVER 00 000.

   d. Should the oxygen reading drift upwards to 25 percent or greater. This safety feature is added to warn the user of increased fire hazard. due to excess oxygen, or to indicate oxygen cell failure in the high-output mode.

e. When the useful life of the batteries has been exhausted. LOW BATT will be displayed. Replace with two C-size disposable alkaline dry cells, or recharge if rechargeable cells have been used.

f. Should the H_2S or CO cell fail or be removed after first turn on. This will be indicated by a "FAIL H_2S" or "FAIL CO" malfunction display.

8. Emergency Operation

a. The Model GX-86 is capable of temporary operation on the remaining detectors, even if one or more sensors should fail. If any one or more is disconnected at the time of turn-on, then the instrument will give seven audible pulses, readjust for the remaining sensors, and give an "XX" display at the position of the defective sensor or sensors. Normal operation can be continued for the remaining active sections, for 13 minutes, after which the instrument goes through a "SELF DIAGNOSIS" step and then goes into the malfunction condition. It must be turned off and then turned on to restart for another 13-minute period.

b. If a malfunction occurs during operation, the defective channel goes into malfunction alarm, and the instrument must be turned off, then turned back on. Then operation can be resumed for another 13 minutes, without benefit of the defective sensor, and with XX displayed as its indication.

9. Peak Hold

The Peak Hold feature is put into effect by pressing the PEAK/AIR switch pad. Hold it down for at least a second, and listen for a single audible pulse which confirms that the microprocessor has accepted the instruction. A letter "P" will appear at the far left of the display.

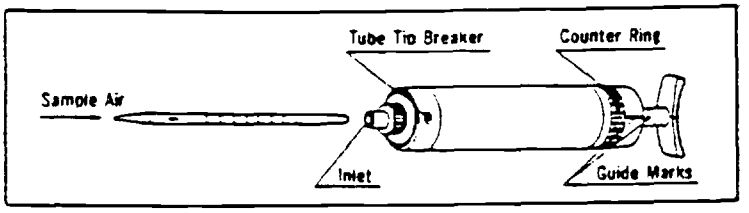
While in this mode, the display will show for five seconds the reading which represents the maximum deviation from normal that has been experienced during the entire operating period since first turned on; that is, the highest reading for the combustibles, H_2S and CO ranges, and the lowest for oxygen. This extreme reading will be "remembered" by the instrument until a higher reading occurs, or until the instrument is turned OFF. This relieves the operator of the need to watch the display constantly for a maximum reading.

5.20 OPERATING PROCEDURE FOR GASTEC (SENSIDYNE) PRECISION GAS DETECTOR SYSTEM

This procedure describes usage of the Gastec Sensidyne indicator tube system.

This unit is replacing the previously-used Draeger system.

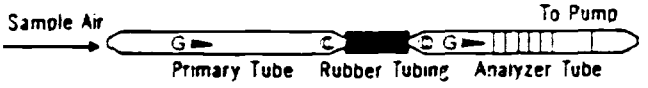
Sampling & Measurement Procedure



1. Break tips off a fresh detector tube by breaking each tube end in the tube tip breaker of the pump.

2. Insert tube securely into pump inlet with arrow on tube pointing toward pump.

3. For twin tubes, connect © marked ends with rubber tubing after breaking each end. Insert analyzer tube into pump with arrows on tubes pointing toward pump. See figure below.



4. Make certain pump handle is all the way in. Align guide marks on pump body and handle.

5. Pull handle out to desired stroke volume. Handle can be locked on either 1/2 pump stroke (50 cc) or 1 pump stroke (100 cc).

6. Read concentration at the interface of stained-to-unstained reagent when staining stops. Unlock handle by making 1/4 turn, and return it to starting position.

7. In case more pump strokes are indicated in instruction sheet included in each box of tubes, take additional sample by repeating pump strokes without removing tube.

Correction for Temperature, Humidity or Pressure:

Calibration of the Gastec detector tubes is based on a tube temperature of 20° C (68° F), approximately 50% relative humidity, and normal atmospheric pressure.

1. No correction is normally required for tube temperature of 0° - 40° C (32° - 104° F) and for relative humidity range of 20-90%.

2. Where the detecting reagent is abnormally sensitive to temperature or humidity, a correction table or chart is provided in each box of tubes. In this case, the tube reading must be corrected using correction table or chart.

3. Tube reading is proportional to absolute pressure. To correct for pressure, multiply by

$$\frac{760}{\text{Atmospheric Pressure (mmHg)}}$$

How to Use Counter Ring:

In case numerous pump strokes are required, use the counter ring of the pump.

1. Turn the counter ring manually counterclockwise after each pump stroke.

2. The operator may thus keep count of the number of pump strokes.

For more detail, see instruction sheet in detector tube box.
MAKE CERTAIN YOUR PUMP IS LEAK-TIGHT by performing a leak test as per Instruction B under CHECKING PUMP PERFORMANCE.

5.21 AIRBORNE PARTICULATE MONITORING

Purpose

Airborne particulate monitoring is to be done at all sites for Silica and/or heavy metals. Colorado soils generally contain about 25% Silica quartz, of which 30-50% is respirable fraction. Sites in Grand Junction and Denver Radium have been identified as containing arsenic, lead, zinc, cadmium, silver, and mercury. For these reasons, routine monitoring for Silica and heavy metals is to be conducted during work activities.

Sample Frequency

Sites identified as containing Silica and/or heavy metals are to be monitored on a routine basis until hazard classes are identified in all weather conditions. A minimum of two samples are to be collected per day, using a personal sample pump and 37mm cassettes. One sample is to be as a personal monitor, with the cassette to be placed in the worker breathing zone. Other samples are to be collected as area samples, strategically located to most closely represent the overall work environment. Sampling for Silica is to utilize a cyclone with the cassette, and flow rate is to be maintained at 1.7 LPM. Flow rates for heavy metal sampling are to be 1.5-2.5 LPM. Vicinity properties, where work is short-term, are to be monitored for respirable Silica dust using the Mini-Ram particulate monitor. Short-term work monitoring will use an assumed Silica value of 25%, or a PEL of $0.3 mg/m^3$.

Personal Protective Equipment

In areas where heavy metal contamination has been identified, Level "C" protection, including respiratory protection, will be worn until air sampling indicates that Level "C" protection may be reduced.

5.24 SIP 1000 ORGANIC VAPOR ANALYZER

Purpose

The SIP 1000 Organic Vapor Analyzer is for the detection of organic vapors in the work environment. The unit is to be operated only by personnel signed off by the Industrial Hygienist as qualified to operate this instrument.

Charge/Discharge Characteristics (Refer to Figures 1(a) and 1(b))

The battery is a 12-volt, 1.9 ampere-hour sealed lead-acid type that can be operated in any orientation. Since any battery loses capacity through self-discharge, it is recommended that a "top charge" be applied to any battery which has been stored prior to putting it in service. With the power and pump switches off (not depressed), connect the battery and charger as indicated on the back of the SIP 1000. Plug the battery charger into the appropriate AC power source, as indicated on the charger, and let the battery charge for 16 hours.

Connections

1. Fasten the 1/4-inch x 6-inch long probe to the probe hand grip (1/4" fitting).

2. Connect the probe hand grip to the sample inlet fitting on the back of the unit with the 1/8" coiled teflon tubing provided.

3. Turn off the hydrogen cylinder after the hydride has been charged, and unplug the quick connect by grasping the hydride container and pulling the knurled portion of the connector toward you. Unfasten the tubing from the hydrogen cylinder and connect it to the carrier inlet fitting (1/8") on the back of the SIP-1000. **CAUTION**: Never disconnect the tubing from the hydrogen cylinder or carrier inlet with the hydride connected as this will discharge the stored hydrogen.

4. Check the battery and charger to see that they are properly connected.

5. Connect the cable between the signal jack and any appropriate accessory recording instrument.

Operation

Turn On

Remove the reaction chamber cap, grasp the reaction module by the "O" ring and firmly pull it out of the chamber.

Electrical Shock

Depress the PWR switch and note the display will read [E E E E], indicating the program has been erased. Depress the MODE switch once. The display will read between [0 0 0 0] and [0 0 0 5] within a few seconds, indicating that the electronics are functioning properly.

FIGURE 1(a). DISCHARGE CHARACTERISTICS

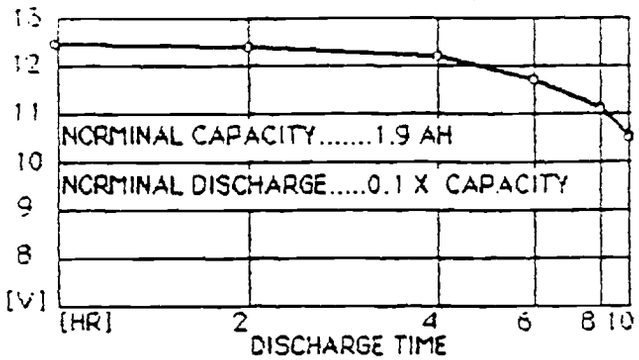
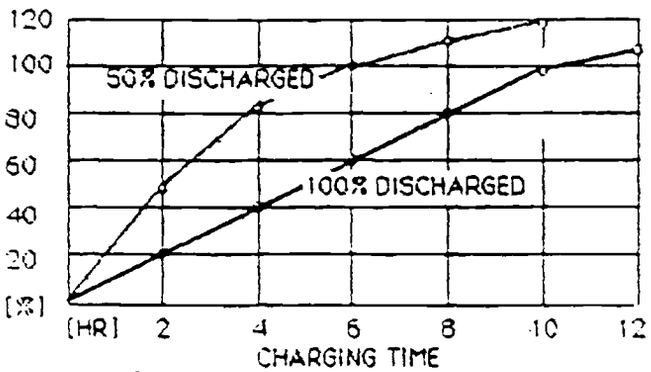


FIGURE 1(b). CHARGING CHARACTERISTICS



Pump Check

Depress the PUMP switch, and you will hear the pump operate. Place your finger over the sample probe inlet and note the pump will "load down," indicating no major leaks in the sampling system. Turn off the POWER switch before proceeding.

Photoionization Detector (PID) Check

NOTE: Refer to the appropriate section for checking the specific detector options you have purchased. Insert the PID reaction module, (the one with the lamp window visible through the base), observe the keyway when inserting. Replace the reaction chamber cap. **CAUTION**: do not overtighten. The module is properly sealed as soon as some resistance is felt. Turn on the POWER switch, and note through the hole in the chamber cap that the ultra violet lamp is on. The display again reads [E E E E] until you depress the MODE switch once, at which time it will display background ionization counts. If the display reads [H I], wait a few minutes for the sampling system to flush and the count rate to drop. If it does not, place the sample probe in an area where it will sample uncontaminated air. The standard lamp will ionize most gases with an ionization potential at or below 10.6 electron volts. Turn off the power switch and remove the PID reaction module before proceeding to the "Flame Ionization Detector Check."

Flame Ionization Detector (FID) Check

Insert the FID reaction module, (the one with the black anodized base), again observing the keyway. Replace the cap and again do not overtighten. Plug the quick connect into the hydride container or other hydrogen source such as a compressed gas cylinder or hydrogen generator. Set the SIP 1000 regulator at 15 to 20 psi; this corresponds to a flow rate of approximately 50 cc/min. Turn on the POWER and PUMP, and wait about 30 seconds for the hydrogen to flush the column and reach the flame jet. The display will again read [E E E E]. Depress the MODE switch, and the display will read between [0 0 0 0] to [0 0 0 5]. Depress the IGNITE switch, and listen for the FID to ignite. You will hear a slight "pop," and the display will indicate background count. Reduce the pressure to between 5 and 7 psi for normal operation. **CAUTION**: Excessive hydrogen flow will cause the flame to burn too hot; this causes high background noise and may result in damage to the reaction chamber or module.

NOTE: Turn off the power and insert the reaction module you wish to calibrate before proceeding.

Thermal Conductivity Detector (TCD)

The TCD reaction module is only used in the gas chromatograph configuration and will be discussed in specific application notes.

NOTE: Turn off the POWER and insert the reaction module you wish to calibrate before proceeding.

Calibration

As with any analytical instrument, the accuracy of your results will directly relate to the calibration method, accuracy of the standards and technique. It is outside the scope of this manual to discuss the details of the many calibration methods. It is up to the user to select the method, calibration standards and technique best suited to the application. Basically, CALIBRATION is divided into two categories, ZERO and SPAN.

NOTE: Always observe the following for the most accurate results regardless of the method used:

1. Always sample the zero and span gases at ambient pressure to assure the same flow rate as the instrument normally pumps through the system, i.e., never pressurize the inlet or allow the pump to create a partial vacuum by impeding pump flow.

2. Always select the zero gas and the majority component in the span gas to be the same as the atmosphere to be sampled, i.e., use pure air as the zero gas and an air calibration mixture if you intend to look for contaminants in air. Conversely use nitrogen and nitrogen mixtures if you intend to monitor contaminants in a nitrogen atmosphere.

3. Always select a calibration mixture that is reasonably close in concentration to the average levels you would expect to find in the atmosphere to be monitored.

Zero

1. Turn the POWER and PUMP switches on and depress the MODE switch once so that you are monitoring background count. Allow the SIP 1000 to warm up for approximately 15 minutes.

2. Sample a pure gas source as described above. When the count rate has stabilized at its lowest value, depress MODE once more to zero the unit. If there is any down-scale drift, as indicated by a negative reading on the display, depress the set switch to re-zero. There is no limit on how many times you can re-zero during this process. What the unit is doing is storing the sum of both the zero and re-zero readings for subtraction from subsequent readings. This updates the "zero."

Span (Refer to Figure 2)

1. Sample an appropriate calibration standard as previously discussed and wait for the count rate to increase and stabilize.

2. Depress the MODE switch and note that the least significant digit (LSD) on the display is now blank. Enter the value of your calibration standard as follows: EXAMPLE, 14.5 ppm of Benzene, balance air,

   a) Select 5 for LSD with the SET switch and depress MODE once to enter. The third digit is then blank.

   b) Select 4 with the SET switch and depress MODE to enter. The second digit is then blank.

c) Select 1 with the SET switch and depress MODE to enter. The first digit is then blank.

d) Select 0 with the SET switch and depress MODE to enter. CALIBRATION IS NOW COMPLETE.

Recall (Refer to Figure 3)

After calibration has been completed, the instrument is ready to use in the monitoring mode. However, it is suggested that you recall and record the values you have entered and stored for background counts, span counts, and calibration value. You will note that the background counts stored is the sum of the counts zeroed and any rezero counts.

Recalibrate

The frequency with which you should recalibrate the SIP-1000 is a function of operator judgment and is dictated by the desired accuracy, environmental conditions and monitoring requirements. To reduce recalibration frequency, the unit has been designed to minimize long-term drift with changes in environmental conditions. Because it is many times difficult or even impossible to have the necessary equipment available for accurate on-site calibration, the following are available options:

1. An operator programmable microprocessor that stores the program for up to 10 years with the power off.

2. An electronic calibrator to dial in the values recorded as suggested previously. This device replaces the reaction module to simulate detector response and can also be used to change response factors as may be required. In addition, it is a very useful diagnostic tool.

Maintenance

General Information

The unit should be periodically cleaned to avoid the build-up of particulates, moisture, and other foreign materials that may affect operation. Dust, moisture, or other liquids allowed to accumulate in the plumbing lines, probe or detector elements could seriously damage the unit, or at a minimum, cause restriction and/or coat surfaces that would degrade accuracy. Always clean and perform routine maintenance before storage. Carefully pack the unit in the carrying case with all accessories and store in a dry, clean area. Avoid locations that may be exposed to severe environmental conditions such as the trunk of your vehicle.

FIGURE 2. PROGRAMMING

DESCRIPTION	MODE	DISPLAY	SET
PROGRAM ERASED	☐	E E E E	☐
BACKGROUND COUNT (SAMPLING ZERO GAS)	■	0 1 5 2	☐
ZERO BACKGROUND	■	0 0 0 0	☐
BACKGROUND DRIFT (IF ANY)	☐	- 0 0 3	☐
REZERO	☐	0 0 0 0	■
SPAN COUNTS (SAMPLING CAL.GAS)	☐	0 6 8 4	☐
ENTER CAL. VALUE	■	0 0 0.	☐
REPEAT FOUR TIMES TO ENTER ALL DIGITS	☐	0 0 0.5	▒
	■	0 0 .5	☐
READING CAL. UNITS (PPB,PPM OR %)	☐	1 4.5 0	☐

NOTES: 1. ■ MOMENTARILY DEPRESS

2. ▒ SELECT 0 THROUGH 9

3. ☐ DO NOT DEPRESS

4. ALTHOUGH THE FRONT PANEL READS PPM, THE UNIT CAN BE CALIBATED IN: PPB, PPM OR % FROM (000.1 TO 999.9)

FIGURE 3. RECALL

DESCRIPTION	MODE	DISPLAY	SET
BACKGROUND COUNT STORED	■	0149	□
SPAN COUNTS STORED	■	0684	□
CAL. VALUE STORED IN PPB, PPM OR %	■	014.5	□
SAMPLING MODE	■	27.31	□
RECALLS HIGHEST READING	□	68.42	▨
SAMPLING MODE	□	5.208	□
BELOW THE ZERO VALUE STORED	□	LO	□
EXCEEDED THE DYNAMIC RANGE	□	HI	□
HOLD FOR 3 SEC. TO ERASE PROGRAM	▨	----	□

NOTES: 1. ■ MOMENTARILY DEPRESS

2. ▨ (SET) RESETS WHEN HELD 3 SEC.
(MODE) HOLD TO ERASE PROGRAM

3. □ DO NOT DEPRESS

4. ALTHOUGH THE FRONT PANEL READS PPM, THE UNIT CAN BE CALIBATED IN: PPB, PPM OR % FROM (000.1 TO 999.9)

Routine Maintenance

1. CHARGING: Always "top" charge the battery and hydride when not in use and before storage.

2. CLEANING: Remove all items from the carrying case. Remove the partitions, if necessary, and wipe out the inside of the case with a damp cloth. Clean the outside with a lint roller, use a brush, soap and water, if required. Wipe down the unit and all accessories with a damp cloth. **NEVER** use solvents as they may damage the case, but more important, they will be detected during operation. Avoid getting any moisture in open fittings, tubing, connectors or reaction chamber. Inventory all items and repack in the carrying case.

3. PROBE FILTER: The inlet end of the probe is loosely packed with glass wool to prevent particulates from entering the system. Periodically, push it out with a fine wire from the tip end and replace.

4. INJECTION PORT: When injecting samples in the chromatograph mode, always use a syringe with a minimum needle length of 2 inches. Periodically, remove the needle guide and check the condition of the septa. Replace as required to avoid leaks.

5. REACTION MODULES: A decrease in sensitivity, excessive drift or noisy signal are indicators that the PID or FID modules require cleaning. Clean the base of the FID or window on the PID with a Q-tip soaked in Ethanol. Rinse with de-ionized water and bake at 100°C until dry.

6. LEAKS: Whenever the column is changed or fittings reconnected, there is always the possibility for leaks. To avoid leaks, NEVER overtighten fittings. To check for leaks, disconnect the column from the regulator output and plug the fitting. Connect the hydride and set the pressure regulator at 30 psi. Disconnect the hydride from the quick connect. The pressure gauge should remain at 30 psi. If not, check all fittings and injection port with a leak test soap solution. Take corrective measures and reconnect the column.

5.27 INDUSTRIAL HYGIENE EVALUATIONS FOR CHEMICAL/PHYSICAL HAZARDS

Purpose:

Radiological & Environmental Safety (R&ES) conducts industrial hygiene evaluations: (a) to determine the use or generation of hazardous materials, (b) to determine the need for exposure monitoring, (c) to determine the need for workplace monitoring, and (d) to ensure the adequacy of documentation to meet the requirements of DOE Order 5480.10.

This instruction establishes a system for planning, conducting, documenting, and tracking the industrial hygiene evaluation. The extent of activity will be determined by use of the flow diagram in Attachment A.

Requirements:

Responsibilities

1. R&ES shall schedule, conduct, and document the industrial hygiene evaluation to determine courses of action required to ensure compliance with established exposure monitoring requirements.

2. The industrial hygiene evaluation will normally be conducted by an Industrial Hygienist and shall be peer reviewed prior to issuance to the facility manager.

3. R&ES will use the industrial hygiene evaluation to document required personal exposure monitoring, general area monitoring, the tracking of action plans, and scheduling the facility or workplace for reevaluation.

4. If exposure levels are greater than established criteria, R&ES will assist facilities in the development of engineering controls to reduce exposure to acceptable levels.

5. The frequency of reevaluation will be based on the industrial hygiene hazards of the work area.

6. Advanced notification to the facility management shall be made to ensure appropriate technical personnel are available from the facility to assist in the evaluation. At least two weeks advanced notice should be provided.

7. Industrial hygiene evaluations are permanent historical documents and shall be retained for the life of the facility or workplace. The "RECORD COPY" shall be filed in the appropriate Record file.

Format

1. Attachment B is a summary format to identify the facility, chemicals, and physical agents used/generated in the specific workplace, mitigation since the last revision of the document, etc.

2. Attachment C provides the comprehensive documentation for the evaluation. The evaluation should include an Attachment C for each chemical or physical agent identified on Attachment B.

3. Section 5 and 6 of Attachment C provide the basis for further action. Therefore, a simple "yes" or "no" is not acceptable. To withstand an audit, the evaluation must include the basis for the answer.

4. Section 7 of Attachment C is required to ensure monitoring is obtained and closes the documentation loop.

5. All facility documents, studies, R&ES reports, and other technical supporting documents which were reviewed should be included in Section 8. The more documentation that is provided to identify problems or substantiate an action (or no action), the stronger the position from an auditability standpoint.

Exposure Records and Notification

1. When exposure monitoring is performed, the data must be entered into exposure monitoring database which is maintained by the Occupational Medical Program.

2. Occupational Medical Program shall provide a copy of the exposure record in accordance with the schedule listed below:

   - If the data indicates that the exposure is less than the action level, Occupational Medical Program shall notify the employee on a quarterly schedule.
   - If the data indicates that an exposure occurred which was greater than the action level but less than the PEL, within 20 days, Occupational Medical Program shall issue an Internal Memo with the exposure records to the work area manager requesting that he/she discuss the monitoring results with the affected employee(s).
   - If the data indicates an exposure greater that the established exposure limits (PEL or TLV) Occupation Medical Program shall immediately issue an Internal Memo with the Exposure records to the work area manager requesting that he/she notify the employee(s) in writing of the exposure and indicate corrective actions which will be taken. Notification of the employee must be transmitted to the affected employee(s) within 15 days of the receipt of the data by WHC.

Attachments

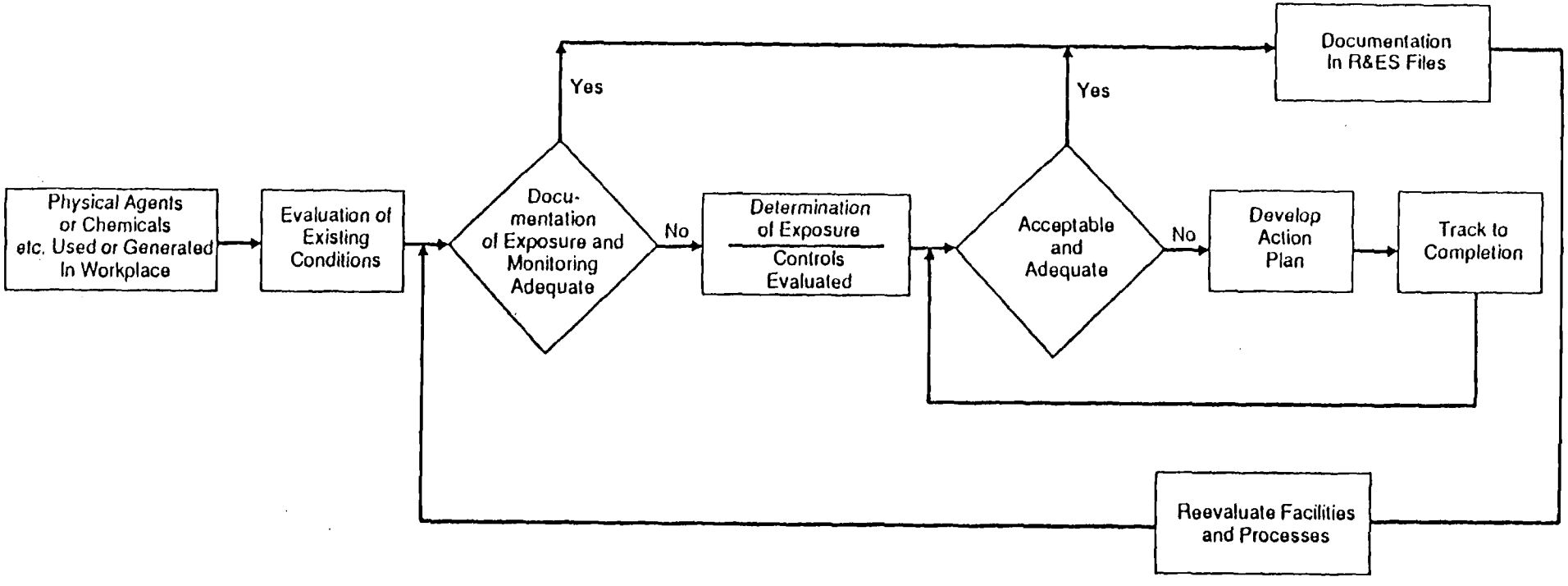
A. Industrial Hygiene Chemical/Physical Hazards Evaluation Flowsheet

B. Chemical/Physical Industrial Hygiene Hazard Evaluation Facility Documentation

C. Industrial Hygiene Evaluation of Chemical/Physical Hazards

D. Exposure Records and Notification Flow Diagram

Industrial Hygiene (Chemical/Physical) Hazards Evaluation Flow Sheet



- Noise
- Chemicals
- RF
- Asbestos
- Lasers
- Lighting
- Biological
- Ergonomic
- Heat Stress

- ID of Specific Hazards
- Facility Walk-Through
- Procedure Review
- Review of Sampling and Monitoring Data
- Ventilation
- Training
- PPE
- Others

- Workplace and Exposure Monitoring
- Auditable Records Generated
- PMs
- Training
- Notification
- Others

- <50% TLV/PEL
- ALARA
- Meet Established Criteria
- Others

- Revision of Procedures
- Periodic or Routine Exposure Monitoring
- Workplace Monitoring
- Elimination of Exposure
- Engineering Controls
- Others

- HS&S Tracking Systems
- Facility Tracking System
- Others

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ATTACHMENT B

CHEMICAL/PHYSICAL INDUSTRIAL HYGIENE HAZARD EVALUATION
FACILITY DOCUMENTATION - PART 1

FACILITY: _____

CHEMICAL/PHYSICAL AGENTS/HAZARDS USED OR GENERATED	LOCATION	SAMPLING DATA AVAILABLE*

AGENTS/HAZARDS CHANGED OR MITIGATED SINCE LAST REVISION:

Initial Evaluation

REFERENCES:

DATE OF REVISION:

INDUSTRIAL HYGIENIST PROVIDING REVISION:

CHEMICAL/PHYSICAL INDUSTRIAL HYGIENE HAZARD EVALUATION
FACILITY DOCUMENTATION - PART 2

DATE: _____

FACILITY: _____

PROCESS: _____

EVALUATED BY: _____ REVIEWED BY: _____

1.0 CHEMICAL/PHYSICAL AGENT EVALUATED: _____

INVENTORY:

STORAGE LOCATION:

STORAGE CONCENTRATION:

2.0 SPECIFIC WORK AREA(S) EVALUATED: _____

3.0 HOW IS CHEMICAL/PHYSICAL AGENT USED/GENERATED? _____

FORM:

CONCENTRATION:

PROCESS DESCRIPTION:

4.0 WHAT IS THE POTENTIAL FOR WORKER EXPOSURE? _____

POTENTIAL EXPOSURE ACTIVITIES:

POTENTIAL ROUTES OF ENTRY:

JOB CLASSIFICATION OF EXPOSED WORKERS:

RELATED SAMPLING DATA AND EXPOSURE CALCULATIONS:

SAMPLING EQUIPMENT USED AND CALIBRATION DATE:

INDUSTRIAL HYGIENE EVALUATION OF CHEMICAL/PHYSICAL HAZARDS

5.0 WHAT SAFETY CONTROLS ARE PROVIDED? _____

_____

_____

WARNING SIGNS/LABELS:

WORKER TRAINING:

ENGINEERING CONTROLS:

PERSONAL PROTECTIVE EQUIPMENT:

OTHER CONTROLS:

6.0 EVALUATION, FINDINGS, AND RECOMMENDATIONS (Provide explanation of basis for answer--simple "yes" or "no" is not acceptable):

STORAGE FACILITIES ADEQUATE?

SIGNS/LABELS ADEQUATE?

WORKER TRAINING ADEQUATE?

ENGINEERING CONTROLS ADEQUATE?

ADMINISTRATIVE CONTROLS ADEQUATE?

PERSONAL PROTECTIVE EQUIPMENT ADEQUATE?

ROUTINE MONITORING REQUIRED?

OTHER RECOMMENDATIONS:

7.0 FOLLOW-UP:

REPORT TO FACILITY MANAGEMENT; DATE: _____

NECESSARY CORRECTIVE ACTION COMPLETE; DATE: _____

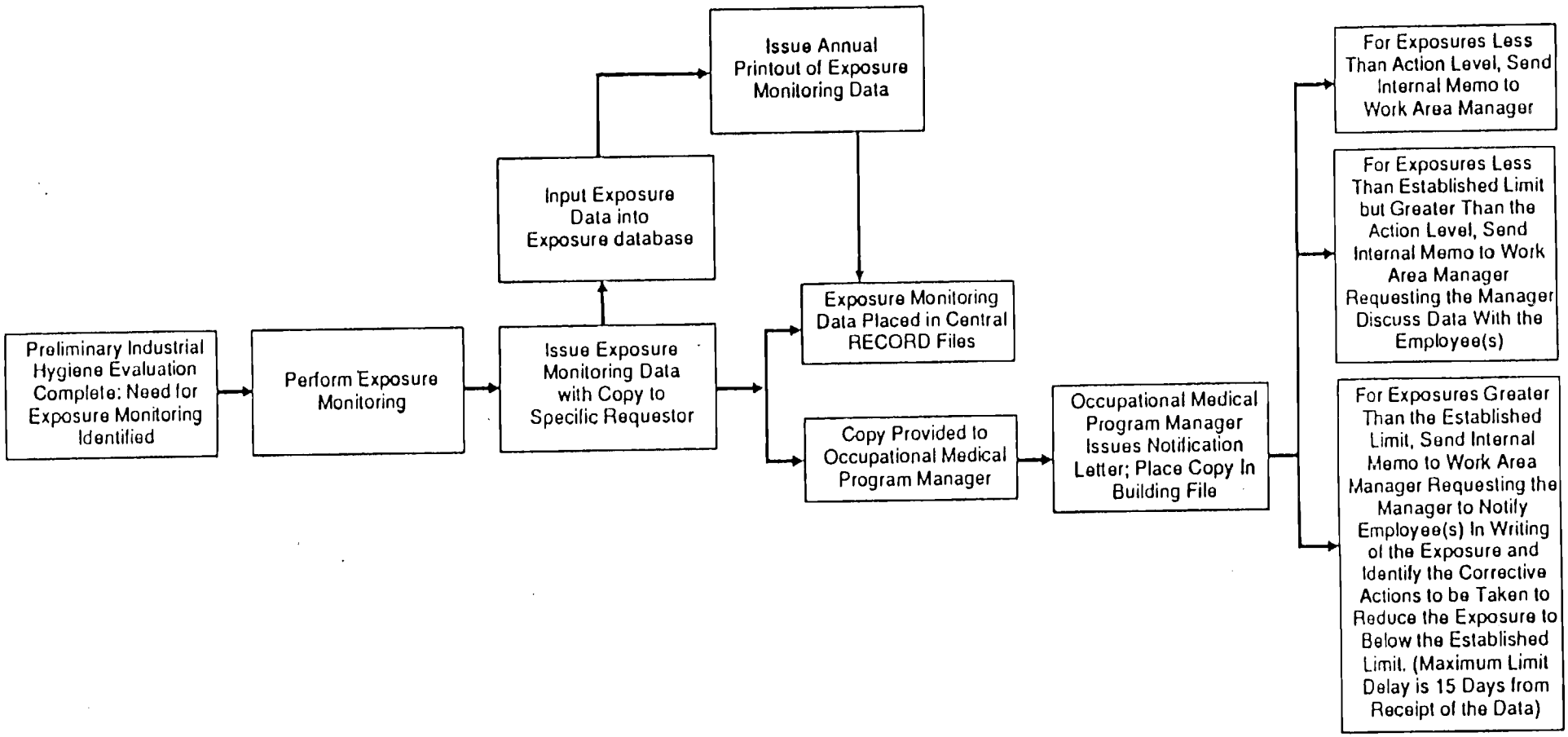
8.0 DOCUMENTS REVIEWED FOR INFORMATION:

o

o

o

Exposure Records and Notification Flow Diagram



O-0631
O-1#2—11/89

UNC Geotech	Procedure no. HSSIH-0001	Revision no. 1	Page 1 of 7
Procedure Title: Airborne Metals Sampling			

The changes are the addition of Quality Assurance in Section 6.4 and specifying a three-piece rather than two-piece cassette in 5.2.1.

SUBMITTED BY: [signature] DATE 7/13/90

INDEPENDENT REVIEW: [signature] DATE 7-16-90

SUBMITTER'S MANAGER: [signature] DATE 7-16-90

HS&S MANAGER: MW Zulemer for [signature] DATE 7/18/90

EFFECTIVE DATE: 7/18/90

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1.0 PURPOSE

This procedure will present the airborne sampling method for most metals. Metals covered by this method are:

Aluminum	Chromium	Magnesium	Selenium	Titanium
Arsenic	Cobalt	Manganese	Silver	Tungsten
Barium	Copper	Molybdenum	Sodium	Vanadium
Beryllium	Iron	Nickel	Tellurium	Yttrium
Cadmium	Lead	Phosphorus	Thallium	Zinc
Calcium	Lithium	Platinum	Tin	Zirconium

By sampling for airborne metal dusts and fumes, these workplace hazards will be known and proper worker protection can be provided.

2.0 SIGNIFICANCE AND USE

2.1 This sampling method follows NIOSH 7300 which uses Inductively Coupled Argon Plasma - Atomic Emission Spectroscopy. Most metals are included in this method. However, organoarsenic compounds, barium, hexavalent chromium, mercury, nickel carbonyl, organotin compounds, and vanadium oxides are not covered and most cannot be accurately analyzed by NIOSH 7300. Nevertheless, UNC Chemistry Lab personnel suggest this method for barium due to it's sensitivity, so it will be included.

3.0 RESPONSIBILITY

3.1 An Industrial Hygienist will determine the applicability of this procedure to special sampling situations. Exceptions to use of this method will also be decided by the IH.

3.2 Occupational Health and Safety Technicians are responsible to sample for airborne metals using this procedure unless otherwise directed by the IH or another method in the HS&S Desktop Procedure applies.

4.0 HAZARD ANALYSIS

4.1 This procedure does not present a hazard to the technicians conducting the sampling.

5.0 PRE-JOB PLANNING

5.1 Prerequisites

5.1.1 Ensure an adequate supply of 0.8 micron mixed cellulose ester filters in three-piece cassettes for the entire job. Discern whether the activity will allow enough time to collect a sample that has a reasonable detection limit.

5.2 Requirements

5.2.1 Equipment

- o 0.8 micron pore, mixed cellulose ester (MCE) filter-37mm dia.
- o Support pad
- o 37mm diameter clear "plastic" three-piece cassette
- o Personal sampling pump, high flow, low volume (e.g., MSA Flow-Lite)
- o Hose barbs
- o Flexible tubing of appropriate diameter and length
- o Lapel clip
- o Belt or other attachment for pump
- o Shrink or electrical tape
- o Other equipment required for calibration by Desktop Procedure 5.15

6.0 INSTRUCTIONS

6.1 Sampling Train

6.1.1 If the cassette is not preloaded, place support pad against radiating ribs on base of opened cassette (may be indicated as outlet on cassette); then place the MCE filter on the support pad and close the cassette (sampling will be closed face). Also wrap shrink tape or electrical tape around the gap between the two cassette halves to prevent leakage (Figure 1).

6.1.2 Attach a hose barb to the cassette side with the radiating ribs and connect the flexible tubing to the hose barb.

6.1.3 Attach the other side of the flexible tubing to the pump.

CAUTION

All potential air leak locations should be checked to ensure that the entire amount of air calibrated as flowing through the filter is not leaking in elsewhere.

6.2 Calibration

6.2.1 Fit a hose barb to the inlet side of the cassette and attach to the tubing connected to the calibrator. Refer to calibration in Desktop Procedure 5.17.

6.3 Flow Parameters

6.3.1 Keep the flow rate between 1 and 4 liters per minute (LPM). Flow rates will depend on environmental conditions and time constraints. If soil conditions are dusty, reduce flow rate; if conditions are damp and minimal airborne disturbance will occur, an increased flow rate is recommended.

6.3.2 Sample volumes generally should be kept between 250 and 2000 liters but specific questions of total volume should be referred to Figure 2. The target volume in most cases will be between 1000 and 2000 liters.

6.3.3 Samples should be collected for the longest period allowed by the dust conditions, total volume limits, task length, etc. to be the most representative of worker exposure.

6.4 Quality Assurance

6.4.1 Prepare the field blanks at about the same time when sampling has began. The field blanks will consist of unused filters and cassettes from the same lot used for sample collection. Remove the caps on the cassettes in a clean area approximately when sampling begins but do not draw air through them. Replace the caps after sampling is finished. Label and submit as blind blanks. Two field blanks are required for each 10 samples up to a maximum of 10 field blanks per sample set. Two field blanks are the minimum submitted. The average of the field blanks may be subtracted from the sample results.

6.5 Personnel Sampling Procedure

6.5.1 Attach the sample pump securely to the belt in a position most comfortable for the worker, usually behind the hip. Run the flexible tubing over the shoulder so that it does not hinder worker movement and attach the clip near the filter to the lapel or collar (Figure 1). The filter cassette must be placed within two feet of the workers nose to be in the breathing zone and should be placed as close as practical to the nose. The filter opening will not be obstructed or oriented upward (to prevent particulates that would not ordinarily be collected from settling on the filter). The ideal filter orientation would be with the two filter openings in the same horizontal plane but a downward orientation of the opening is acceptable and more practical.

6.5.2 Record the pertinent information on the form in Appendix 3 of Desktop Procedure 5.17.

6.5.3 Remove the plug just before starting the sample pump. Note the time as the pump is turned on and ensure that the sampling train is functioning properly.

6.5.4 Once sampling is completed, turn the pump off, replace the plug in the inlet, and record the time and any changes in weather conditions. Remove the pump from the worker.

6.5.5 Calibrate the pump according to Desktop Procedure 5.17

6.6 Area Sampling Procedures

6.6.1 This type of metals sampling is the same as the personnel sampling in Section 6.4 except omit 6.4.1 and place the pump on a stationary support or surface and suspend the cassette about 5 feet above ground or elsewhere as appropriate for the sample desired.

7.0 RECORDS REVIEW AND DISPOSITION

7.1 No new records or forms are generated by this procedure. However, the Calibration and Sampling Form from Appendix 3 of the revised HS&S Desktop Procedure 5.17 is used to record airborne metals sampling information. Therefore the Records Review and Disposition section of Procedure 5.17 should be followed.

8.0 REFERENCES

8.1 NIOSH Manual of Analytical Methods (Third Edition) 1987

8.2 Air Sampling Instruments for Evaluation of Atmospheric Contaminants, 7th Edition, American Conference of Governmental Industrial Hygienists, 1989

8.3 1990 SKC Comprehensive Catalog and Guide

8.4 Hager Laboratories Air Sampling Manual

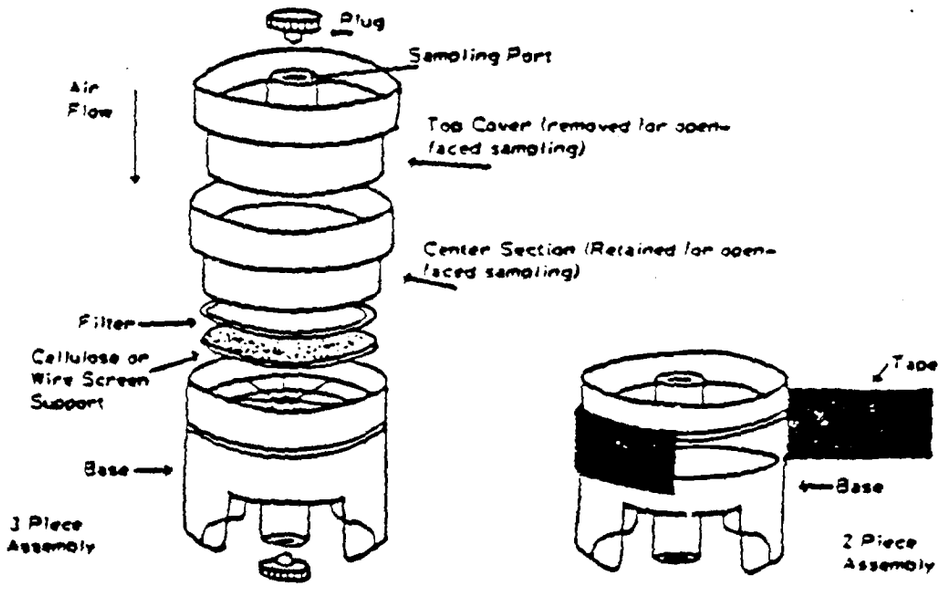
9.0 FORMS AND APPENDICES

Not applicable.

10.0 KEYWORDS

10.1 Metals, Airborne Sampling, NIOSH 7300, ICP-AES

10.2 Desktop Procedure 5.17, Appendix 3; M. L. Mullis


Plug
Sampling Port
Air Flow
Top Cover (removed for open-faced sampling)
Center Section (Retained for open-faced sampling)
Filter
Cellulose or Wire Screen Support
Base
3 Piece Assembly
Tape
Base
2 Piece Assembly

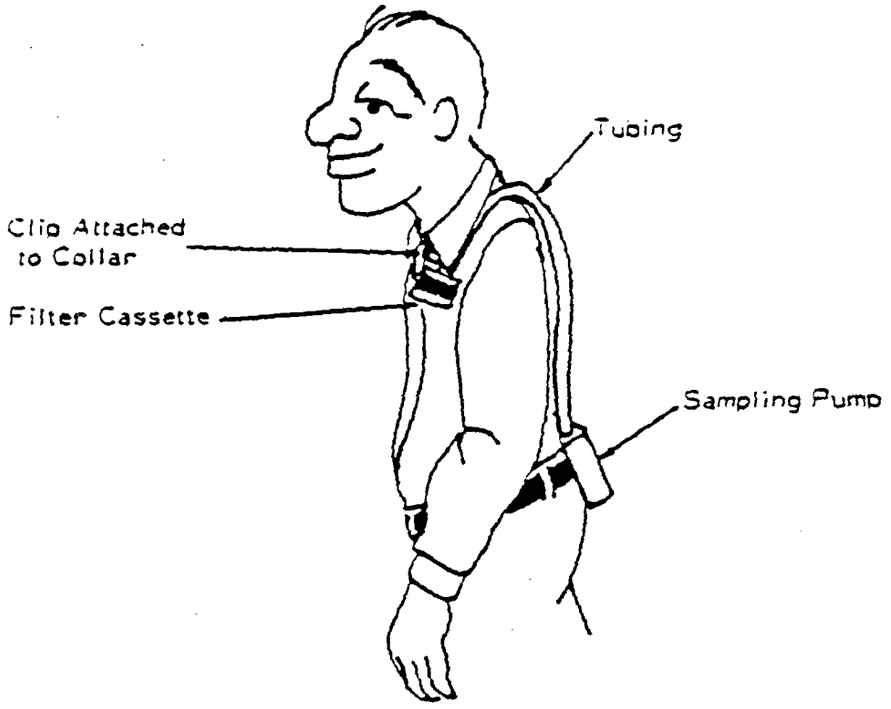

Tubing
Clip Attached to Collar
Filter Cassette
Sampling Pump

FIGURE 1

ELEMENT (SYMBOL)	ATOMIC WEIGHT	AIR VOLUME FROM OSHA, L MINIMUM	MAXIMUM
Silver (Ag)	107.87	250	2000
Aluminum (Al)	26.98	5	100
Arsenic (As)	74.92	5	2000
Beryllium (Be)	9.01	1250	2000
Calcium (Ca)	40.08	5	200
Cadmium (Cd)	112.40	13	2000
Cobalt (Co)	58.93	25	2000
Chromium (Cr)	52.00	5	1000
Copper (Cu)	63.54	5	1000
Iron (Fe)	55.85	5	100
Lithium (Li)	6.94	100	2000
Magnesium (Mg)	24.31	5	67
Manganese (Mn)	54.94	5	200
Molybdenum (Mo)	95.94	5	67
Sodium (Ma)	22.99	13	2000
Nickel (Ni)	58.71	5	1000
Phosphorus (P)	30.97	25	2000
Lead (Pb)	207.19	50	2000
Platinum (Pt)	195.09	1250	2000
Selenium (Se)	78.96	13	2000
Tin (Sn)	118.69	5	500
Tellurium (Te)	127.60	25	2000
Titanium (Ti)	47.90	5	100
Thallium (Tl)	204.37	25	2000
Vanadium (V)	50.94	5	2000
Tungsten (W)	183.85	5	200
Yttrium (Y)	88.91	5	1000
Zinc (Zn)	65.37	5	200
Zirconium (Zr)	91.22	5	200

FIGURE 2

ATOMIC WEIGHTS AND SAMPLING VOLUME FOR METALS
(Based on NIOSH 7300)

SUBMITTED BY: _____ DATE 5/16/90

INDEPENDENT REVIEW: _____ DATE 5/18/90

SUBMITTER'S MANAGER: _____ DATE 5-22-90

HS&S MANAGER: _____ DATE 5-29-90

EFFECTIVE DATE: 5/29/90

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1.0 PURPOSE

This procedure establishes guidelines for operation of the Model HV-108-5 High Volume Air Sampler.

2.0 DISCUSSION OF SIGNIFICANCE AND USE

2.1 Equipment

- o Model HV-108-5 High Volume Air Sampler
- o Airborne Cassettes
- o Tygon Tubing
- o Gilian Bubble Generator System

2.2 General

2.2.1 The HV-108-5 system can be set up to perform up to five air samples simultaneously.

2.2.2 This system can be used simultaneously for up to five samples, each at 9.5 LPM with 300 ft. of hose. It is recommended that this ceiling flow rate not be exceeded.

2.3 Single Sample

2.3.1 Remove electric cord from inside suitcase and plug female end into outlet on left side of suitcase.

2.3.2 Connect suitable length of tygon to plastic manifold adapter and insert adapter into center manifold plug.

2.3.3 If feasible, the 3-section aluminum rod stand may be used to suspend cassette and can be screwed into top of suitcase for easy support.

2.3.4 Connect free end of tygon tube to top of rotameter.

2.3.5 Calibrate system in accordance with Section 5.17 using a Gilian bubble generator system. Pump on-off feature is controlled by physically plugging unit into wall outlet via electric cord. Flow rate control is achieved via flow control valve on front of rotameter. Once calibration is complete - no further flow control adjustments will be made.

2.3.6 Upon completion of calibration, pump is ready for field use.

2.3.7 After sample is collected, re-calibrate pump in accordance with Section 5.17.

2.4 Multiple Samples

2.4.1 Desired Tygon tube length must be established prior to calibration. Once calibrated, the length of tubing cannot be adjusted without an entire system re-calibration.

2.4.2 Any adjustment of flow rate or Tygon length to one sample cassette will affect the flow rate to all cassettes in the system.

2.4.3 It is recommended that Tygon tube length not exceed 300 ft.

2.4.4 Tripod stands provided in suitcase are to be used to support rotameters and cassettes for remote field samples.

2.4.5 Set up, calibration, and use of this system for each of the multiple samples, with the above noted provisions and exceptions, is exactly the same as that for a single sample. Refer to Section 2.3.

2.4.6 Any Tygon cut for samples should be stored in a central location after use for future reuse rather than destroyed.

Procedure Title: 55 178

Operation of Gilian LFS 113D Low-Volume Air Sampler

SUBMITTED BY: _____ DATE _____

INDEPENDENT REVIEW: _____ DATE _____

SUBMITTER'S MANAGER: _____ DATE 5-22-90

HS&S MANAGER: _____ DATE 5-29-90

EFFECTIVE DATE: 5/29/90

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1.0 PURPOSE

This procedure establishes the requirements for accurate and reliable operation of the LFS 113D low-volume air sampling system.

2.0 EQUIPMENT & MATERIAL

- o Gilian LFS 113D Low-Volume Air Sampler
- o Universal Tube Holder System
- o Sorbent Tubes
- o Small Blade Screwdriver
- o Gilian Bubble Generator
- o Tygon Tubing

3.0 DISCUSSION OF SIGNIFICANCE AND USE

3.1 Charging (Figure 1)

3.1.1 Plug the Dual Rate Charger into a properly grounded AC outlet. Set the rate select switch to the Normal Charge mode. Insert the Charging Jack into the receptacle (#1) on the side of the pump. Upon insertion, the Normal rate LED on the charger will light indicating proper charging of the battery pack.

3.1.2 Charge the battery for a minimum of 16 hours at the Normal rate. After 16 hours the sampler may be removed from the charger and utilized. It may remain on the charger but must be switched to the trickle charge mode.

3.1.3 Charging in accord with the above instructions will prolong battery life. Failure to follow these instructions will cause premature failure and permanent damage to the battery pack.

3.2 Filter Check (Figure 1)

3.2.1 Make sure that the Filter Assembly (#2) is secured into the suction inlet (#10). Check this by rotating the knurl on the bottom of the Filter Assembly clockwise. **Do Not Overtighten.**

3.3 Operation (General) (Figure 1)

3.3.1 The LFS 113 is a dual mode sampler, which will provide Low Flow air sampling in Constant Flow or Constant Pressure (multiple flow modes).

3.3.2 In the Constant Flow mode, the unit is externally set from 5-200 cc/min. by adjustment of the flow control valve (#9).

3.3.3 In the Constant Pressure mode, the unit is externally set from 1-350 cc/min. by means of the Flow Controller Valve(s) within the Flow Controller Tube Holder Assembly.

3.3.4 A green Battery Check LED indicator (#6) lights to show that the battery will run for a minimum of eight (8) hours at any flow regime within the unit's capability.

A red Flow Fault LED indicator (#7) results from either a blocked inlet or insufficient battery voltage to maintain the preset flow. If the red LED is lit, check the inlet for an obstruction.

3.4 Mode Selection (Figure 1)

3.4.1 The Mode Selector Switch (#4) is located on the back of the sampler, adjacent to the top of the Belt Clip. This unlocks, indexes and re-locks the Mode Selector Valve into one of the Dual sampling modes.

3.4.2 The Mode Indicator (#3) is observable through a hole in the side of the case. If the indicator is **Black**, then the unit is in the **Constant Flow Mode**. If the indicator is <u>light</u> <u>or</u> <u>white</u>, then the unit is in the <u>Constant</u> <u>Pressure</u> <u>Mode</u> (multiple flow).

3.4.3 To set the LFS pump into one of the sampling modes, insert the Allen Key, (L-shaped hex wrench) provided with the sampler, into the Mode Selector Switch (#4). Rotate the key counterclockwise to unlock the rotor. Continue rotating the key counter-clockwise approximately one half a turn until the switch clicks in.

3.4.4 Look into the Mode Indicator hole on the side of the sampler to see that the indicator is <u>black</u> or <u>white</u>, depending on the mode desired. Continue turning the selector switch counter-clockwise until the desired mode has been set. Now, lock the rotor into position by rotating the key clockwise - a half turn. TIGHTEN GENTLY - **Do Not Overtighten!**

3.4.5 The samplers Mode Indicator appears either **black** for **Constant Flow** or <u>White</u> for <u>Constant</u> <u>Pressure</u>. Turn **ON** the pump. To check if the pump is in the Constant Flow mode, hold your finger over the Pump Inlet Boss (#10), the samplers Fault Light will illuminate in approximately 3-5 seconds. This signal means that the sampler is operating properly in the Constant Flow Mode. **NOTE: If the pump is set at a very low flow (i.e. 10 cc/min.) it may take 10 seconds for the Fault Indicator LED (#7) to illuminate.**

3.5 Constant Flow Sampling (Figure 1)

3.5.1 First, make sure that the pump is in the Constant Flow mode. If needed, follow the procedures explained in Section 3.4 to achieve the Constant Flow mode.

3.5.2 Connect one end of the 1/8" ID tubing to the Pump Inlet Boss (#10) and the opposite end to the inlet boss of the Flow Controller Tube Holder Assembly.

NOTE: Each LFS 113DDk and DCDK model comes equipped with the (TH-DV-LFS) Dual Manifold Tube Holder Kit. This kit was designed to sample two (2) standard 6mm x 70mm sorbent tubes when used in the **Constant Pressure** (Multiple Flow) mode. However, when sampling in the **Constant Flow** mode, you may use only one (1) Sorbent Tube.

3.5.3 Unscrew one of the tubes from the Flow Controller Manifold. Remove one Tube Holder End (THE-S-200) and slip the Collar Clip (THC-S- 200) over the Tube Holder Housing (THH-S-225). Install the desired sorbent tube with the arrow, (printed on the tube) pointing in the direction of the air flow path. Replace the end and insert the additional Hose Barb Fitting (THF-B-218). Connect the tubing from the Pump Inlet Boss (#10) to the Hose Barb on the end of the tube holder.

3.5.4 Turn **ON** the sampler. The sampler will run and the green Battery Check LED (#6) will illuminate indicating that the sampler can be used for 8 hours under maximum load conditions. (If the green light does not illuminate, the sampler may still be run for 8 hours, if <u>not</u> subjected to maximum load conditions).

NOTE: During normal sorbent tube sampling, the LFS system is used at approximately 50% of its maximum capacity.

3.5.5 Setting flow in the Constant Flow mode is accomplished by adjusting the flow adjust valve located on the front of the sampler. To set the flow, connect a piece of 1/8" ID tubing from the inlet of the Flow Controller Tube Holder, to the suction side of a calibrator. Adjust the flow by inserting a small blade screwdriver into the recess marked **Flow Adjust** (#9) - engage the blade of the screwdriver with the slot of the Flow Control Valve and slowly rotate the valve clockwise to decrease flow or counter-clockwise to increase flow.

3.5.6 Once the flow has been established, allow the sampler to run preferably for fifteen minues (at least five minutes) to reach flow stability. A quick check of the fault system should be performed by blocking the inlet to the pump and observing the activation of the Fault Indicator. Maintaining the blockage for

20-40 seconds will cause the pump to cease and the time to latch. If the blockage is removed prior to completion of the fault time activation period, the light will extinguish and the pump will continue to run normally. Perform pump calibration referred to in Desktop Procedure 5.17.

3.6 Multiple Flow Sampling (Figure 1)

3.6.1 Set the mode select switch (#4) to the Constant Pressure (Multiple Flow) position. **See Mode Selection in Section 3.4.** In this mode, the internal control valve is inoperative.

3.6.2 Attach the 1/8" ID tubing to the Flow Controller Manifold outlet boss (single, dual, triple or quad). Connect the opposite end of the tubing to the boss of the Pump Inlet Filter (#2). Remove the protective end caps covering the Flow Adjust Valves of the Flow Controller Manifold. Install the desired sorbent tube(s) with the arrow, (printed on the tube) pointing in the direction of the air flow path. Reassemble each sorbent tube cassette and install a boss into the tube holder end of each cassette position if necessary.

3.6.3 Turn **ON** the sampler. The sampler will run and the green Battery Check LED (#6) will illuminate indicating that the sampler can be used for 8 hours under maximum load conditions. (If the green light does not illuminate, the sampler may still be run for 8 hours, if not subjected to maximum load conditions).

NOTE: During normal sorbent tube sampling, the LFS system is used at approximately 50% of its maximum capacity.

3.6.4 Connect a second piece of 1/8" ID tubing from the Inlet Boss of sorbent tube position #1, to a calibrator. Adjust the flow through the sorbent tube by adjusting the Flow Control Valve located at that cassette position. Slowly rotate the valve clockwise to decrease flow or counter-clockwise to increase flow. Perform calibration according to Desktop Procedure 5.17.

3.6.5 Repeat this procedure for each of the sorbent tube holder positions. Remove the tubing from the inlet boss of position (#1) and reattach to the inlet boss of the next desired cassette position. NOTE: **In the Constant Pressure mode, the total cumulative flow of all the flow controller valves, cannot exceed 350 cc/min. Therefore, add the flow rate of Tubes 1 through 4 to ensure it remains at or below the maximum.** After the flow of each position has been set, check that no flow interactions have occurred. If there has been a deviation at one particular position, go back to each holder, readjust the flow, and recalibrate according to Desktop Procedure 5.17.

3.6.6 The unit can now be removed from the calibrator and deployed for sampling. In the Constant Pressure mode, blocking any one or all of the sorbent tube inlets, will not cause the sampler to flow fault. However, if the battery voltage falls below the operating point required, the Fault Indicator (#7) will light and the unit will cease running.

4.0 MAINTENANCE

4.1 Battery Charging and Storage Maintenance

A proper battery maintenance program is essential to insure maximum battery life and performance. Specific charging and discharging procedures will vary with the users needs and/or applications. The following is a list of general recommendations which will help to extend efficient battery life and serviceability.

4.1.1 **Do not short the battery connectors.** This will result in irreversible damage to the battery pack.

4.1.2 **Do not overcharge the batteries.** You should not charge the battery packs at the Normal rate for more than 24 hours. Repeated overcharging will eventually lead to a deterioration in the performance level of the battery pack. If you must have the batteries on charge for more than 24 hours, switch the charger to the Trickle rate.

4.1.3 **The long-term storage of pumps** will require some special handling. If pumps are not scheduled to be used for long periods of time, (more than 2 months), it is recommended that the following procedure be followed on a periodic basis.

4.1.3.1 Run pumps until they shut down on low battery.

4.1.3.2 Recharge the battery overnight (16) hours and return the pumps into storage.

4.2 Replacing the Battery (Figure 2)

Place the sampler face down on a soft, level surface. Remove the four corner case screws. Supporting the pump by the front half, turn the sampler face up. Remove the top half to reveal the internal mechanism. Carefully disengage the Battery Connector from the receptacle located on the Control Board (#7). Lift the Battery (#3) from the base of the case. To install a new Battery, reverse this procedure. NOTE: The connector is polarized and can only be properly installed in one direction.

4.3 Changing the Pump Filter

Under normal operating conditions, the Pump Filter should be changed after approximately 250 hours of operation or when needed. Failure to change the filter as it becomes dirty will decrease the pump back pressure capability and performance envelope.

Blow all dust and debris from around the Filter Housing. Grasp the knurled edge of the Filter Housing Assembly and rotate counter-clockwise. Check the new Filter Housing Assembly to make sure that the sealing "O" ring is present on the internal boss. Install the new Filter Housing Assembly onto the pump rotating the knurled edge clockwise. **Do not overtighten.**

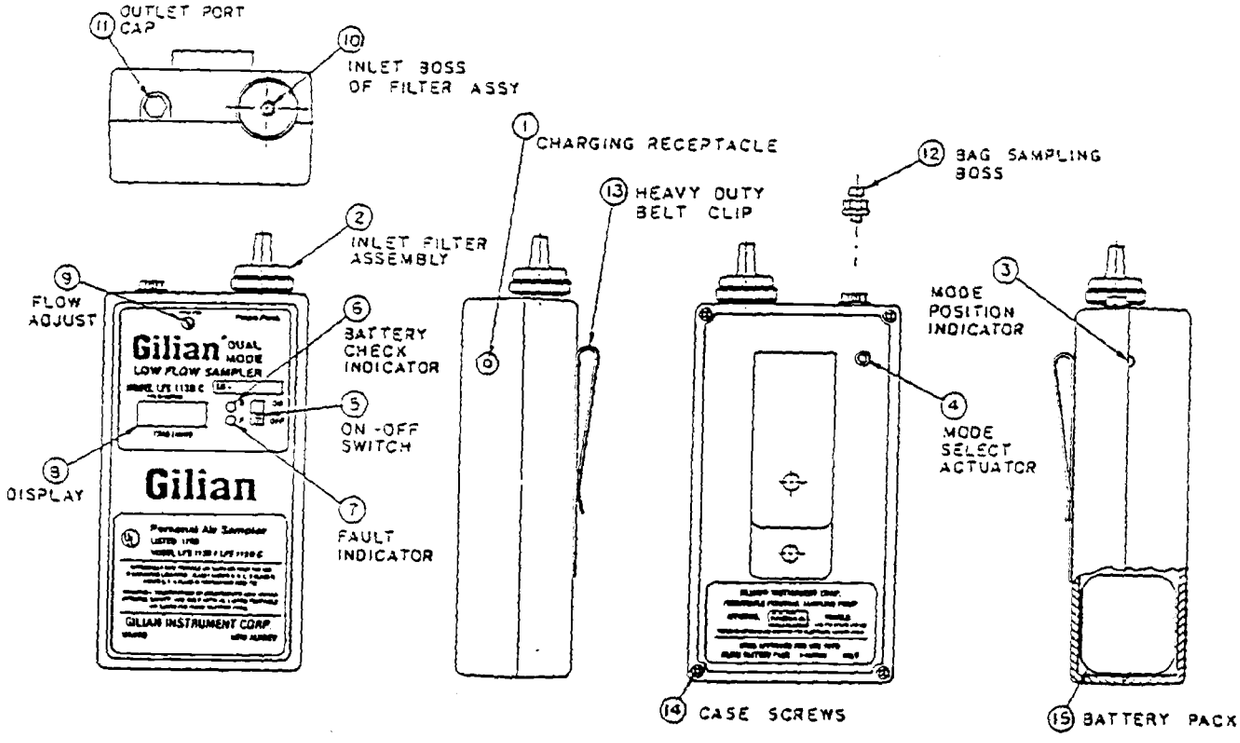
11 OUTLET PORT CAP
10 INLET BOSS OF FILTER ASSY
1 CHARGING RECEPTACLE
12 BAG SAMPLING BOSS
13 HEAVY DUTY BELT CLIP
2 INLET FILTER ASSEMBLY
9 FLOW ADJUST
6 BATTERY CHECK INDICATOR
5 ON-OFF SWITCH
8 DISPLAY
7 FAULT INDICATOR
3 MODE POSITION INDICATOR
4 MODE SELECT ACTUATOR
14 CASE SCREWS
15 BATTERY PACK
Gilian
DUAL MODE
LOW FLOW SAMPLER
Gilian
GILIAN INSTRUMENT CORP

FIGURE 1

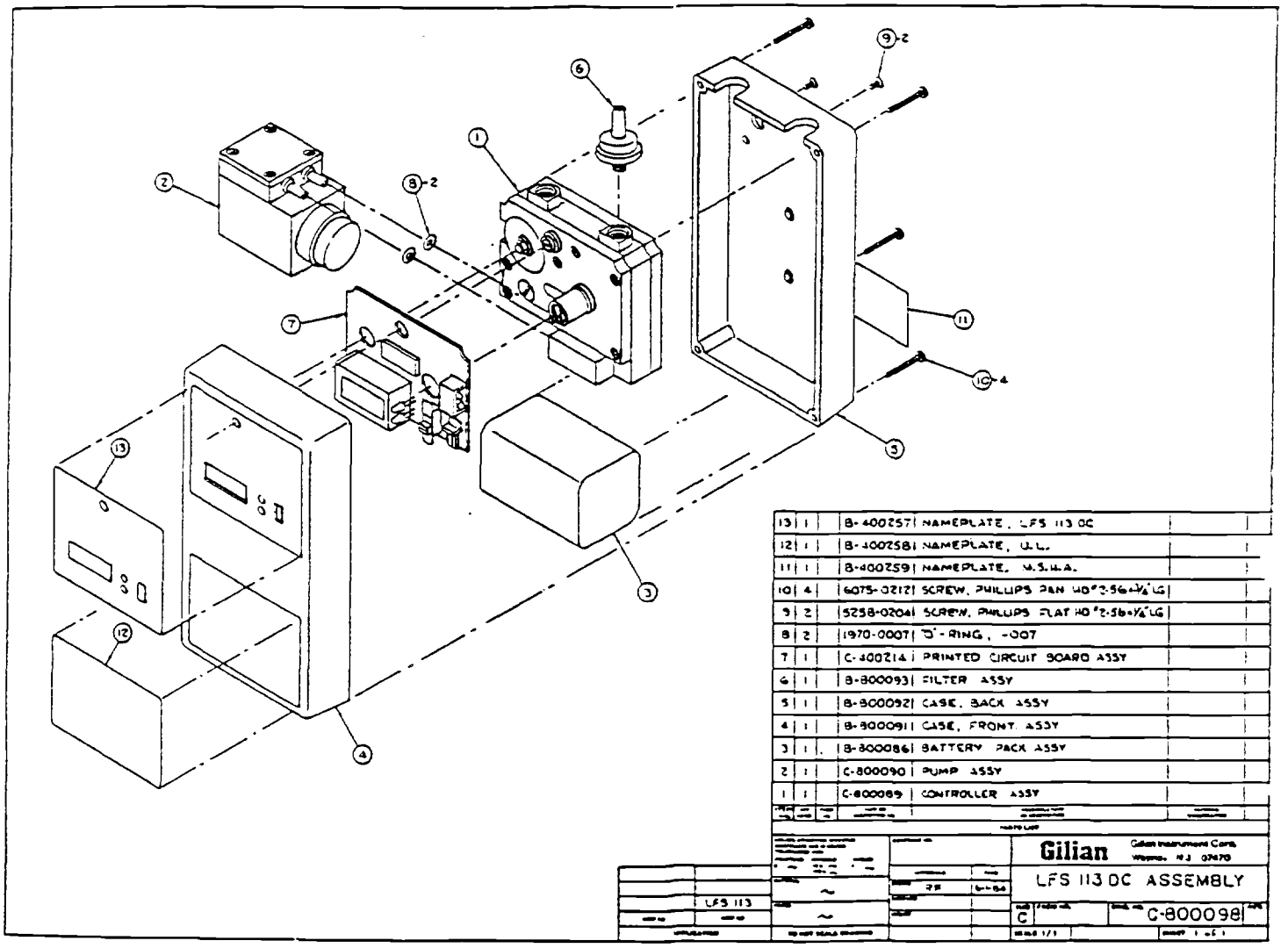
13 | 1 | B-400257 | NAMEPLATE, LFS 113 DC
12 | 1 | B-400258 | NAMEPLATE, U.L.
11 | 1 | B-400259 | NAMEPLATE, W.S.H.A.
10 | 4 | 6075-0212 | SCREW, PHILLIPS PAN HD #2-56×1/4" LG
9 | 2 | 5258-0204 | SCREW, PHILLIPS FLAT HD #2-56×1/4" LG
8 | 2 | 1970-0007 | "O"-RING, -007
7 | 1 | C-400214 | PRINTED CIRCUIT BOARD ASSY
6 | 1 | B-800093 | FILTER ASSY
5 | 1 | B-800092 | CASE, BACK ASSY
4 | 1 | B-800091 | CASE, FRONT ASSY
3 | 1 | B-800086 | BATTERY PACK ASSY
2 | 1 | C-800090 | PUMP ASSY
1 | 1 | C-800089 | CONTROLLER ASSY
Gilian
LFS 113 DC ASSEMBLY
C-800098
LFS 113

FIGURE 2

Procedure Title:
Colorimetric Indicator Tubes and Pumps - Draeger

Upon implementation this procedure will cancel and replace ES&H Desktop Procedure 5.6

SUBMITTED BY: [signature] DATE 6/11/90

INDEPENDENT REVIEW: [signature] DATE 6/18/90

SUBMITTER'S MANAGER: [signature] DATE 6/18/90

HS&S MANAGER: [signature] DATE 6/19/90

EFFECTIVE DATE: 6/19/90

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1.0 PURPOSE

This procedure specifies the requirements and methods for using Draeger tubes and pumps.

Draeger indicator tubes are used to indicate a specific chemical or group of chemicals. Tubes are available in different concentration ranges for some chemicals. While in storage they should be refrigerated. Tubes should not be used beyond their stamped expiration date.

2.0 SIGNIFICANCE AND USE

2.1 Field Check

All colorimetric indicator tubes and pumps should be field checked prior to use. This field check tests for pump leaks in the following manner:

2.1.1 Insert an unopened tube into the pump's tube holder

2.2.2 If using a bellows-type pump, squeeze the bellows. After at least 2 minutes, bellows should not regain its original shape or chain should not be taut. If a pump fails this test, it should be serviced according to manufacturer's instructions.

2.2 Operation

The following steps are used for instrument operation:

2.2.1 Break off both tips of a fresh colorimetric indicator tube in break-off eyelet on front cover plate or in tube breaker (an accessory).

2.2.2 Insert tube into pump head with arrow on tube pointing towards pump.

2.2.3 Hold pump between thumb and the base of index finger with front cover plate contacting finger.

2.2.4 In atmosphere to be sampled, begin compressing pump bellows.

2.2.5 Compress the bellows completely with a squeezing motion assuring that the total volume of the bellows is used.

2.2.6 Release grip and allow chain to become taut, signifying that 100 cc of air have been pulled through tube. Be sure to keep the tube end in the sample atmosphere during the specified time.

2.2.7 Complete steps 4 and 5 as many times as the tube's instructions state.

2.2.8 Read concentration of material in air at stained/unstained interface.

3.0 INTERPRETATION OF RESULTS

3.1 If no discoloration occurs when the system is used according to the instructions accompanying the tubes, the sampling results are less than the lower detection limit listed for that type of tube.

3.2 If the color change occurs within the detection range of the tube when the instructions for that tube are followed, the concentration at the coloration/discoloration interface is expressed as ___ ppm ± 25%.

3.3 Readings at or above the top of the detection range should be expressed as above that specific level.

3.4 The date, time, sampler name, tube type, number of pump strokes, and results will be reported in the logbook along with the pertinent identifier of the project.

3.5 A copy of the appropriate logbook pages will be filed in the project file.

SUBMITTED BY: J R Waugh DATE: 7/16/90

INDEPENDENT REVIEW: J. B. Guthrie DATE: 7/16/90

SUBMITTER'S MANAGER: V. Kirkland DATE: 7-16-90

HS&S MANAGER: M W Fullmer for T L Best DATE: 7/18/90

EFFECTIVE DATE: 7/18/90

SUBMITTED BY: J R Warga DATE: 7/16/90

INDEPENDENT REVIEW: J. B. Guthrie DATE: 7/16/90

SUBMITTER'S MANAGER: J. Richards DATE: 7-16-90

HS&S MANAGER: M W Fullmer for T L Best DATE: 7/18/90

EFFECTIVE DATE: 7/18/90

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1.0 INSTRUCTIONS

The purpose of this procedure is to establish the method which the UNC Geotech Respirator Program shall employ to promulgate respirator field inspection and maintenance limitations.

2.0 DISCUSSION OF SIGNIFICANCE AND USE

2.1 To maintain the integrity of a respirator and insure that maximum design protection is obtained, each respirator needs to be periodically inspected and only limited maintenance by users may be allowed. To maintain continuity, a procedure is needed for trained personnel to follow.

2.2 This procedure shall be used by all UNC Geotech and subcontractor personnel who have completed respirator training and are assigned to wear a respirator.

3.0 RESPONSIBILITY

3.1 The Respirator Program Administrator is responsible for the implementation, revision, and usage of this procedure.

3.2 All OH&S technicians are responsible to frequently monitor the usage of this procedure on the jobsite and immediately correct any deficiencies.

3.3 All personnel assigned to wear a respirator are responsible for compliance during day-to-day usage.

4.0 HAZARD ANALYSIS AND CONTROLS

There are no apparent hazards imposed or controls needed while using this procedure.

5.0 PRE-JOB PLANNING

5.1 Prerequisites

Any personnel wearing a respirator and using this procedure shall have completed Respirator User training (course #HS312).

5.2 Requirements

5.2.1 This procedure shall be utilized before and after each use of the respirator assigned.

5.2.2 Maintenance other than outlined in this procedure shall not be performed. If respirator problems outside the scope of this procedure are evident, terminate use of the respirator and notify an OH&S technician.

6.0 INSTRUCTIONS

6.1 Field Inspection of Air - Purifying Respirators

6.1.1 Examine the facepiece for:

6.1.1.1 Excessive dirt.

6.1.1.2 Cracks, tears, holes, or distortion from improper storage.

6.1.1.3 Inflexibility.

6.1.1.4 Cracked or badly scratched lenses in full facepieces.

6.1.1.5 Incorrectly mounted full facepiece lens or broken or missing mounting clips.

6.1.1.6 Cracked or broken air - purifying element holders, badly worn threads, or missing gaskets.

6.1.2 Examine the head straps or harness assembly for:

6.1.2.1 Breaks.

6.1.2.2 Loss of elasticity.

6.1.2.3 Broken or malfunctioning.

6.1.2.4 Excessively worn serrations on the head harness which might permit slippage (full facepiece only).

6.1.3 Examine the exhalation valve assembly for:

6.1.3.1 Missing, cracked, or distorted cover - then remove the cover.

6.1.3.2 Foreign material such as detergent residue, dust particles, or human hair under the valve seat.

6.1.3.3 Improper insertion of the valve body in the facepiece.

6.1.3.4 Cracks, breaks, or chips in the valve body, particularly in the seating surface.

6.1.3.5 Improper installation of the valve in the valve body.

6.1.4 Examine the air - purifying elements for:

6.1.4.1 Incorrect cartridge/filter for the hazard.

6.1.4.2 Incorrect installation, loose connections, missing or worn gaskets, or cross - threading in holder.

6.1.4.3 Expired shelf - life date on cartridge.

6.1.4.4 Cracks or dents in outside case of cartridge/filter.

6.0 (cont.)

6.1.5 If any discrepancies are noted, refer to 6.3.

6.2 Field Inspection of Atmosphere - Supplying Respirators

6.2.1 Complete 6.1 with the exception of 6.1.4, then examine the corrugated breathing tube for:

6.2.1.1 Broken or missing end connecters, gaskets, or o-rings.

6.2.1.2 Missing or loose hose clamps.

6.2.1.3 Deterioration - stretch the tube and inspect for cracks.

6.2.1.4 Damaged or missing threads.

6.2.2 Examine the air supply system for:

6.2.2.1 Integrity and good condition of air supply lines and hoses, including attachments and end fittings, also, hose length no greater than 300 feet.

6.2.2.2 Correct operation of all regulators, valves, or other air - flow regulators.

6.2.2.3 Air supply tank fully charged.

6.2.3 If any discrepancies are noted, refer to 6.3.

6.3 Field Maintenance

If any discrepancies are noted upon inspection, the following actions may be taken with the assistance of the OH&S technician. If the problem cannot be solved by these actions, terminate use of the respirator and insure that it cannot be mistakenly used by another person.

6.3.1 Air - Purifying Respirators

6.3.1.1 For dirt removal, wipe with a warm cloth. If this is not sufficient, the respirator can be cleaned and sanitized by the OH&S technician in accordance with HSSRP-006.

6.3.1.2 If harness straps on a half face respirator are defective or missing and they are the snap-on type, replace them.

6.3.1.3 If the exhalation valve cover is missing, replace it.

6.3.1.4 If the exhalation valve seat has residue or foreign material buildup, carefully wipe with a warm cloth.

6.3.1.5 If cartridge/filter discrepancies are noted, replace with a new one.

6.0 (cont.)

6.3.2 Atmosphere - Supplying Respirators

In addition to any applicable items from 6.3.1 above:

6.3.2.1 If discrepancies with quick disconnect air lines are noted, replace the defective line(s).

6.3.2.2 If an air supply tank is not 80% fully charged prior to use, replace with a fully charged tank.

7.0 RECORDS REVIEW AND DISPOSITION

There are no records generated from the use of this procedure.

8.0 REFERENCES

8.1 ANSI Z88.2 - 1980, "Practices for Respiratory Protection"

8.2 29 CFR 1910.134, "Respiratory Protection"

8.3 DOE/ID Order 5480.11, "RADIATION PROTECTION FOR OCCUPATIONAL WORKERS"

8.4 NIOSH Publication 87-116, "Guide to Industrial Respiratory Protection"

8.5 darrel bevis associates, inc., "Occupational Respiratory Protection"

MATERIAL SAFETY DATA SHEET OHS02610

55 199

OCCUPATIONAL HEALTH SERVICES, INC.
450 SEVENTH AVENUE, SUITE 2407
NEW YORK, NEW YORK 10123
(800) 445-MSDS (212) 967-1100

EMERGENCY CONTACT:
JOHN S. BRANSFORD, JR. (615) 292-1180

SUBSTANCE IDENTIFICATION

CAS-NUMBER 71-43-2
RTEC-NUMBER CY1400000

SUBSTANCE: BENZENE

TRADE NAMES/SYNONYMS:
BENZOL: CYCLOHEXATRIENE: BENZOLE: PHENE: PYROBENZOL: PYROBENZOLE: CARBON OIL: COAL TAR NAPHTHA: PHENYL HYDRIDE: BENZOLENE: BICARBURET OF HYDROGEN: COAL NAPHTHA: MOTOR BENZOL: ANNULENE: (6)ANNULENE: RCRA U019: STCC 4908110: UN 1114: C6H6: OHS02610

CHEMICAL FAMILY:
HYDROCARBON, AROMATIC

MOLECULAR FORMULA: C6-H6 MOLECULAR WEIGHT: 78.08

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

COMPONENTS AND CONTAMINANTS

COMPONENT: BENZENE PERCENT: >99

OTHER CONTAMINANTS: 0.15% NON-AROMATICS; 1 PPM THIOPHENE

EXPOSURE LIMIT:
BENZENE:
1 PPM OSHA TWA; 5 PPM OSHA 15 MINUTE STEL;
0.5 PPM OSHA ACTION LEVEL
10 PPM (30 MG/M3) ACGIH TWA;
ACGIH A2-SUSPECTED HUMAN CARCINOGEN
0.1 PPM (0.32 MG/M3) NIOSH RECOMMENDED 8 HOUR TWA;
1 PPM (3.2 MG/M3) NIOSH RECOMMENDED 15 MINUTE CEILING

10 POUNDS CERCLA SECTION 103 REPORTABLE QUANTITY
SUBJECT TO SARA SECTION 313 ANNUAL TOXIC CHEMICAL RELEASE REPORTING
SUBJECT TO CALIFORNIA PROPOSITION 65 CANCER AND/OR REPRODUCTIVE TOXICITY WARNING AND RELEASE REQUIREMENTS- (FEBRUARY 27, 1987)

PHYSICAL DATA

DESCRIPTION: COLORLESS TO LIGHT YELLOW LIQUID WITH AN AROMATIC ODOR

BOILING POINT: 176 F (80 C) MELTING POINT: 42 F (6 C)

SPECIFIC GRAVITY: 0.877 EVAPORATION RATE: (CARBON TETRACHLORIDE = 1) 1.0

VOLATILITY: 100%

SOLUBILITY IN WATER: 0.18% @ 25 C

VAPOR DENSITY: 2.8

VAPOR PRESSURE: 74.6 MMHG @ 20 C

ODOR-THRESHOLD: 1.5-5.0 PPM

55 200

OTHER SOLVENTS (SOLVENT - SOLUBILITY):
ACETONE, ALCOHOL, CARBON DISULFIDE, ACETIC ACID,
CARBON TETRACHLORIDE, CHLOROFORM, ETHER, OILS

OTHER PHYSICAL DATA
VISCOSITY: 0.65 CPS @ 25 C

FIRE AND EXPLOSION DATA

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

MODERATE EXPLOSION HAZARD WHEN EXPOSED TO HEAT OR FLAME.

VAPOR-AIR MIXTURES ARE EXPLOSIVE.

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

DUE TO LOW ELECTROCONDUCTIVITY OF THE SUBSTANCE, FLOW OR AGITATION MAY GENERATE ELECTROSTATIC CHARGES RESULTING IN SPARKS WITH POSSIBLE IGNITION.

FLASH POINT: 12 F (-11 C) (CC)

UPPER EXPLOSION LIMIT: 7.9%

LOWER EXPLOSION LIMIT: 1.3%

AUTOIGNITION TEMP.: 928 F (498 C)

FLAMMABILITY CLASS (OSHA): IB

FIREFIGHTING MEDIA:
DRY CHEMICAL, CARBON DIOXIDE, HALON, WATER SPRAY OR STANDARD FOAM (1987 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.4).

FOR LARGER FIRES, USE WATER SPRAY, FOG OR STANDARD FOAM (1987 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.4).

FIREFIGHTING:
MOVE CONTAINER FROM FIRE AREA IF POSSIBLE. COOL FIRE-EXPOSED CONTAINERS WITH WATER FROM SIDE UNTIL WELL AFTER FIRE IS OUT. STAY AWAY FROM STORAGE TANK ENDS. FOR MASSIVE FIRE IN STORAGE AREA, USE UNMANNED HOSE HOLDER OR MONITOR NOZZLES, ELSE WITHDRAW FROM AREA AND LET FIRE BURN. WITHDRAW IMMEDIATELY IN CASE OF RISING SOUND FROM VENTING SAFETY DEVICE OR ANY DISCOLORATION OF STORAGE TANK DUE TO FIRE (1987 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.4, GUIDE PAGE 27).

EXTINGUISH ONLY IF FLOW CAN BE STOPPED. USE WATER IN FLOODING QUANTITIES AS A FOG; SOLID STREAMS MAY SPREAD FIRE. COOL CONTAINERS WITH FLOODING AMOUNTS OF WATER; APPLY FROM AS FAR A DISTANCE AS POSSIBLE. AVOID BREATHING HAZARDOUS MATERIALS; KEEP UPWIND. EVACUATE TO A RADIUS OF 1500 FEET FOR UNCONTROLABLE FIRES. CONSIDER EVACUATION OF DOWNWIND AREA IF MATERIAL IS

LEAKING.

WATER MAY BE INEFFECTIVE (NFPA FIRE PROTECTION GUIDE ON HAZARDOUS MATERIALS, EIGHTH EDITION).

TRANSPORTATION

DEPARTMENT OF TRANSPORTATION HAZARD CLASSIFICATION 49CFR172.101:
FLAMMABLE LIQUID

DEPARTMENT OF TRANSPORTATION LABELING REQUIREMENTS 49CFR172.101 AND SUBPART E:
FLAMMABLE LIQUID

DEPARTMENT OF TRANSPORTATION PACKAGING REQUIREMENTS: 49CFR173.119
EXCEPTIONS: 49CFR173.118

TOXICITY

BENZENE:
IRRITATION DATA: 20 MG/24 HOURS SKIN-RABBIT MODERATE; 15 MG/24 HOURS OPEN SKIN-RABBIT MILD; 88 MG EYE-RABBIT MODERATE; 2 MG/24 HOURS EYE-RABBIT SEVERE.
TOXICITY DATA: 2000 PPM/5 MINUTES INHALATION-HUMAN LCLO; 2 PPH/5 MINUTES INHALATION-HUMAN LCLO; 65 MG/M3/5 YEARS INHALATION-HUMAN LCLO; 100 PPM INHALATION-HUMAN TCLO; 150 PPM/1 YEAR INTERMITTENT INHALATION-MAN TCLO; 20,000 PPM/5 MINUTES INHALATION-MAMMAL LCLO; 10,000 PPM/7 HOURS INHALATION-RAT LC50; 9980 PPM INHALATION-MOUSE LC50; 146,000 MG/M3 INHALATION-DOG LCLO; 170,000 MG/M3 INHALATION-CAT LCLO; 50 MG/KG ORAL-MAN LDLO; 3306 MG/KG ORAL-RAT LD50; 4700 MG/KG ORAL-MOUSE LD50; 2000 MG/KG ORAL-DOG LDLO; 88 MG/KG INTRAVENOUS-RABBIT LDLO; 2890 UG/KG INTRAPERITONEAL-RAT LD50; 340 MG/KG INTRAPERITONEAL-MOUSE LD50; 527 MG/KG INTRAPERITONEAL-GUINEA PIG LDLO; 194 MG/KG UNREPORTED-MAN LDLO; MUTAGENIC DATA (RTECS); REPRODUCTIVE EFFECTS DATA (RTECS); TUMORIGENIC DATA (RTECS).
CARCINOGEN STATUS: OSHA CARCINOGEN; KNOWN HUMAN CARCINOGEN (NTP); HUMAN SUFFICIENT EVIDENCE, ANIMAL SUFFICIENT EVIDENCE (IARC CLASS 1). THE RELATIONSHIP BETWEEN EXPOSURE TO BENZENE AND THE DEVELOPMENT OF ACUTE MYELOGENOUS LEUKEMIA HAS BEEN ESTABLISHED IN EPIDEMIOLOGICAL STUDIES.
LOCAL EFFECTS: IRRITANT- SKIN, EYE.
ACUTE TOXICITY LEVEL: MODERATELY TOXIC BY INGESTION; SLIGHTLY TOXIC BY INHALATION.
TARGET EFFECTS: CENTRAL NERVOUS SYSTEM DEPRESSANT; BONE MARROW DEPRESSANT. POISONING MAY ALSO AFFECT THE IMMUNE, HEMATOPOIETIC AND NERVOUS SYSTEMS.
AT INCREASED RISK FROM EXPOSURE: PERSONS WITH CERTAIN IMMUNOLOGICAL TENDENCIES.
ADDITIONAL DATA: USE OF ALCOHOLIC BEVERAGES MAY ENHANCE THE TOXIC EFFECTS. USE OF STIMULANTS SUCH AS EPINEPHRINE MAY CAUSE CARDIAC ARRYTHMIAS.

HEALTH EFFECTS AND FIRST AID

INHALATION:
BENZENE:

NARCOTIC/BONE MARROW DEPRESSANT/CARCINOGEN.

ACUTE EXPOSURE- HIGH CONCENTRATIONS, AROUND 3000 PPM, MAY CAUSE RESPIRATORY TRACT IRRITATION, AND MORE SEVERE EXPOSURES MAY RESULT IN PULMONARY EDEMA. SYSTEMIC EFFECTS ARE MAINLY ON THE CENTRAL NERVOUS SYSTEM AND DEPEND ON THE CONCENTRATION AND EXPOSURE TIME. NO EFFECTS WERE NOTED AT 25 PPM FOR 8 HOURS, BUT SIGNS OF INTOXICATION BEGAN AT 50-150 PPM WITHIN 5 HOURS; AT 500-1500 PPM, WITHIN 1 HOUR; AT 7500 PPM, WITHIN 30 MINUTES; AND 20,000 PPM MAY BE FATAL WITHIN 5-10 MINUTES. EFFECTS MAY INCLUDE NAUSEA, VOMITING, HEADACHE, DIZZINESS, DROWSINESS, WEAKNESS, SOMETIMES PRECEDED BY A BRIEF PERIOD OF EXHILARATION OR EUPHORIA, IRRITABILITY, MALAISE, INCOHERENT SPEECH, STAGGERING, INCREASED PULSE RATE, CHEST PAIN AND TIGHTNESS WITH BREATHLESSNESS, PALLOR, AND TINNITUS. IN SEVERE EXPOSURES THERE MAY BE BLURRED VISION, SHALLOW, RAPID BREATHING, DELIRIUM, CARDIAC ARRHYTHMIAS, UNCONSCIOUSNESS, DEEP ANESTHESIA, PARALYSIS, AND COMA CHARACTERIZED BY MOTOR RESTLESSNESS, TREMORS AND HYPEREFLEXIA, SOMETIMES PRECEDED BY CONVULSIONS. RECOVERY DEPENDS ON THE SEVERITY OF EXPOSURE. BREATHLESSNESS, NERVOUS IRRITABILITY AND UNSTEADY GAIT MAY PERSIST FOR 2-3 WEEKS; A PECULIAR YELLOW SKIN COLOR AND CARDIAC DISTRESS MAY PERSIST FOR 4 WEEKS. LIVER AND KIDNEY EFFECTS MAY OCCUR, BUT ARE USUALLY MILD, TEMPORARY IMPAIRMENTS. CHRONIC EFFECTS MAY ARISE AND PERSIST LONG AFTER AN ACUTE EXPOSURE. ALTHOUGH GENERALLY HEMATOTOXICITY IS NOT A SIGNIFICANT CONCERN IN ACUTE EXPOSURE, DELAYED HEMATOLOGIC EFFECTS, INCLUDING ANEMIA, HAVE BEEN REPORTED, AS HAVE PETECHIAL HEMORRHAGES, SPONTANEOUS BLEEDING, SECONDARY INFECTIONS, AND SKIN RASHES. IN FATAL EXPOSURES, DEATH MAY BE DUE TO CENTRAL NERVOUS SYSTEM DEPRESSION, CARDIAC OR RESPIRATORY FAILURE AND CIRCULATORY COLLAPSE, OR OCCASIONALLY, SUDDEN VENTRICULAR FIBRILLATION. IT MAY OCCUR WITHIN A FEW MINUTES TO SEVERAL HOURS, OR CARDIAC ARRYTHMIA MAY OCCUR AT ANYTIME WITHIN 24 HOURS. ALSO, DEATH FROM CENTRAL NERVOUS SYSTEM, RESPIRATORY OR HEMORRHAGIC COMPLICATIONS MAY OCCUR UP TO 5 DAYS AFTER EXPOSURE. PATHOLOGIC FINDINGS HAVE INCLUDED RESPIRATORY INFLAMMATION WITH EDEMA AND HEMORRHAGE OF THE LUNGS, RENAL CONGESTION, CEREBRAL EDEMA, AND EXTENSIVE PETECHIAL HEMORRHAGES IN THE BRAIN, PLEURAE, PERICARDIUM, URINARY TRACT, MUCOUS MEMBRANES, AND SKIN. BENZENE CROSSES THE PLACENTAL BARRIER AND THEREFORE MAY AFFECT UNBORN CHILDREN.

CHRONIC EXPOSURE- LONGTERM EXPOSURE MAY CAUSE SYMPTOMS REFERABLE TO THE CENTRAL NERVOUS, HEMATOPOIETIC AND IMMUNE SYSTEMS. EARLY EFFECTS ARE VAGUE AND VARIED AND MAY INCLUDE HEADACHE, LIGHT-HEADEDNESS, DIZZINESS, NAUSEA, ANOREXIA, ABDOMINAL DISCOMFORT, AND FATIGUE. LATER THERE MAY BE DYSPNEA, PALLOR, SLIGHTLY INCREASED TEMPERATURE, DECREASED BLOOD PRESSURE, AND VISUAL DISTURBANCES. DIZZINESS WHEN COLD WATER IS PLACED IN THE EAR AND HEARING IMPAIRMENT HAVE BEEN REPORTED, AS HAVE DIFFUSE CEREBRAL ATROPHY ASSOCIATED WITH ATAXIA, TREMORS AND EMOTIONAL LABILITY. WORKERS EXPOSED TO BENZENE IN COMBINATION WITH OTHER SOLVENTS HAVE EXHIBITED POLYNEURITIS. HEMATOLOGIC EFFECTS VARY WIDELY AND MAY APPEAR AFTER A FEW WEEKS OR MANY YEARS OF EXPOSURE OR EVEN MANY YEARS AFTER EXPOSURE HAS CEASED. THE DEGREE OF EXPOSURE BELOW WHICH NO BLOOD EFFECTS WILL OCCUR CANNOT BE ESTABLISHED WITH CERTAINTY. IN THE EARLY STAGES, THERE MAY BE BLOOD CLOTTING DEFECTS DUE TO FUNCTIONAL, MORPHOLOGICAL AND QUANTITATIVE PLATELET ALTERATION WITH RESULTANT BLEEDING FROM THE NOSE AND GUMS AND EASY BRUISING; LEUKOPENIA WITH PREDOMINANT LYMPHOCYTOPENIA OR NEUTROPENIA; AND ANEMIA WHICH MAY BE NORMOCHROMIC OR MACROCYTIC AND HYPOCHROMIC. HEMATOPOIESIS, BOTH IN THE BONE MARROW AND EXTRAMEDULLARY SITES, MAY BE HYPER- OR HYPOACTIVE WHICH MAY ACCOUNT FOR THE LACK OF CORRELATION, IN SOME CASES, BETWEEN THE BONE MARROW AND THE PERIPHERAL BLOOD PICTURES. ALSO, THE SYMPTOMS DO NOT ALWAYS PARALLEL THE LABORATORY FINDINGS. IF TREATED AT THIS STAGE, THE EFFECTS APPEAR REVERSIBLE, ALTHOUGH RECOVERY MAY BE PROTRACTED AND THERE MAY BE RELAPSES. HEMOLYSIS, DECREASED ERYTHROCYTE SURVIVAL, IRON METABOLISM DISTURBANCES, INTERNAL HEMORRHAGES, AND INCREASED SERUM BILIRUBIN LEVELS HAVE ALSO BEEN REPORTED. EXPOSURE TO HIGH DOSES FOR LONGER PERIODS MAY

RESULT IN APLASIA AND FATTY DEGENERATION OF THE BONE MARROW WITH PANCYTOPENIA AND IS CONSIDERED TO BE IRREVERSIBLE. ENORMOUS VARIABILITY IN INDIVIDUAL RESPONSE, INCLUDING NON-DOSE DEPENDENT APLASIA, AND THE FINDING OF EOSINOPHILIA, SUGGESTS THAT IN SOME CASES, THE BLOOD DYSCRASIA MAY PARTIALLY BE AN ALLERGIC REACTION. IN A SERIES OF EPIDEMIOLOGICAL STUDIES THERE WAS A STATISTICALLY SIGNIFICANT EXCESS OF LEUKEMIAS, PREDOMINATELY MYELOGENOUS, IN PERSONS EXPOSED PRIMARILY TO BENZENE. ALSO, MANY CASE REPORTS AND SERIES HAVE DESCRIBED THE ASSOCIATION OF LEUKEMIA AND BENZENE EXPOSURE. MOST WERE ACUTE MYELOGENOUS, ALTHOUGH SOME WERE MONOCYTIC, ERYTHROBLASTIC, OR LYMPHOCYTIC; SOME LYMPHOMAS WERE NOTED ALSO. ALTHOUGH APLASTIC ANEMIA IS PROBABLY THE MORE LIKELY CONSEQUENCE OF LONGTERM EXPOSURE, IT IS NOT UNCOMMON FOR AN INDIVIDUAL SURVIVING THIS, TO GO THROUGH A PRELEUKEMIC PHASE INTO FRANK LEUKEMIA. CONVERSELY, LEUKEMIA WITHOUT PRECEDENT APLASTIC ANEMIA CAN OCCUR. IN ONE STUDY THE RANGE OF TIME FROM THE START OF THE EXPOSURE TO THE DIAGNOSIS OF LEUKEMIA WAS 3-24 YEARS. IT HAS BEEN SUGGESTED THAT THE CHROMOSOMAL ABERRATIONS WHICH CAN ARISE IN PERIPHERAL BLOOD AND BONE MARROW CELLS AND PERSIST FOR A LONG TIME AFTER EXPOSURE CEASES, MAY BE ASSOCIATED WITH THE INCREASED INCIDENCE OF LEUKEMIA. THE IMMUNOSUPPRESSIVE EFFECT HAS ALSO BEEN SUGGESTED AS ASSOCIATED WITH THE LEUKEMOGENESIS. ADVERSE EFFECTS ON THE IMMUNOLOGICAL SYSTEM HAVE BEEN SHOWN TO MAKE RABBITS MORE SUSCEPTIBLE TO TUBERCULOSIS AND PNEUMONIA AND MAY EXPLAIN WHY THE TERMINAL EVENT IN SOME CASES OF BENZENE INTOXICATION MAY BE OVERWHELMING INFECTION. MENSTRUAL DISTURBANCES HAVE BEEN REPORTED MORE FREQUENTLY IN EXPOSED WOMEN. REPRODUCTIVE EFFECTS HAVE BEEN REPORTED IN ANIMALS.

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

SKIN CONTACT:
BENZENE:
IRRITANT.

ACUTE EXPOSURE- DIRECT CONTACT MAY CAUSE IRRITATION. EFFECTS MAY INCLUDE ERYTHEMA, A BURNING SENSATION, AND IN MORE SEVERE CASES, BLISTERING AND EDEMA. PROLONGED CONTACT MAY CAUSE LESIONS RESEMBLING 1ST- AND 2ND- DEGREE BURNS. UNDER NORMAL CONDITIONS, SIGNIFICANT SIGNS OF SYSTEMIC INTOXICATION ARE UNLIKELY FROM SKIN CONTACT ALONE, DUE TO THE SLOW RATE OF ABSORPTION AND THE HIGH VOLATILITY. APPLICATION TO GUINEA PIGS RESULTED IN INCREASED DERMAL PERMEABILITY.

CHRONIC EXPOSURE- REPEATED OR PROLONGED CONTACT DEFATS THE SKIN AND MAY RESULT IN DERMATITIS WITH ERYTHEMA, SCALING, DRYNESS, VESICULATION, AND FISSURING, POSSIBLY ACCOMPANIED BY PARESTHESIAS OF THE FINGERS WHICH MAY PERSIST SEVERAL WEEKS AFTER THE DERMATITIS SUBSIDES. SECONDARY INFECTIONS MAY OCCUR. TESTS ON GUINEA PIGS INDICATE SENSITIZATION IS POSSIBLE. ALTHOUGH STUDIES HAVE FAILED TO ESTABLISH A RELATIONSHIP BETWEEN SKIN CONTACT AND A CARCINOGENIC EFFECT, SOME PAPILLOMAS AND HEMATOPOIETIC EFFECTS HAVE BEEN REPORTED.

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

EYE CONTACT:
BENZENE:

IRRITANT.
ACUTE EXPOSURE- VAPOR CONCENTRATIONS OF 3000 PPM ARE VERY IRRITATING, EVEN ON BRIEF EXPOSURE. DROPLETS CAUSE MODERATE BURNING SENSATION, BUT ONLY A SLIGHT, TRANSIENT EPITHELIAL INJURY WITH RAPID RECOVERY.
CHRONIC EXPOSURE- REPEATED OR PROLONGED EXPOSURE TO IRRITANTS MAY CAUSE CONJUNCTIVITIS. SEVERAL CASE REPORTS, ONE OF THEM AN ACUTE EXPOSURE, SUGGEST THAT SYSTEMIC EXPOSURE MAY BE ASSOCIATED WITH RETROBULBAR OR OPTIC NEURITIS. 50% OF RATS EXPOSED TO 50 PPM FOR MORE THAN 600 HOURS DEVELOPED CATARACTS.

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

INGESTION:
BENZENE:
NARCOTIC/CARCINOGEN.
ACUTE EXPOSURE- MAY CAUSE LOCAL IRRITATION AND BURNING SENSATION IN THE MOUTH, THROAT, AND STOMACH. SIGNS AND SYMPTOMS OF SYSTEMIC INTOXICATION MAY INCLUDE NAUSEA, VOMITING, HEADACHE, DIZZINESS, WEAKNESS, STAGGERING, CHEST PAIN AND TIGHTNESS, SHALLOW, RAPID PULSE, BREATHLESSNESS, PALLOR FOLLOWED BY FLUSHING, AND A FEAR OF IMPENDING DEATH. THERE MAY BE VISUAL DISTURBANCES AND CONVULSIONS. VIOLENT EXCITEMENT, EUPHORIA OR DELIRIUM MAY PRECEDE WEARINESS, FATIGUE AND SLEEPINESS FOLLOWED BY UNCONSCIOUSNESS, COMA AND DEATH. THOSE WHO SURVIVE THE CENTRAL NERVOUS SYSTEM EFFECTS MAY DEVELOP BRONCHITIS, PNEUMONIA, PULMONARY EDEMA, AND INTRAPULMONARY HEMORRHAGE. ASPIRATION MAY CAUSE IMMEDIATE PULMONARY EDEMA AND HEMORRHAGE. THE USUAL LETHAL DOSE IN HUMANS IS 10-15 MILLILITERS, BUT SMALLER AMOUNTS HAVE BEEN REPORTED TO CAUSE DEATH. A SINGLE EXPOSURE MAY PRODUCE LONGTERM EFFECTS WITH PANCYTOPENIA PERSISTING UP TO A YEAR.
CHRONIC EXPOSURE- DAILY ADMINISTRATION TO HUMANS OF 2-5 GRAMS IN OLIVE OIL HAS CAUSED HEADACHE, VERTIGO, BLADDER IRRITABILITY, IMPOTENCE, GASTRIC DISTURBANCES, AND RENAL DYSFUNCTION. IN FEMALE RATS TREATED WITH 132 SINGLE DAILY DOSES OVER 187 DAYS, NO EFFECTS WERE OBSERVED AT 1 MG/KG; SLIGHT LEUKOPENIA AT 10 MG/KG; AND BOTH LEUKOPENIA AND ANEMIA AT 50 AND 100 MG/KG. IN A 2 YEAR GAVAGE STUDY WITH RATS AND MICE, THERE WAS AN INCREASED INCIDENCE OF LYMPHOMAS AND TUMORS OF THE ORAL CAVITY, SKIN, LUNGS, OVARIES, AND MAMMARY, HARDERIAN, AND PREPUTIAL GLANDS. IN A ONE YEAR GAVAGE STUDY, RATS GIVEN 50 OR 250 MG/KG, 4-5 DAYS/WEEK FOR 52 WEEKS DID NOT EXHIBIT ACUTE OR SUBACUTE TOXIC EFFECTS, BUT A DOSE CORRELATED INCREASE OF LEUKEMIAS AND MAMMARY CARCINOMAS WAS OBSERVED. REPRODUCTIVE EFFECTS HAVE BEEN REPORTED IN ANIMALS.

FIRST AID- EXTREME CARE MUST BE USED TO PREVENT ASPIRATION. GASTRIC LAVAGE WITH A CUFFED ENDOTRACHEAL TUBE IN PLACE TO PREVENT FURTHER ASPIRATION SHOULD BE DONE WITHIN 15 MINUTES. IN THE ABSENCE OF DEPRESSION OR CONVULSIONS OR IMPAIRED GAG REFLEX, EMESIS CAN ALSO BE INDUCED USING SYRUP OF IPECAC WITHOUT INCREASING THE HAZARD OF ASPIRATION (DREISBACH, HANDBOOK OF POISONING, 12TH ED.). TREAT SYMPTOMATICALLY AND SUPPORTIVELY. GASTRIC LAVAGE SHOULD BE PERFORMED BY QUALIFIED MEDICAL PERSONNEL. GET MEDICAL ATTENTION IMMEDIATELY.

ANTIDOTE:
NO SPECIFIC ANTIDOTE. TREAT SYMPTOMATICALLY AND SUPPORTIVELY.

REACTIVITY SECTION

REACTIVITY:
STABLE UNDER NORMAL TEMPERATURES AND PRESSURES.

INCOMPATIBILITIES:
BENZENE:
ACIDS (STRONG): INCOMPATIBLE.
ALLYL CHLORIDE WITH DICHLOROETHYL ALUMINUM OR ETHYLALUMINUM SESQUICHLORIDE: POSSIBLE EXPLOSION.
ARSENIC PENTAFLUORIDE + POTASSIUM METHOXIDE: EXPLOSIVE INTERACTION.
BASES (STRONG): INCOMPATIBLE.
BROMINE + IRON: INCOMPATIBLE.
BROMINE PENTAFLUORIDE: FIRE AND EXPLOSION HAZARD.
BROMINE TRIFLUORIDE: POSSIBLE EXPLOSION OR IGNITION.
CHLORINE: EXPLOSION IN THE PRESENCE OF LIGHT.
CHLORINE TRIFLUORIDE: VIOLENT REACTION WITH POSSIBLE EXPLOSION.
CHROMIC ANHYDRIDE (POWDERED): IGNITION.
DIBORANE: SPONTANEOUSLY EXPLOSIVE REACTION IN AIR.
DIOXYGEN DIFLUORIDE: IGNITION, EVEN AT REDUCED TEMPERATURES.
DIOXYGENYL TETRAFLUOROBORATE: IGNITION REACTION.
INTERHALOGEN COMPOUNDS: IGNITION OR EXPLOSION.
IODINE HEPTAFLUORIDE: IGNITION ON CONTACT.
IODINE PENTAFLUORIDE: VIOLENT INTERACTION ABOVE 50 C.
NITRIC ACID: VIOLENT OR EXPLOSIVE UNLESS PROPERLY AGITATED AND COOLED.
NITRYL PERCHLORATE: EXPLOSIVE INTERACTION.
OXIDIZERS (STRONG): FIRE AND EXPLOSION HAZARD.
OXYGEN (LIQUID): EXPLOSIVE MIXTURE.
OZONE: FORMATION OF EXPLOSIVE GELATINOUS OZONIDE.
PERCHLORATES (METAL): FORMATION OF EXPLOSIVE COMPLEX.
PERCHLORYL FLUORIDE + ALUMINUM CHLORIDE: FORMATION OF SHOCK SENSITIVE COMPOUND.
PERMANGANATES + SULFURIC ACID: POSSIBLE EXPLOSION.
PERMANGANIC ACID: EXPLOSION HAZARD.
PEROXODISULFURIC ACID: EXPLOSION HAZARD.
PEROXOMONOSULFURIC ACID: EXPLOSIVE INTERACTION.
POTASSIUM PEROXIDE: IGNITION.
SILVER PERCHLORATE: FORMATION OF EXPLOSIVE COMPLEX.
SODIUM PEROXIDE + WATER: IGNITION.
URANIUM HEXAFLUORIDE: VIOLENT REACTION.

DECOMPOSITION:
THERMAL DECOMPOSITION PRODUCTS MAY INCLUDE TOXIC OXIDES OF CARBON.

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

STORAGE-DISPOSAL

OBSERVE ALL FEDERAL, STATE AND LOCAL REGULATIONS WHEN STORING OR DISPOSING OF THIS SUBSTANCE. FOR ASSISTANCE, CONTACT THE DISTRICT DIRECTOR OF THE ENVIRONMENTAL PROTECTION AGENCY.

STORAGE

STORE IN ACCORDANCE WITH 29 CFR 1910.106.

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

PROTECT AGAINST PHYSICAL DAMAGE. OUTSIDE OR DETACHED STORAGE IS PREFERABLE. INSIDE STORAGE SHOULD BE IN A STANDARD FLAMMABLE LIQUIDS STORAGE ROOM OR CABINET. SEPARATE FROM OXIDIZING MATERIALS (NFPA 49, HAZARDOUS CHEMICALS DATA, 1975).

STORE AWAY FROM INCOMPATIBLE SUBSTANCES.

DISPOSAL

DISPOSAL MUST BE IN ACCORDANCE WITH STANDARDS APPLICABLE TO GENERATORS OF HAZARDOUS WASTE, 40CFR 262. EPA HAZARDOUS WASTE NUMBER U019.

CONDITIONS TO AVOID

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

SPILLS AND LEAKS

SOIL-RELEASE:
DIG HOLDING AREA SUCH AS LAGOON, POND OR PIT FOR CONTAINMENT.
DIKE FLOW OF SPILLED MATERIAL USING SOIL OR SANDBAGS OR FOAMED BARRIERS SUCH AS POLYURETHANE OR CONCRETE.
USE CEMENT POWDER, FLY ASH, SAWDUST OR COMMERCIAL SORBENT TO ABSORB BULK LIQUID.
REDUCE VAPOR AND FIRE HAZARD WITH FLUOROCARBON WATER FOAM.

AIR-RELEASE:
KNOCK DOWN VAPORS WITH WATER SPRAY. KEEP UPWIND.

WATER-SPILL:
LIMIT SPILL MOTION AND DISPERSION WITH NATURAL BARRIERS OR OIL SPILL CONTROL BOOMS.
APPLY DETERGENTS, SOAPS, ALCOHOLS OR ANOTHER SURFACE ACTIVE AGENT TO THICKEN SPILLED MATERIAL.
APPLY UNIVERSAL GELLING AGENT TO IMMOBILIZE TRAPPED SPILL AND INCREASE EFFICIENCY OF REMOVAL.
IF DISSOLVED, APPLY ACTIVATED CARBON AT TEN TIMES THE SPILLED AMOUNT IN THE REGION OF 10 PPM OR GREATER CONCENTRATION.
USE SUCTION HOSES TO REMOVE TRAPPED SPILL MATERIAL.
USE DREDGES OR LIFTS TO EXTRACT IMMOBILIZED MASSES OF POLLUTION AND PRECIPITATES.

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

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

REPORTABLE QUANTITY (RQ): 10 POUNDS
THE SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT (SARA) SECTION 304 REQUIRES THAT A RELEASE EQUAL TO OR GREATER THAN THE REPORTABLE QUANTITY FOR THIS SUBSTANCE BE IMMEDIATELY REPORTED TO THE LOCAL EMERGENCY PLANNING COMMITTEE AND THE STATE EMERGENCY RESPONSE COMMISSION (40 CFR 355.40). IF THE RELEASE OF THIS SUBSTANCE IS REPORTABLE UNDER CERCLA SECTION 103, THE NATIONAL RESPONSE CENTER MUST BE NOTIFIED IMMEDIATELY AT (800) 424-8802 OR (202) 426-2675 IN THE METROPOLITAN WASHINGTON, D.C. AREA (40 CFR 302.6).

PROTECTIVE EQUIPMENT SECTION

VENTILATION:
PROVIDE LOCAL EXHAUST OR PROCESS ENCLOSURE VENTILATION TO MEET THE PUBLISHED EXPOSURE LIMITS. VENTILATION EQUIPMENT MUST BE EXPLOSION-PROOF.

RESPIRATOR:
THE FOLLOWING RESPIRATORS ARE THE MINIMUM LEGAL REQUIREMENTS AS SET FORTH BY THE OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION FOUND IN 29 CFR 1910, SUBPART Z.

BENZENE:

CONCENTRATION:	REQUIRED RESPIRATOR:
LESS THAN OR EQUAL TO 10 PPM-	HALF-MASK AIR-PURIFYING RESPIRATOR WITH ORGANIC VAPOR CARTRIDGE.
LESS THAN OR EQUAL TO 50 PPM-	FULL FACEPIECE RESPIRATOR WITH ORGANIC VAPOR CARTRIDGES. FULL FACEPIECE GAS MASK WITH CHIN STYLE CANISTER.
LESS THAN OR EQUAL TO 100 PPM-	FULL FACEPIECE POWERED AIR-PURIFYING RESPIRATOR WITH ORGANIC VAPOR CANISTER.
LESS THAN OR EQUAL TO 1000 PPM-	SUPPLIED AIR RESPIRATOR WITH FULL FACEPIECE IN POSITIVE-PRESSURE MODE.
GREATER THAN 1000 PPM OR UNKNOWN CONCENTRATION-	SELF-CONTAINED BREATHING APPARATUS WITH FULL FACEPIECE IN POSITIVE-PRESSURE MODE. FULL FACEPIECE POSITIVE-PRESSURE SUPPLIED-AIR RESPIRATOR WITH AUXILIARY SELF-CONTAINED AIR SUPPLY.
ESCAPE-	ANY ORGANIC VAPOR GAS MASK.

ANY SELF-CONTAINED BREATHING APPARATUS WITH FULL FACEPIECE.

FIREFIGHTING- FULL FACEPIECE SELF-CONTAINED BREATHING APPARATUS IN POSITIVE-PRESSURE MODE.

THE FOLLOWING RESPIRATORS AND MAXIMUM USE CONCENTRATIONS ARE RECOMMENDATIONS BY THE U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES, NIOSH POCKET GUIDE TO CHEMICAL HAZARDS OR NIOSH CRITERIA DOCUMENTS.
THE SPECIFIC RESPIRATOR SELECTED MUST BE BASED ON CONTAMINATION LEVELS FOUND IN THE WORK PLACE AND BE JOINTLY APPROVED BY THE NATIONAL INSTITUTE OF OCCUPATIONAL SAFETY AND HEALTH AND THE MINE SAFETY AND HEALTH ADMINSTRATION.

AT ANY DETECTABLE CONCENTRATION:

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

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

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

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

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

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

BENZENE:
PROTECTIVE CLOTHING SHOULD MEET THE REQUIREMENTS FOR PERSONAL PROTECTIVE EQUIPMENT IN 29 CFR 1910.1028(H).

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

BENZENE:
PROTECTIVE GLOVES SHOULD MEET THE REQUIREMENTS FOR PERSONAL PROTECTIVE EQUIPMENT IN 29 CFR 1910.1028(H).

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

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

BENZENE:
PROTECTIVE EYE EQUIPMENT SHOULD MEET THE REQUIREMENTS FOR PROTECTIVE CLOTHING AND EQUIPMENT IN 29 CFR 1910.1028(H).

AUTHORIZED BY- OCCUPATIONAL HEALTH SERVICES, INC.

CREATION DATE: 10/11/84 REVISION DATE: 12/04/89

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OCCUPATIONAL HEALTH SERVICES, INC.
450 SEVENTH AVENUE, SUITE 2407
NEW YORK, NEW YORK 10123
(800) 445-MSDS (212) 967-1100

EMERGENCY CONTACT:
JOHN S. BRANSFORD, JR. (615) 292-1180

SUBSTANCE IDENTIFICATION

CAS-NUMBER 100-41-4
RTEC-NUMBER DA0700000

SUBSTANCE: ETHYL BENZENE

TRADE NAMES/SYNONYMS:
BENZENE, ETHYL-: EB: PHENYLETHANE: ETHYLBENZENE: ETHYLBENZOL:
ALPHA-METHYLTOLUENE: STCC 4909163: UN 1175: C8H10: OHS08780

CHEMICAL FAMILY:
HYDROCARBON, AROMATIC

MOLECULAR FORMULA: C-H3-C-H2-C6-H5 MOLECULAR WEIGHT: 106.17

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

COMPONENTS AND CONTAMINANTS

COMPONENT: ETHYL BENZENE PERCENT: 100

OTHER CONTAMINANTS: NONE

EXPOSURE LIMIT:
ETHYL BENZENE:
100 PPM (435 MG/M3) OSHA TWA; 125 PPM (545 MG/M3) OSHA STEL
100 PPM (435 MG/M3) ACGIH TWA; 125 PPM (545 MG/M3) ACGIH STEL

1000 POUNDS CERCLA SECTION 103 REPORTABLE QUANTITY
SUBJECT TO SARA SECTION 313 ANNUAL TOXIC CHEMICAL RELEASE REPORTING

PHYSICAL DATA

DESCRIPTION: CLEAR, COLORLESS LIQUID WITH AN AROMATIC ODOR.

BOILING POINT: 277 F (136 C) MELTING POINT: -139 F (-95 C)

SPECIFIC GRAVITY: 0.8670 EVAPORATION RATE: (BUTYL ACETATE=1) <1

VOLATILITY: 100% SOLUBILITY IN WATER: 0.015%

VAPOR DENSITY: 3.7 VAPOR PRESSURE: 7.1 MMHG @ 20 C

ODOR-THRESHOLD: 140 PPM

OTHER SOLVENTS (SOLVENT - SOLUBILITY):
SOLUBLE IN ALCOHOL, ETHER, BENZENE, SULFUR DIOXIDE,

CARBON TETRACHLORIDE; INSOLUBLE IN AMMONIA.

OTHER PHYSICAL DATA
VISCOSITY: 0.64 CPS @ 25 C

FIRE AND EXPLOSION DATA

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

VAPOR-AIR MIXTURES ARE EXPLOSIVE.

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

DUE TO LOW ELECTROCONDUCTIVITY OF THE SUBSTANCE, FLOW OR AGITATION MAY GENERATE ELECTROSTATIC CHARGES RESULTING IN SPARKS WITH POSSIBLE IGNITION.

FLASH POINT: 59 F (15 C) (CC) UPPER EXPLOSION LIMIT: 6.7%

LOWER EXPLOSION LIMIT: 1.0% AUTOIGNITION TEMP.: 810 F (432 C)

FLAMMABILITY CLASS (OSHA): IB

FIREFIGHTING MEDIA:
DRY CHEMICAL, CARBON DIOXIDE, HALON, WATER SPRAY OR STANDARD FOAM (1987 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.4).

FOR LARGER FIRES, USE WATER SPRAY, FOG OR STANDARD FOAM (1987 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.4).

FIREFIGHTING:
MOVE CONTAINER FROM FIRE AREA IF POSSIBLE. COOL FIRE-EXPOSED CONTAINERS WITH WATER FROM SIDE UNTIL WELL AFTER FIRE IS OUT. STAY AWAY FROM STORAGE TANK ENDS. FOR MASSIVE FIRE IN STORAGE AREA, USE UNMANNED HOSE HOLDER OR MONITOR NOZZLES, ELSE WITHDRAW FROM AREA AND LET FIRE BURN. WITHDRAW IMMEDIATELY IN CASE OF RISING SOUND FROM VENTING SAFETY DEVICE OR ANY DISCOLORATION OF STORAGE TANK DUE TO FIRE (1987 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.4, GUIDE PAGE 27).

EXTINGUISH ONLY IF FLOW CAN BE STOPPED; US WATER IN FLOODING AMOUNTS AS A FOG, SOLID STREAMS MAY NOT BE EFFECTIVE. COOL CONTAINERS WITH FLOODING QUATITIES OF WATER, APPLY FROM AS FAR A DISTANCE AS POSSIBLE. AVOID BREATHING TOXIC VAPORS, KEEP UPWIND.

WATER MAY BE INEFFECTIVE (NFPA FIRE PROTECTION GUIDE ON HAZARDOUS MATERIALS, EIGHTH EDITION).

TRANSPORTATION

DEPARTMENT OF TRANSPORTATION HAZARD CLASSIFICATION 49CFR172.101:
FLAMMABLE LIQUID

DEPARTMENT OF TRANSPORTATION LABELING REQUIREMENTS 49CFR172.101 AND SUBPART E: FLAMMABLE LIQUID

DEPARTMENT OF TRANSPORTATION PACKAGING REQUIREMENTS: 49CFR173.119
EXCEPTIONS: 49CFR173.118

TOXICITY

ETHYL BENZENE:
IRRITATION DATA: 15 MG/24 HOURS OPEN SKIN-RABBIT MILD; 100 MG EYE-RABBIT.
TOXICITY DATA: 100 PPM/8 HOURS INHALATION-HUMAN TCLO; 4000 PPM/4 HOURS INHALATION-RAT LCLO; 50 GM/M3/2 HOURS INHALATION-MOUSE LCLO; 10000 PPM INHALATION-GUINEA PIG LCLO; 17800 MG/KG SKIN-RABBIT LD50; 3500 MG/KG ORAL-RAT LD50; 2272 MG/KG INTRAPERITONEAL-MOUSE LD50; MUTAGENIC DATA (RTECS); REPRODUCTIVE EFFECTS DATA (RTECS).
CARCINOGEN STATUS: NONE.
LOCAL EFFECTS: IRRITANT- INHALATION, SKIN, EYES.
ACUTE TOXICITY LEVEL: MODERATELY TOXIC BY INGESTION; SLIGHTLY TOXIC BY DERMAL ABSORPTION.
TARGET EFFECTS: CENTRAL NERVOUS SYSTEM DEPRESSANT. POISONING MAY AFFECT THE LIVER.
AT INCREASED RISK FROM EXPOSURE: PERSONS WITH PRE-EXISTING SKIN DISORDERS OR IMPAIRED PULMONARY, RENAL, OR LIVER FUNCTION.
ADDITIONAL DATA: ETHYL BENZENE CROSSES THE PLACENTA. ETHYL BENZENE EXPOSED TO PHOTO-OXIDATION IN THE PRESENCE OF OZONE AND NITROGEN DIOXIDE, AS IN THE FORMATION OF SMOG, YIELDS PRODUCTS HAVING CONSIDERABLE IRRITANCY TO THE HUMAN EYE.

HEALTH EFFECTS AND FIRST AID

INHALATION:
ETHYL BENZENE:
IRRITANT/NARCOTIC. 2000 PPM IS IMMEDIATELY DANGEROUS TO LIFE AND HEALTH.
ACUTE EXPOSURE- MAY CAUSE SEVERE IRRITATION OF THE NOSE AND THROAT. ODOR IS CONSIDERED AN ADEQUATE WARNING PROPERTY AT LEVELS BELOW SYSTEMIC TOXICITY. AT HIGHER CONCENTRATIONS COUGH, FATIGUE, DEPRESSION, VERTIGO OR DIZZINESS, DYSPNEA, SENSE OF CHEST CONSTRICTION, HEADACHE, NARCOSIS, AND COMA MAY OCCUR. DEATH IS POSSIBLE FROM RESPIRATORY CENTER PARALYSIS. EXPOSED ANIMALS EXHIBITED SIMILAR SYMPTOMS, AS WELL AS TREMOR OF THE EXTREMITIES, STATIC AND MOTOR ATAXIA, STAGGERING GAIT, AND LOSS OF RIGHTING REFLEX. LOSS OF CONSCIOUSNESS WAS FOLLOWED BY DEATH FROM RESPIRATORY PARALYSIS. PATHOLOGIES INCLUDED EDEMA AND CONGESTION OF THE BRAIN AND LUNGS, GENERALIZED VISCERAL HYPEREMIA, EPITHELIAL NECROSIS OF THE RENAL TUBULES, AND HEPATIC DYSTROPHY. ODOR AND EYE IRRITATION ARE CONSIDERED ADEQUATE WARNING PROPERTIES AT LEVELS BELOW SYSTEMIC TOXICITY. REPRODUCTIVE EFFECTS HAVE BEEN REPORTED IN ANIMALS.
CHRONIC EXPOSURE- MAY CAUSE IRRITATION OF THE UPPER RESPIRATORY TRACT, FATIGUE, SLEEPINESS, HEADACHE, IRRITABILITY, AND FUNCTIONAL NERVOUS DISORDERS. CHRONIC INHALATION EXPOSURE IN ANIMALS HAS CAUSED UPPER RESPIRATORY INFLAMMATION, NERVOUS SYSTEM DISORDERS, DYSTROPHIC CHANGES IN THE LIVER AND KIDNEYS INCLUDING TOXIC HEPATITIS, CHANGES IN BLOOD CHOLINESTERASE ACTIVITY, LEUKOCYTOSIS, AND RETICULOCYTOSIS. TESTICULAR HISTOPATHOLOGY WAS OBSERVED IN RABBITS AND MONKEYS. REPRODUCTIVE EFFECTS HAVE BEEN REPORTED IN ANIMALS; IN ONE CASE PREGNANT RATS EXPOSED

TO 100 OR 1000 PPM FOR 6 HOURS/DAY ON DAYS 1 TO 19 OF GESTATION HAD OFFSPRING WITH A SIGNIFICANT INCREASE IN EXTRA RIB FORMATION.

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

SKIN CONTACT:
ETHYL BENZENE:
IRRITANT/NARCOTIC.
ACUTE EXPOSURE- LIQUID OR VAPOR MAY, DEPENDING ON CONCENTRATION AND LENGTH OF EXPOSURE, CAUSE IRRITATION, INFLAMMATION, AND POSSIBLY 1ST OR 2ND DEGREE BURNS. ETHYL BENZENE WAS ABSORBED AT A RATE OF 22-33 MG/CM2/HOUR ON THE HAND AND FOREARM OF HUMAN SUBJECTS AND COULD POSSIBLY CAUSE SYSTEMIC TOXICITY AS IN INHALATION. CONTACT WITH RABBIT SKIN BY THE LIQUID CAUSED ERYTHEMA, EXFOLIATION AND VESCICULATION.
CHRONIC EXPOSURE- REPEATED OR PROLONGED EXPOSURE MAY CAUSE RASH OR DERMATITIS BY DEFATTING THE SKIN. ADMINISTRATION TO RABBITS CAUSED EFFECTS RANGING FROM REDDENING AND MODERATE IRRITATION TO SLIGHT NECROSIS, EXFOLIATION, AND BLISTERING.

FIRST AID- REMOVE CONTAMINATED CLOTHING AND SHOES IMMEDIATELY. WASH AFFECTED AREA WITH SOAP OR MILD DETERGENT AND LARGE AMOUNTS OF WATER UNTIL NO EVIDENCE OF CHEMICAL REMAINS (AT LEAST 15-20 MINUTES). IN CASE OF CHEMICAL BURNS, COVER AREA WITH STERILE, DRY DRESSING. BANDAGE SECURELY, BUT NOT TOO TIGHTLY. GET MEDICAL ATTENTION IMMEDIATELY.

EYE CONTACT:
ETHYL BENZENE:
IRRITANT.
ACUTE EXPOSURE- CAN CAUSE IRRITATION AT LEVELS OF 200 PPM WHICH USUALLY PROVIDES SOME WARNING OF DANGEROUS CONCENTRATIONS. IRRITATION AND LACRIMATION MAY OCCUR ABOVE 1000 PPM, WITH TOLERANCE DEVELOPING QUICKLY, AND MAY BE SEVERE ABOVE 2000 PPM. AT 5000 PPM, IRRITATION IS INTOLERABLE. 2 DROPS OF THE LIQUID IN THE EYE OF A RABBIT CAUSED SLIGHT CONJUNCTIVAL IRRITATION AND SLIGHT CORNEAL INJURY; GUINEA PIGS SHOWED EYE IRRITATION AFTER 8 MINUTES AT 1000 PPM AND AFTER 1 MINUTE AT 2000 PPM, WITH IMMEDIATE, INTENSE IRRITATION OF THE CONJUNCTIVA AT 5000-10000 PPM.
CHRONIC EXPOSURE- REPEATED OR PROLONGED EXPOSURE MAY CAUSE CONJUNCTIVITIS. IN ONE REPORT WORKERS EXPOSED TO 0.8-1.2 MG/L AIR FOR MORE THAN EIGHTEEN MONTHS COMPLAINED OF REDUCED VISION IN DIM LIGHT.

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

INGESTION:
ETHYL BENZENE:
ACUTE EXPOSURE- MAY CAUSE ABDOMINAL PAIN, NAUSEA, AND VOMITING WHICH MAY LEAD TO ASPIRATION WITH EXTENSIVE EDEMA AND HEMORRHAGE OF LUNG TISSUE. ASPIRATION BY RATS CAUSED IMMEDIATE DEATH BY CARDIAC ARREST AND RESPIRATORY PARALYSIS.
CHRONIC EXPOSURE- INGESTION OF 408-680 MG/KG/DAY FOR 182 DAYS BY RATS CAUSED SLIGHT LIVER AND KIDNEY WEIGHT INCREASES WITH SLIGHT PATHOLOGICAL SIGNS.

FIRST AID- EXTREME CARE MUST BE USED TO PREVENT ASPIRATION. USE GASTRIC LAVAGE WITH ACTIVATED CHARCOAL AND A CUFFED ENDOTRACHEAL TUBE WITHIN 15 MINUTES. IN THE ABSENCE OF DEPRESSION OR CONVULSIONS OR IMPAIRED GAG REFLEX, IPECAC EMESIS CAN BE DONE. WHEN VOMITING BEGINS, KEEP HEAD BELOW HIPS TO PREVENT ASPIRATION. AFTER VOMITING STOPS, GIVE 30-60 MILLILITERS OF FLEET'S PHOSPHO-SODA DILUTED 1:4 IN WATER. MAINTAIN AIRWAY, BLOOD PRESSURE AND RESPIRATION. (DREISBACH, HANDBOOK OF POISONING, 11TH ED.) TREATMENT MUST BE ADMINISTERED BY QUALIFIED MEDICAL PERSONNEL. GET MEDICAL ATTENTION IMMEDIATELY.

ANTIDOTE:
NO SPECIFIC ANTIDOTE. TREAT SYMPTOMATICALLY AND SUPPORTIVELY.

REACTIVITY SECTION

REACTIVITY:
STABLE UNDER NORMAL TEMPERATURES AND PRESSURES.

INCOMPATIBILITIES:
ETHYL BENZENE:
- ACIDS (STRONG): POSSIBLE VIOLENT REACTION.
- AMMONIA: POSSIBLE VIOLENT REACTION.
- BASES (STRONG): POSSIBLE VIOLENT REACTION.
- OXIDIZERS (STRONG): FIRE AND EXPLOSION HAZARD.
- PLASTICS: MAY BE ATTACKED.

DECOMPOSITION:
THERMAL DECOMPOSITION PRODUCTS MAY INCLUDE TOXIC OXIDES OF CARBON.

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

STORAGE-DISPOSAL

OBSERVE ALL FEDERAL, STATE AND LOCAL REGULATIONS WHEN STORING OR DISPOSING OF THIS SUBSTANCE. FOR ASSISTANCE, CONTACT THE DISTRICT DIRECTOR OF THE ENVIRONMENTAL PROTECTION AGENCY.

STORAGE

STORE IN ACCORDANCE WITH 29 CFR 1910.101.

PROTECT AGAINST PHYSICAL DAMAGE. OUTSIDE OR DETACHED STORAGE IS PREFERABLE. INSIDE STORAGE SHOULD BE IN A STANDARD FLAMMABLE LIQUIDS STORAGE ROOM OR CABINET. ISOLATE FROM ACUTE FIRE HAZARDS AND OXIDIZING AGENTS (NFPA 49, HAZARDOUS CHEMICALS DATA, 1975).

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

STORE AWAY FROM INCOMPATIBLE SUBSTANCES.

DISPOSAL

DISPOSAL MUST BE IN ACCORDANCE WITH STANDARDS APPLICABLE TO GENERATORS OF HAZARDOUS WASTE, 40 CFR 262. EPA HAZARDOUS WASTE NUMBER D001.

100 POUND CERCLA SECTION 103 REPORTABLE QUANTITY.

CONDITIONS TO AVOID

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

SPILLS AND LEAKS

SOIL-RELEASE:
DIG A HOLDING AREA SUCH AS A PIT, POND OR LAGOON TO CONTAIN SPILL AND DIKE SURFACE FLOW USING BARRIER OF SOIL, SANDBAGS, FOAMED POLYURETHANE OR FOAMED CONCRETE. ABSORB LIQUID MASS WITH FLY ASH OR CEMENT POWDER.

DIMINISH VAPOR AND FIRE HAZARD BY APPLICATION OF APPROPRIATE FOAM.

AIR-RELEASE:
APPLY WATER SPRAY TO KNOCK DOWN VAPORS.

WATER-SPILL:
USE NATURAL DEEP WATER POCKETS, EXCAVATED LAGOONS, OR SAND BAG BARRIERS TO TRAP MATERIAL AT BOTTOM. USE ACTIVATED CARBON AT 10 TIMES THE SPILLED AMOUNT IF IT IS DISSOLVED AT 10 PPM OR GREATER CONCENTRATION. REMOVE TRAPPED MATERIAL WITH SUCTION HOSES. USE MECHANICAL DREDGES OR LIFTS TO REMOVE IMMOBILIZED MASSES OF POLLUTION AND PRECIPITATES.

APPLY UNIVERSAL GELLING AGENT TO IMMOBILIZE TRAPPED SPILL AND INCREASE EFFICIENCY OF REMOVAL.

APPLY DETERGENTS, SOAPS, ALCOHOLS OR ANOTHER SURFACE ACTIVE AGENT.

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

REPORTABLE QUANTITY (RQ): 1000 POUNDS
THE SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT (SARA) SECTION 304 REQUIRES THAT A RELEASE EQUAL TO OR GREATER THAN THE REPORTABLE QUANTITY FOR THIS SUBSTANCE BE IMMEDIATELY REPORTED TO THE LOCAL EMERGENCY PLANNING COMMITTEE AND THE STATE EMERGENCY RESPONSE COMMISSION (40 CFR 355.40). IF THE RELEASE OF THIS SUBSTANCE IS REPORTABLE UNDER CERCLA SECTION 103, THE NATIONAL RESPONSE

CENTER MUST BE NOTIFIED IMMEDIATELY AT (800) 424-8802 OR (202) 426-2675 IN THE METROPOLITAN WASHINGTON, D.C. AREA (40 CFR 302.6).

PROTECTIVE EQUIPMENT SECTION

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

RESPIRATOR:
THE FOLLOWING RESPIRATORS AND MAXIMUM USE CONCENTRATIONS ARE RECOMMENDATIONS BY THE U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES, NIOSH POCKET GUIDE TO CHEMICAL HAZARDS; NIOSH CRITERIA DOCUMENTS OR BY THE U.S. DEPARTMENT OF LABOR, 29 CFR 1910 SUBPART Z.
THE SPECIFIC RESPIRATOR SELECTED MUST BE BASED ON CONTAMINATION LEVELS FOUND IN THE WORK PLACE, MUST NOT EXCEED THE WORKING LIMITS OF THE RESPIRATOR AND BE JOINTLY APPROVED BY THE NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH AND THE MINE SAFETY AND HEALTH ADMINISTRATION (NIOSH-MSHA).

ETHYL BENZENE:

1000 PPM- ANY POWERED AIR-PURIFYING RESPIRATOR WITH ORGANIC VAPOR CARTRIDGES.
ANY SUPPLIED-AIR RESPIRATOR.
ANY SELF-CONTAINED BREATHING APPARATUS.
ANY CHEMICAL CARTRIDGE RESPIRATOR WITH ORGANIC VAPOR CARTRIDGE(S).

2000 PPM- ANY AIR-PURIFYING FULL FACEPIECE RESPIRATOR (GAS MASK) WITH A CHIN-STYLE OR FRONT- OR BACK-MOUNTED ORGANIC VAPOR CANISTER.
ANY SUPPLIED-AIR RESPIRATOR WITH A FULL FACEPIECE.
ANY SELF-CONTAINED BREATHING APPARATUS WITH A FULL FACEPIECE.

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

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

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

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

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

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

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

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

AUTHORIZED BY- OCCUPATIONAL HEALTH SERVICES, INC.

CREATION DATE: 02/05/85 REVISION DATE: 11/02/89

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OCCUPATIONAL HEALTH SERVICES, INC.
450 SEVENTH AVENUE, SUITE 2407
NEW YORK, NEW YORK 10123
(800) 445-MSDS (212) 967-1100

EMERGENCY CONTACT:
JOHN S. BRANSFORD, JR. (615) 292-1180

SUBSTANCE IDENTIFICATION

CAS-NUMBER 108-90-7
RTEC-NUMBER CZ0175000

SUBSTANCE: CHLOROBENZENE

TRADE NAMES/SYNONYMS:
PHENYL CHLORIDE: MONOCHLOROBENZENE: CP 27: I.P. CARRIER T 40: MCB: TETROSIN SP: RCRA U037: STCC 4909153: UN 1134: MONOCHLOROBENZOL: BENZENE CHLORIDE: BENZENE, CHLORO: C6H5CL: OHS04730

CHEMICAL FAMILY:
HALOGEN COMPOUND, AROMATIC

MOLECULAR FORMULA: C6-H5-CL MOLECULAR WEIGHT: 112.56

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

COMPONENTS AND CONTAMINANTS

COMPONENT: CHLOROBENZENE PERCENT: 100

OTHER CONTAMINANTS: NONE

EXPOSURE LIMIT:
CHLOROBENZENE:
75 PPM (350 MG/M3) OSHA TWA
75 PPM (350 MG/M3) ACGIH TWA (NOTICE OF INTENDED CHANGES 1989-1990)

100 POUNDS CERCLA SECTION 103 REPORTABLE QUANTITY
SUBJECT TO SARA SECTION 313 ANNUAL TOXIC CHEMICAL RELEASE REPORTING

PHYSICAL DATA

DESCRIPTION: COLORLESS LIQUID WITH A MILD ALMOND-LIKE ODOR.

BOILING POINT: 270 F (132 C) MELTING POINT: -51 F (-46 C)

SPECIFIC GRAVITY: 1.1058 EVAPORATION RATE: (BUTYL ACETATE=1) 1

SOLUBILITY IN WATER: 0.049% VAPOR DENSITY: 3.9

VAPOR PRESSURE: 8.8 MMHG @ 20 C ODOR-THRESHOLD: 60 PPM

OTHER SOLVENTS (SOLVENT - SOLUBILITY):
ALCOHOL, ETHER, CHLOROFORM, BENZENE, CARBON DISULFIDE, CARBON TETRACHLORIDE.

FIRE AND EXPLOSION DATA

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

MODERATE EXPLOSION HAZARD WHEN EXPOSED TO HEAT OR FLAME.

DUE TO LOW ELECTROCONDUCTIVITY OF THE SUBSTANCE, FLOW OR AGITATION MAY GENERATE ELECTROSTATIC CHARGES RESULTING IN SPARKS WITH POSSIBLE IGNITION.

VAPOR-AIR MIXTURES ARE EXPLOSIVE ABOVE FLASH POINT.

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

FLASH POINT: 82 F (28 C) (CC) UPPER EXPLOSION LIMIT: 7.1%

LOWER EXPLOSION LIMIT: 1.3% AUTOIGNITION TEMP.: 1099 F (593 C)

FLAMMABILITY CLASS (OSHA): IC

FIREFIGHTING MEDIA:
DRY CHEMICAL, CARBON DIOXIDE, HALON, WATER SPRAY OR STANDARD FOAM (1987 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.4).

FOR LARGER FIRES, USE WATER SPRAY, FOG OR STANDARD FOAM (1987 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.4).

FIREFIGHTING:
MOVE CONTAINER FROM FIRE AREA IF POSSIBLE. COOL FIRE-EXPOSED CONTAINERS WITH WATER FROM SIDE UNTIL WELL AFTER FIRE IS OUT. STAY AWAY FROM STORAGE TANK ENDS. FOR MASSIVE FIRE IN STORAGE AREA, USE UNMANNED HOSE HOLDER OR MONITOR NOZZLES, ELSE WITHDRAW FROM AREA AND LET FIRE BURN. WITHDRAW IMMEDIATELY IN CASE OF RISING SOUND FROM VENTING SAFETY DEVICE OR ANY DISCOLORATION OF STORAGE TANK DUE TO FIRE (1987 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.4, GUIDE PAGE 27).

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

WATER MAY BE INEFFECTIVE EXCEPT AS A BLANKET (NFPA FIRE PROTECTION GUIDE ON HAZARDOUS MATERIAL, EIGHTH EDITION).

TRANSPORTATION

DEPARTMENT OF TRANSPORTATION HAZARD CLASSIFICATION 49CFR172.101:
FLAMMABLE LIQUID

DEPARTMENT OF TRANSPORTATION LABELING REQUIREMENTS 49CFR172.101 AND SUBPART E:
FLAMMABLE LIQUID

DEPARTMENT OF TRANSPORTATION PACKAGING REQUIREMENTS: 49CFR173.119
EXCEPTIONS: 49CFR173.118

TOXICITY

CHLOROBENZENE:
TOXICITY DATA: 15 GM/M3 INHALATION-MOUSE LCLO; 2290 MG/KG ORAL-RAT LD50; 2250 MG/KG ORAL-RABBIT LD50; 2300 MG/KG ORAL-MOUSE LD50; 2250 MG/KG ORAL-GUINEA PIG LD50; 7000 MG/KG SUBCUTANEOUS-RAT LDLO; 7400 MG/KG INTRAPERITONEAL-RAT LDLO; 515 MG/KG INTRAPERITONEAL-MOUSE LD50; 4100 MG/KG INTRAPERITONEAL-GUINEA PIG LDLO; 2300 MG/KG UNREPORTED-MAMMAL LD50; MUTAGENIC DATA (RTECS); REPRODUCTIVE EFFECTS DATA (RTECS).
CARCINOGEN STATUS: NONE.
LOCAL EFFECTS: IRRITANT- INHALATION, SKIN, EYE.
ACUTE TOXICITY LEVEL: MODERATELY TOXIC BY INGESTION.
TARGET EFFECTS: CENTRAL NERVOUS SYSTEM DEPRESSANT. POISONING MAY AFFECT THE LIVER AND KIDNEYS.
AT INCREASED RISK FROM EXPOSURE: PERSONS WITH PREEXISTING SKIN, LIVER, KIDNEY, OR CHRONIC RESPIRATORY DISEASES.
ADDITIONAL DATA: GASTROENTERIC ABSORPTION IS ENHANCED BY THE PRESENCE OF FATS OR OILS. ALCOHOL MAY ENHANCE THE TOXIC EFFECTS.

HEALTH EFFECTS AND FIRST AID

INHALATION:
CHLOROBENZENE:
IRRITANT/NARCOTIC. 2400 PPM IMMEDIATELY DANGEROUS TO LIFE OR HEALTH.
ACUTE EXPOSURE- INHALATION OF 200 PPM MAY CAUSE MUCOUS MEMBRANE IRRITATION AND COUGHING. AT HIGHER CONCENTRATIONS, CENTRAL NERVOUS SYSTEM DEPRESSION WITH HEADACHE, DIZZINESS, DROWSINESS, SOMNOLENCE, TRANSIENT ANESTHESIA AND INCOHERENCE, CYANOSIS FROM METHEMOGLOBINEMIA, SPASTIC CONTRACTIONS OF THE EXTREMITIES, RAPID RESPIRATION, WEAK AND IRREGULAR PULSE, BURGUNDY-RED URINE, LOSS OF CONSCIOUSNESS, COMA, AND RESPIRATORY AND CIRCULATORY COLLAPSE MAY OCCUR. IN CATS, A CONCENTRATION OF 1200-2900 PPM PRODUCED NARCOSIS WITH RESTLESSNESS, TREMOR AND MUSCULAR SPASMS, BUT NO SERIOUS INJURY OR FATALITY; 3700 PPM WAS LETHAL AFTER SEVERAL HOURS. 8000 PPM PRODUCED SEVERE NARCOSIS AFTER 30 MINUTES AND DEATH WITHIN 2 HOURS AFTER REMOVAL FROM EXPOSURE. PATHOLOGICAL CHANGES MAY INCLUDE HYPERTROPHY AND NECROSIS OF THE LIVER AND BRONCHIAL EPITHELIUM OF THE LUNGS, EDEMA OF THE BRAIN AND SUBMUCOSAL HEMORRHAGE IN THE STOMACH.
CHRONIC EXPOSURE- WORKERS EXPOSED TO CHLOROBENZENE VAPORS FROM 1-2 YEARS SUFFERED FROM HEADACHE, DIZZINESS, SOMNOLENCE, AND DYSPEPTIC DISORDERS. OTHER SYMPTOMS REPORTED IN SOME OF THE WORKERS WERE ACROPARESTHESIA, SPASTIC CONTRACTIONS OF FINGER MUSCLES, HYPESTHESIA, SPASTIC CONTRACTIONS OF THE GASTROCNEMIUS MUSCLE AND VASOVEGETATIVE INSTABILITY. REPEATED EXPOSURE TO 1000 PPM SEVEN HOURS PER DAY, FIVE DAYS A WEEK FOR 44 DAYS RESULTED IN LUNG, LIVER, AND KIDNEY CHANGES IN ANIMALS. AT 475 PPM THERE WAS ONLY SLIGHT LIVER DAMAGE IN GUINEA PIGS AND NO EFFECTS WERE NOTED AT 200 PPM. REPRODUCTIVE EFFECTS HAVE BEEN REPORTED IN ANIMAL STUDIES.

FIRST AID- REMOVE FROM EXPOSURE AREA TO FRESH AIR IMMEDIATELY. IF BREATHING HAS STOPPED, PERFORM ARTIFICIAL RESPIRATION. KEEP PERSON WARM AND AT REST.

TREAT SYMPTOMATICALLY AND SUPPORTIVELY. GET MEDICAL ATTENTION IMMEDIATELY.

SKIN CONTACT:
CHLOROBENZENE:
IRRITANT.
ACUTE EXPOSURE- CONTACT WITH THE LIQUID MAY CAUSE IRRITATION WITH REDNESS AND DEFATTING OF THE SKIN. ACNEFORM ERUPTIONS MAY OCCUR DUE TO CHLOROBENZENE.
CHRONIC EXPOSURE- PROLONGED CONTACT WITH THE LIQUID MAY CAUSE DERMATITIS DUE TO ITS DEFATTING ACTION, MODERATE ERYTHEMA AND SLIGHT SUPERFICIAL NECROSIS OR BURNS.

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

EYE CONTACT:
CHLOROBENZENE:
IRRITANT.
ACUTE EXPOSURE- CONTACT WITH THE LIQUID MAY RESULT IN TRANSIENT CONJUNCTIVAL IRRITATION WITH REDNESS AND PAIN. EYE IRRITATION IN HUMANS HAS BEEN REPORTED FROM EXPOSURE TO VAPORS AT 200 PPM.
CHRONIC EXPOSURE- REPEATED OR PROLONGED CONTACT WITH IRRITANTS MAY CAUSE CONJUNCTIVITIS.

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

INGESTION:
CHLOROBENZENE
NARCOTIC.
ACUTE EXPOSURE- INGESTION MAY CAUSE SALIVATION, ABDOMINAL PAIN, NAUSEA, VOMITING, HEADACHE, LATENT PALLOR, CYANOSIS FROM METHEMOGLOBINEMIA AND COLLAPSE. INGESTION OF THE LIQUID BY A CHILD RESULTED IN PALLOR, CYANOSIS AND COMA FOLLOWED BY COMPLETE RECOVERY.
CHRONIC EXPOSURE- RATS FED 14.4 MG/KG AND 18.8 MG/KG 5 DAYS PER WEEK FOR 192 DAYS SHOWED NO ADVERSE EFFECTS. AT 144 MG/KG-288 MG/KG PRODUCED INCREASES IN LIVER AND KIDNEY WEIGHTS. A DOSAGE OF 376 MG/KG PER DAY CAUSED SLIGHT CIRRHOSIS AND FOCAL NECROSIS OF THE LIVER AND A SLIGHT DECREASE IN AVERAGE SPLEEN WEIGHTS. EOSINOPHILIA AND INHIBITION OF ERYTHROPOIESIS AND THROMBOCYTOSIS HAVE ALSO BEEN REPORTED IN RATS.

FIRST AID- REMOVE BY GASTRIC LAVAGE OR EMESIS. MAINTAIN BLOOD PRESSURE AND AIRWAY. GIVE OXYGEN IF RESPIRATION IS DEPRESSED. DO NOT PERFORM GASTRIC LAVAGE OR EMESIS IF VICTIM IS UNCONSCIOUS. GET MEDICAL ATTENTION IMMEDIATELY (DREISBACH, HANDBOOK OF POISONING, 11TH ED.). ADMINISTRATION OF GASTRIC LAVAGE OR OXYGEN SHOULD BE PERFORMED BY QUALIFIED MEDICAL PERSONNEL.

ANTIDOTE:
NO SPECIFIC ANTIDOTE. TREAT SYMPTOMATICALLY AND SUPPORTIVELY.

REACTIVITY SECTION

REACTIVITY:
STABLE UNDER NORMAL TEMPERATURES AND PRESSURES.

INCOMPATIBILITIES:
CHLOROBENZENE:
DIMETHYL SULFOXIDE: VIOLENT REACTION.
OXIDIZERS (STRONG): VIOLENT REACTIONS.
PLASTICS, RUBBER AND COATINGS: MAY BE ATTACKED.
SILVER PERCHLORATE: REACTS FORMING A SHOCK-SENSITIVE SOLVATED SALT.
SODIUM: MAY CAUSE EXPLOSIONS OR THE FORMATION OF AN EXPLOSIVE COMPOUND.

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

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

STORAGE-DISPOSAL

OBSERVE ALL FEDERAL, STATE AND LOCAL REGULATIONS WHEN STORING OR DISPOSING OF THIS SUBSTANCE. FOR ASSISTANCE, CONTACT THE DISTRICT DIRECTOR OF THE ENVIRONMENTAL PROTECTION AGENCY.

STORAGE

STORE IN ACCORDANCE WITH 29 CFR 1910.106.

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

PROTECT AGAINST PHYSICAL DAMAGE. OUTSIDE OR DETACHED STORAGE IS PREFERABLE. INSIDE STORAGE SHOULD BE IN A STANDARD FIRE-RESISTIVE FLAMMABLE LIQUIDS STORAGE ROOM OR CABINET. SEPARATE FROM OXIDIZING MATERIALS (NFPA 49, HAZARDOUS CHEMICALS DATA, 1975).

STORE AWAY FROM INCOMPATIBLE SUBSTANCES.

DISPOSAL

DISPOSAL MUST BE IN ACCORDANCE WITH STANDARDS APPLICABLE TO GENERATORS OF HAZARDOUS WASTE, 40CFR 262. EPA HAZARDOUS WASTE NUMBER U037.

CONDITIONS TO AVOID

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

SPILLS AND LEAKS

SOIL-RELEASE:
DIG A HOLDING AREA SUCH AS A PIT, POND OR LAGOON TO CONTAIN SPILL AND DIKE SURFACE FLOW USING BARRIER OF SOIL, SANDBAGS, FOAMED POLYURETHANE OR FOAMED CONCRETE. ABSORB LIQUID MASS WITH FLY ASH OR CEMENT POWDER.

IMMOBILIZE SPILL WITH UNIVERSAL GELLING AGENT.

REDUCE VAPOR AND FIRE HAZARD WITH APPROPRIATE FOAM.

AIR-RELEASE:
APPLY WATER SPRAY TO KNOCK DOWN VAPORS. COMBUSTION PRODUCTS INCLUDE TOXIC OR CORROSIVE VAPORS.

WATER-SPILL:
USE NATURAL DEEP WATER POCKETS, EXCAVATED LAGOONS, OR SAND BAG BARRIERS TO TRAP MATERIAL AT BOTTOM. USE ACTIVATED CARBON AT 10 TIMES THE SPILLED AMOUNT IF IT IS DISSOLVED AT 10 PPM OR GREATER CONCENTRATION. REMOVE TRAPPED MATERIAL WITH SUCTION HOSES. USE MECHANICAL DREDGES OR LIFTS TO REMOVE IMMOBILIZED MASSES OF POLLUTION AND PRECIPITATES.

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

REPORTABLE QUANTITY (RQ): 100 POUNDS
THE SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT (SARA) SECTION 304 REQUIRES THAT A RELEASE EQUAL TO OR GREATER THAN THE REPORTABLE QUANTITY FOR THIS SUBSTANCE BE IMMEDIATELY REPORTED TO THE LOCAL EMERGENCY PLANNING COMMITTEE AND THE STATE EMERGENCY RESPONSE COMMISSION (40 CFR 355.40). IF THE RELEASE OF THIS SUBSTANCE IS REPORTABLE UNDER CERCLA SECTION 103, THE NATIONAL RESPONSE CENTER MUST BE NOTIFIED IMMEDIATELY AT (800) 424-8802 OR (202) 426-2675 IN THE METROPOLITAN WASHINGTON, D.C. AREA (40 CFR 302.6).

PROTECTIVE EQUIPMENT SECTION

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

RESPIRATOR:
THE FOLLOWING RESPIRATORS AND MAXIMUM USE CONCENTRATIONS ARE RECOMMENDATIONS BY THE U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES, NIOSH POCKET GUIDE TO CHEMICAL HAZARDS; NIOSH CRITERIA DOCUMENTS OR BY THE U.S. DEPARTMENT OF LABOR, 29 CFR 1910 SUBPART Z.
THE SPECIFIC RESPIRATOR SELECTED MUST BE BASED ON CONTAMINATION LEVELS FOUND IN THE WORK PLACE, MUST NOT EXCEED THE WORKING LIMITS OF THE RESPIRATOR AND BE JOINTLY APPROVED BY THE NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND

HEALTH AND THE MINE SAFETY AND HEALTH ADMINISTRATION (NIOSH-MSHA).

CHLOROBENZENE:

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

1875 PPM- ANY SUPPLIED-AIR RESPIRATOR OPERATED IN A CONTINUOUS FLOW MODE.

2400 PPM- ANY AIR-PURIFYING FULL FACEPIECE RESPIRATOR (GAS MASK) WITH A CHIN-STYLE OR FRONT- OR BACK-MOUNTED ORGANIC VAPOR CANISTER.
ANY SELF-CONTAINED BREATHING APPARATUS WITH A FULL FACEPIECE.
ANY SUPPLIED-AIR RESPIRATOR WITH A FULL FACEPIECE.

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

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

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

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

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

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

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

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

AUTHORIZED BY- OCCUPATIONAL HEALTH SERVICES, INC.

CREATION DATE: 10/01/84 REVISION DATE: 11/02/89

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OCCUPATIONAL HEALTH SERVICES, INC.
450 SEVENTH AVENUE, SUITE 2407
NEW YORK, NEW YORK 10123
(800) 445-MSDS (212) 967-1100

EMERGENCY CONTACT:
JOHN S. BRANSFORD, JR. (615) 292-1180

SUBSTANCE IDENTIFICATION

CAS-NUMBER 67-66-3
RTEC-NUMBER FS9100000

SUBSTANCE: CHLOROFORM

TRADE NAMES/SYNONYMS:
TRICHLOROMETHANE: METHANE TRICHLORIDE: R 20: FREON 20: METHANE, TRICHLORO-: METHYL TRICHLORIDE: TRICHLOROFORM: R 20 (REFRIGERANT): METHENYL TRICHLORIDE: RCRA U044: STCC 4940310: UN 1888: CHCL3: OHS04770

CHEMICAL FAMILY:
HALOGEN COMPOUND, ALIPHATIC

MOLECULAR FORMULA: C-H-CL3 MOLECULAR WEIGHT: 119.38

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

COMPONENTS AND CONTAMINANTS

COMPONENT: CHLOROFORM PERCENT: >99

OTHER CONTAMINANTS: MAY CONTAIN TRACES OF A STABILIZER.

EXPOSURE LIMIT:
CHLOROFORM:
2 PPM (9.78 MG/M3) OSHA TWA
10 PPM (50 MG/M3) ACGIH TWA
ACGIH A2-SUSPECTED HUMAN CARCINOGEN.
2 PPM NIOSH RECOMMENDED 60 MINUTE CEILING

10,000 POUNDS SARA SECTION 302 THRESHOLD PLANNING QUANTITY
5000 POUNDS SARA SECTION 304 REPORTABLE QUANTITY
10 POUNDS CERCLA SECTION 103 REPORTABLE QUANTITY
SUBJECT TO SARA SECTION 313 ANNUAL TOXIC CHEMICAL RELEASE REPORTING
SUBJECT TO CALIFORNIA PROPOSITION 65 CANCER AND/OR REPRODUCTIVE TOXICITY WARNING AND RELEASE REQUIREMENTS- (OCTOBER 1, 1987)

PHYSICAL DATA

DESCRIPTION: CLEAR, COLORLESS, HEAVY, VOLATILE LIQUID WITH A SWEET PLEASANT ETHEREAL TASTE AND ODOR.

BOILING POINT: 143 F (62 C) MELTING POINT: -82 F (-64 C)

SPECIFIC GRAVITY: 1.4832 EVAPORATION RATE: (BUTYL ACETATE=1)

VOLATILITY: 100%

SOLUBILITY IN WATER: 0.82% @ 20 C

VAPOR DENSITY: 4.12

VAPOR PRESSURE: 160 MMHG @ 20 C

ODOR-THRESHOLD: 200 PPM

OTHER SOLVENTS (SOLVENT - SOLUBILITY):
SOLUBLE IN ALCOHOL, ETHER, ACETONE, BENZENE, LIGROIN, SOLVENT NAPHTHA, PETROLEUM ETHER, CARBON TETRACHLORIDE, CARBON DISULFIDE, OILS, OTHER ORGANIC SOLVENTS.

OTHER PHYSICAL DATA
VISCOSITY: 56.3 CPS @ 20 C

FIRE AND EXPLOSION DATA

FIRE AND EXPLOSION HAZARD
NEGLIGIBLE FIRE HAZARD WHEN EXPOSED TO HEAT OR FLAME.

AUTOIGNITION TEMP.: >1832 F (>1000 C)

FIREFIGHTING MEDIA:
DRY CHEMICAL, CARBON DIOXIDE, HALON, WATER SPRAY OR STANDARD FOAM (1987 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.4).

FOR LARGER FIRES, USE WATER SPRAY, FOG OR STANDARD FOAM (1987 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.4).

FIREFIGHTING:
MOVE CONTAINERS FROM FIRE AREA IF POSSIBLE. FIGHT FIRE FROM MAXIMUM DISTANCE. STAY AWAY FROM STORAGE TANK ENDS. DIKE FIRE CONTROL WATER FOR LATER DISPOSAL. DO NOT SCATTER MATERIAL (1987 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.4, GUIDE PAGE 55).

EXTINGUISH USING AGENTS SUITABLE FOR TYPE OF FIRE. AVOID BREATHING VAPORS OR DUSTS, KEEP UPWIND.

TRANSPORTATION

DEPARTMENT OF TRANSPORTATION HAZARD CLASSIFICATION 49CFR172.101:
ORM-A

DEPARTMENT OF TRANSPORTATION LABELING REQUIREMENTS 49CFR172.101 AND SUBPART E:
NONE

DEPARTMENT OF TRANSPORTATION PACKAGING REQUIREMENTS: 49CFR173.630
EXCEPTIONS: 49CFR173.505

TOXICITY

CHLOROFORM:
IRRITATION DATA: 10 MG/24 HOURS OPEN SKIN-RABBIT MILD; 500 MG/24 HOURS SKIN-RABBIT MILD; 148 MG EYE-RABBIT; 20 MG/24 HOURS EYE-RABBIT MODERATE.
TOXICITY DATA: 25,000 PPM/5 MINUTES INHALATION-HUMAN LCLO; 10 MG/M3/1 YEAR INHALATION-HUMAN TCLO; 5000 MG/M3/7 MINUTES INHALATION-HUMAN TCLO; 47,702 MG/M3/4 HOURS INHALATION-RAT LC50; 28 GM/M3 INHALATION-MOUSE LCLO; 59 GM/M3 INHALATION-RABBIT LCLO; 35 GM/M3/4 HOURS INHALATION-CAT LCLO; 100 GM/M3 INHALATION-DOG LCLO; 20,000 PPM/2 HOURS INHALATION-GUINEA PIG LCLO; >4000 MG/KG SKIN-RABBIT LD50 (DOW MSDS); 908 MG/KG ORAL-RAT LD50; 36 MG/KG ORAL-MOUSE LD50; 1000 MG/KG ORAL-DOG LDLO; 500 MG/KG ORAL-RABBIT LDLO; 820 MG/KG ORAL-GUINEA PIG LD50; 704 MG/KG SUBCUTANEOUS-MOUSE LD50; 800 MG/KG SUBCUTANEOUS-RABBIT LDLO; 75 MG/KG INTRAVENOUS-DOG LDLO; 894 MG/KG INTRAPERITONEAL-RAT LD50; 623 MG/KG INTRAPERITONEAL-MOUSE LD50; 1000 MG/KG INTRAPERITONEAL-DOG LD50; 546 MG/KG UNREPORTED-MAN LDLO. MUTAGENIC DATA (RTECS); REPRODUCTIVE EFFECTS DATA (RTECS); TUMORIGENIC DATA (RTECS).
CARCINOGEN STATUS: ANTICIPATED HUMAN CARCINOGEN (NTP); HUMAN INADEQUATE EVIDENCE, ANIMAL SUFFICIENT EVIDENCE (IARC CLASS-2B). CHLOROFORM PRODUCED BENIGN AND MALIGNANT TUMORS OF THE LIVER AND KIDNEY IN MICE FOLLOWING ORAL GAVAGE. ADMINISTRATION TO RATS BY GAVAGE OR IN DRINKING-WATER INCREASED THE INCIDENCES OF KIDNEY AND THYROID TUMORS AND OF NEOPLASTIC NODULES OF THE LIVER.
LOCAL EFFECTS: IRRITANT- INHALATION, SKIN, EYE.
ACUTE TOXICITY LEVEL: MODERATELY TOXIC BY INHALATION, INGESTION; SLIGHTLY TOXIC BY DERMAL ABSORPTION.
TARGET EFFECTS: CENTRAL NERVOUS SYSTEM DEPRESSANT; HEPATOTOXIN, NEPHROTOXIN. POISONING MAY ALSO AFFECT THE HEART.
AT INCREASED RISK FROM EXPOSURE: ALCOHOLICS AND PERSONS WITH CHRONIC SKIN, EYE, LIVER, KIDNEY, HEART OR RESPIRATORY DISORDERS.
ADDITIONAL DATA: USE OF, OR EXPOSURE TO, ALCOHOL, STEROIDS, POLYBROMINATED BIPHENYLS, ACETONE, OR CHLORDECONE MAY ENHANCE THE TOXIC EFFECTS. MAY BE EXCRETED IN BREAST MILK. STIMULANTS SUCH AS EPINEPHRINE MAY INDUCE VENTRICULAR FIBRILLATION.

HEALTH EFFECTS AND FIRST AID

INHALATION:
CHLOROFORM:
IRRITANT/NARCOTIC/HEPATOTOXIN/NEPHROTOXIN.
ACUTE EXPOSURE- MAY CAUSE IRRITATION OF THE UPPER RESPIRATORY TRACT. CENTRAL NERVOUS SYSTEM DEPRESSION MAY BE PRECEDED BY EXCITATION AND INEBRIATION. 1,000-2,000 PPM MAY CAUSE DIZZINESS, HEADACHE, FATIGUE, SALIVATION, AND NAUSEA; 4,000 PPM MAY CAUSE VOMITING, SERIOUS DISORIENTATION, AND A FAINTING FEELING; 14,000-16,000 PPM MAY CAUSE ANESTHESIA AND RAPID LOSS OF CONSCIOUSNESS; MORE THAN 20,000 PPM MAY CAUSE RESPIRATORY FAILURE, CARDIAC ARRHYTHMIAS, AND DEATH. OTHER SYMPTOMS MAY INCLUDE A FEELING OF WARMTH, MALAISE, DROWSINESS, MYDRIASIS WITH DIMINISHED LIGHT REFLEX, TOXEMIA, LOSS OF TENDON REFLEXES, STUPOR, CONVULSIONS, COMA AND HYPOTENSION. FATTY CHANGES AND CENTRILOBULAR NECROSIS OF THE LIVER AND FATTY DEGENERATIVE CHANGES OF THE KIDNEY AND HEART MAY OCCUR. IF DEATH DOES NOT OCCUR IMMEDIATELY FROM RESPIRATORY ARREST OR VENTRICULAR FIBRILLATION, IT MAY OCCUR LATER FROM LIVER AND KIDNEY DAMAGE.
CHRONIC EXPOSURE- REPEATED EXPOSURE TO 77-237 PPM HAS CAUSED LASSITUDE, DULLNESS, URINARY FREQUENCY, AND GASTROINTESTINAL DISTURBANCES. OTHER

REPORTED SYMPTOMS INCLUDE DRY MOUTH, THIRST, MALAISE, ANOREXIA, HEADACHE, DEPRESSION, CONFUSION, WEAKNESS, BLURRED VISION, PARESTHESIAS, LOSS OF SENSE OF BALANCE, MEMORY LOSS, TREMORS, ANEMIA, KIDNEY DAMAGE, AND FATTY DEGENERATION OF THE LIVER. 17 OF 68 WORKERS EXPOSED TO 10-200 PPM FOR 1-4 YEARS EXHIBITED HEPATOMEGALY AND INCREASED SUSCEPTIBILITY TO VIRAL HEPATITIS. EXPOSURE OF RATS ON DAYS 6-15 OF GESTATION CAUSED A HIGH RATE OF RESORPTIONS, RETARDED FETAL DEVELOPMENT, DECREASED FETAL BODY MEASUREMENTS, AND A LOW INCIDENCE OF ACAUDATE FETUSES WITH IMPERFORATE ANUS. MICE EXPOSED ON DAYS 8-15 OF GESTATION HAD OFFSPRING WITH A SIGNIFICANT INCREASE OF CLEFT PALATE. ONE NONCORROBORATED STUDY REPORTS ABNORMAL SPERMATOZOA IN MICE EXPOSED TO LEVELS ABOVE THE TLV.

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

SKIN CONTACT:
CHLOROFORM:
IRRITANT.

ACUTE EXPOSURE- MAY CAUSE IRRITATION WITH INFLAMMATION, DESTRUCTION OF THE EPITHELIUM, AND PRURULENT BLEBS. APPLICATION TO RABBIT SKIN FOR 24 HOURS CAUSED HYPEREMIA AND MODERATE NECROSIS. SOME ABSORPTION OCCURRED RESULTING IN WEIGHT LOSS AND DEGENERATIVE KIDNEY CHANGES, HOWEVER DOSES AS HIGH AS 3980 MG/KG WERE SURVIVED.

CHRONIC EXPOSURE- REPEATED OR PROLONGED EXPOSURE MAY CAUSE DERMATITIS WITH DRYING, CRACKING, AND REDNESS. IF SUFFICIENT AMOUNTS ARE ABSORBED, SYSTEMIC EFFECTS MAY OCCUR.

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

EYE CONTACT:
CHLOROFORM:
IRRITANT.

ACUTE EXPOSURE- HIGH VAPOR CONCENTRATIONS MAY CAUSE STINGING, IRRITATION, AND BLEPHAROSPASM. CONTACT WITH THE LIQUID MAY ALSO CAUSE BURNING PAIN, LACRIMATION, AND REDNESS. THE CORNEAL EPITHELIUM MAY BE INJURED AND PARTIALLY LOST, HOWEVER, THE EYES RETURN TO NORMAL IN 1-3 DAYS. LONG EXPOSURE OF THE CORNEA DURING GENERAL ANESTHESIA HAS CAUSED PERSISTENT INJURY.

CHRONIC EXPOSURE- REPEATED OR PROLONGED CONTACT WITH IRRITANTS MAY CAUSE CONJUNCTIVITIS.

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

INGESTION:
CHLOROFORM:
NARCOTIC/HEPATOTOXIN/NEPHROTOXIN/CARCINOGEN.

ACUTE EXPOSURE- MAY CAUSE BURNING OF THE MOUTH, THROAT, ESOPHAGUS, AND STOMACH, NAUSEA, VOMITING, DIARRHEA, ABDOMINAL AND SUBSTERNAL PAIN, COLD, CLAMMY SKIN, CYANOSIS OF THE EXTREMITIES AND FACE, MUSCLE CRAMPS, MYDRIASIS, HYPOTENSION, PERIPHERAL VASODILATION, IRREGULAR RESPIRATION, RESPIRATORY FAILURE, UNCONSCIOUSNESS, AND LIVER DAMAGE. THE MEAN LETHAL DOSE IN HUMANS IS ABOUT 1 OUNCE. ASPIRATION MAY OCCUR AND RESULT IN

CHEMICAL PNEUMONITIS. 250 MG/KG CAUSED DEPRESSION, PROFOUND SLEEP, DYSPNEA, ANOREXIA, HEMATURIA, AND LIVER AND KIDNEY CHANGES IN RATS.
CHRONIC EXPOSURE- REPEATED INGESTION MAY CAUSE LIVER AND KIDNEY DAMAGE. IN FEEDING STUDIES, THERE WAS AN INCREASED INCIDENCE OF BENIGN AND MALIGNANT TUMORS OF THE LIVER AND KIDNEYS IN MICE AND OF TUMORS OF THE KIDNEY AND THYROID AND NEOPLASTIC NODULES IN THE LIVER IN RATS. REPRODUCTIVE EFFECTS HAVE BEEN REPORTED IN ANIMALS.

FIRST AID- TREAT SYMPTOMATICALLY AND SUPPORTIVELY. GET MEDICAL ATTENTION IMMEDIATELY. IF VOMITING OCCURS, KEEP HEAD LOWER THAN HIPS TO PREVENT ASPIRATION.

ANTIDOTE:
NO SPECIFIC ANTIDOTE. TREAT SYMPTOMATICALLY AND SUPPORTIVELY.

REACTIVITY SECTION

REACTIVITY:
STABLE UNDER NORMAL TEMPERATURES AND PRESSURES.

INCOMPATIBILITIES:
CHLOROFORM:
ALUMINUM (POWDERED): EXPLOSION ON CONTACT.
BIS(DIMETHYLAMINO)DIMETHYLSTANNANE: EXPLOSION WHEN HEATED.
DINITROGEN TETRAOXIDE: EXPLOSIVE MIXTURE.
DISILANE: VIGOROUS INCANDESCENT REACTION.
FLUORINE: EXPLOSIVE REACTION.
KETONES + ALKALIES: VIGOROUS EXOTHERMIC REACTION.
LITHIUM: FORMS SHOCK-SENSITIVE MIXTURE.
MAGNESIUM (POWDER): EXPLODES ON CONTACT.
METALS + WATER: MAY BE ATTACKED.
METHANOL + ALKALIES: EXOTHERMIC REACTION.
NITROMETHANE: FORMS EXPLOSIVE MIXTURE.
PERCHLORIC ACID + PHOSPHOROUS PENTOXIDE: VIOLENT EXPLOSION.
PLASTICS, RUBBER, COATINGS: MAY BE ATTACKED.
POTASSIUM: EXPLOSIVE REACTION.
POTASSIUM TERT-BUTOXIDE (VAPOR): IGNITES ON CONTACT.
SODIUM: EXPLOSIVE REACTION.
SODIUM METHOXIDE: INCOMPATIBLE.
TRIISOPROPYLPHOSPHINE: VIGOROUS REACTION.

DECOMPOSITION:
CHLOROFORM:
THERMAL DECOMPOSITION MAY RELEASE TOXIC OR CORROSIVE VAPORS, INCLUDING OXIDES OF CHLORINE AND CARBON, PHOSGENE, CHLORINE GAS AND HYDROGEN CHLORIDE.

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

STORAGE-DISPOSAL

OBSERVE ALL FEDERAL, STATE AND LOCAL REGULATIONS WHEN STORING OR DISPOSING OF THIS SUBSTANCE. FOR ASSISTANCE, CONTACT THE DISTRICT DIRECTOR OF THE

STORAGE

THRESHOLD PLANNING QUANTITY (TPQ):
THE SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT (SARA) SECTION 302 REQUIRES THAT EACH FACILITY WHERE ANY EXTREMELY HAZARDOUS SUBSTANCE IS PRESENT IN A QUANTITY EQUAL TO OR GREATER THAN THE TPQ ESTABLISHED FOR THAT SUBSTANCE NOTIFY THE STATE EMERGENCY RESPONSE COMMISSION FOR THE STATE IN WHICH IT IS LOCATED. SECTION 303 OF SARA REQUIRES THESE FACILITIES TO PARTICIPATE IN LOCAL EMERGENCY RESPONSE PLANNING (40 CFR 355.30).

STORE IN A COOL, DRY, WELL-VENTILATED LOCATION. SEPARATE FROM STRONG ALKALIS (NFPA 49, HAZARDOUS CHEMICALS DATA, 1975).

STORE AWAY FROM INCOMPATIBLE SUBSTANCES.

KEEP CONTAINER TIGHTLY CLOSED. PROTECT FROM EXPOSURE TO AIR OR LIGHT.

DISPOSAL

DISPOSAL MUST BE IN ACCORDANCE WITH STANDARDS APPLICABLE TO GENERATORS OF HAZARDOUS WASTE, 40CFR 262. EPA HAZARDOUS WASTE NUMBER U044.

CONDITIONS TO AVOID

MAY BURN BUT DOES NOT IGNITE READILY. CONTAINERS MAY EXPLODE IN HEAT OF FIRE.

SPILLS AND LEAKS

SOIL-RELEASE:
DIG A HOLDING AREA SUCH AS A PIT, POND OR LAGOON TO CONTAIN SPILL AND DIKE SURFACE FLOW USING BARRIER OF SOIL, SANDBAGS, FOAMED POLYURETHANE OR FOAMED CONCRETE. ABSORB LIQUID MASS WITH FLY ASH OR CEMENT POWDER.

IMMOBILIZE SPILL WITH UNIVERSAL GELLING AGENT.

AIR-RELEASE:
COMBUSTION PRODUCTS INCLUDE CORROSIVE OR TOXIC VAPORS.

WATER-SPILL:
TRAP SPILLED MATERIAL AT BOTTOM IN DEEP WATER POCKETS, EXCAVATED HOLDING AREAS OR WITHIN SAND BAG BARRIERS.

USE SUCTION HOSES TO REMOVE TRAPPED SPILL MATERIAL.

USE MECHANICAL DREDGES OR LIFTS TO EXTRACT IMMOBILIZED MASSES OF POLLUTION AND PRECIPITATES.

IF DISSOLVED, AT A CONCENTRATION OF 10 PPM OR GREATER, APPLY ACTIVATED CARBON AT TEN TIMES THE AMOUNT THAT HAS BEEN SPILLED.

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

OCCUPATIONAL-SPILL:
DO NOT TOUCH SPILLED MATERIAL. STOP LEAK IF YOU CAN DO IT WITHOUT RISK. USE WATER SPRAY TO REDUCE VAPORS. FOR SMALL SPILLS, TAKE UP WITH SAND OR OTHER ABSORBENT MATERIAL AND PLACE INTO CONTAINERS FOR LATER DISPOSAL. FOR SMALL DRY SPILLS, WITH A CLEAN SHOVEL PLACE MATERIAL INTO CLEAN, DRY CONTAINERS AND COVER. MOVE CONTAINERS FROM SPILL AREA. FOR LARGER SPILLS, DIKE FAR AHEAD OF SPILL FOR LATER DISPOSAL. KEEP UNNECESSARY PEOPLE AWAY. ISOLATE HAZARD AREA AND DENY ENTRY. VENTILATE CLOSED SPACES BEFORE ENTERING.

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

PROTECTIVE EQUIPMENT SECTION

VENTILATION:
PROVIDE LOCAL EXHAUST OR PROCESS ENCLOSURE VENTILATION TO MEET PUBLISHED EXPOSURE LIMITS.

RESPIRATOR:
THE FOLLOWING RESPIRATORS AND MAXIMUM USE CONCENTRATIONS ARE RECOMMENDATIONS BY THE U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES, NIOSH POCKET GUIDE TO CHEMICAL HAZARDS; NIOSH CRITERIA DOCUMENTS OR BY THE U.S. DEPARTMENT OF LABOR, 29 CFR 1910 SUBPART Z.
THE SPECIFIC RESPIRATOR SELECTED MUST BE BASED ON CONTAMINATION LEVELS FOUND IN THE WORK PLACE, MUST NOT EXCEED THE WORKING LIMITS OF THE RESPIRATOR AND BE JOINTLY APPROVED BY THE NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH AND THE MINE SAFETY AND HEALTH ADMINISTRATION (NIOSH-MSHA).

CHLOROFORM:

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

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

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

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

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

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

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

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

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

AUTHORIZED BY- OCCUPATIONAL HEALTH SERVICES, INC.

CREATION DATE: 10/01/84 REVISION DATE: 11/02/89

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OCCUPATIONAL HEALTH SERVICES, INC.
450 SEVENTH AVENUE, SUITE 2407
NEW YORK, NEW YORK 10123
(800) 445-MSDS (212) 967-1100

EMERGENCY CONTACT:
JOHN S. BRANSFORD, JR. (615) 292-1180

SUBSTANCE IDENTIFICATION

CAS-NUMBER 7440-47-3
RTEC-NUMBER GB4200000

SUBSTANCE: CHROMIUM

TRADE NAMES/SYNONYMS:
CHROME: CHROMIUM ELEMENT: CHROMIUM METAL: METALLIC CHROMIUM: CR: OHS05000

CHEMICAL FAMILY:
METAL

MOLECULAR FORMULA: CR MOLECULAR WEIGHT: 51.996

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

COMPONENTS AND CONTAMINANTS

COMPONENT: CHROMIUM PERCENT: 100.0

OTHER CONTAMINANTS: NONE

EXPOSURE LIMIT:
CHROMIUM:
1 MG/M3 OSHA TWA
0.5 MG/M3 ACGIH TWA

5000 POUNDS CERCLA SECTION 103 REPORTABLE QUANTITY
SUBJECT TO SARA SECTION 313 ANNUAL TOXIC CHEMICAL RELEASE REPORTING

PHYSICAL DATA

DESCRIPTION: ODORLESS, STEEL-GRAY, LUSTROUS METAL OR POWDER.

BOILING POINT: 4842 F (2672 C) MELTING POINT: 3339-3411 F (1837-1877 C)

SPECIFIC GRAVITY: 7.20 @ 28 C SOLUBILITY IN WATER: INSOLUBLE

VAPOR PRESSURE: 1 MMHG @ 1616

OTHER SOLVENTS (SOLVENT - SOLUBILITY):
SOLUBLE IN DILUTE SULFURIC ACID, HYDROCHLORIC ACID;
INSOLUBLE IN NITRIC ACID, AQUA REGIA.

OTHER PHYSICAL DATA
AUTOIGNITION TEMPERATURE: 1076 F (580 C) (CLOUD); 752 F (400 C) (LAYER)

FIRE AND EXPLOSION DATA

FIRE AND EXPLOSION HAZARD
NEGLIGIBLE FIRE HAZARD IN METALLIC FORM; HOWEVER, DUST, POWDER, OR FUMES ARE FLAMMABLE OR EXPLOSIVE WHEN EXPOSED TO HEAT OR FLAMES.

FINELY DIVIDED MATERIAL MAY IGNITE ON EXPOSURE TO AIR.

LOWER EXPLOSION LIMIT: 0.230 OZ/FT3

FIREFIGHTING MEDIA:
USE DRY SAND, DOLOMITE, GRAPHITE, SODIUM CHLORIDE, SODA ASH, OR APPROPRIATE METAL-EXTINGUISHING POWDER. DO NOT APPLY WATER TO BURNING MATERIAL (NFPA FIRE PROTECTION HANDBOOK, 16TH EDITION).

FIREFIGHTING:
MOVE CONTAINER FROM FIRE AREA IF POSSIBLE. COOL CONTAINERS EXPOSED TO FLAME WITH WATER FROM SIDE UNTIL WELL AFTER FIRE IS OUT. STAY AWAY FROM STORAGE TANK ENDS. FOR MASSIVE FIRE IN CARGO AREA, USE UNMANNED HOSE HOLDER OR MONITOR NOZZLES; ELSE WITHDRAW AND LET FIRE BURN (1987 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.4, GUIDE PAGE 32).

EXTINGUISH USING AGENT FOR TYPE OF FIRE. AVOID BREATHING FUMES FROM BURNING MATERIAL.

TRANSPORTATION

DEPARTMENT OF TRANSPORTATION HAZARD CLASSIFICATION 49CFR172.101:
*FLAMMABLE SOLID

DEPARTMENT OF TRANSPORTATION LABELING REQUIREMENTS 49CFR172.101 AND SUBPART E:
*FLAMMABLE SOLID

*HAZARD CLASSIFICATION AND LABEL APPLY TO DUST AND POWDER FORM ONLY.

DEPARTMENT OF TRANSPORTATION PACKAGING REQUIREMENTS: 49CFR173.154
EXCEPTIONS: 49CFR173.153

TOXICITY

CHROMIUM:
TOXICITY DATA: TUMORIGENIC DATA (RTECS).
CARCINOGEN STATUS: HUMAN INADEQUATE EVIDENCE, ANIMAL INADEQUATE EVIDENCE (IARC CLASS-3). THERE IS SUFFICIENT EVIDENCE OF RESPIRATORY CARCINOGENICITY IN MEN OCCUPATIONALLY EXPOSED DURING CHROMATE PRODUCTION. THE EPIDEMIOLOGICAL DATA DO NOT ALLOW AN EVALUATION OF THE RELATIVE CONTRIBUTIONS TO CARCINOGENIC RISK OF METALLIC CHROMIUM, CHROMIUM(III), AND CHROMIUM(VI) OR OF SOLUBLE VERSUS INSOLUBLE CHROMIUM COMPOUNDS.

ACUTE TOXICITY LEVEL: NO DATA AVAILABLE.
TARGET EFFECTS: POISONING MAY AFFECT THE LIVER AND KIDNEYS.*

* MAY BE BASED ON GENERAL INFORMATION ON CHROMIUM COMPOUNDS.

HEALTH EFFECTS AND FIRST AID

INHALATION:
CHROMIUM:
500 MG(CR)/M3 IMMEDIATELY DANGEROUS TO LIFE OR HEALTH.
ACUTE EXPOSURE- HIGH CONCENTRATIONS OF DUSTS OR FUMES MAY CAUSE IRRITATION.
CHRONIC EXPOSURE- REPEATED OR PROLONGED EXPOSURE TO SOME CHROMIUM COMPOUNDS MAY RESULT IN ULCERATION AND PERFORATION OF THE NASAL SEPTUM, SHORT-TERM MEMORY AND ATTENTION SPAN DISTURBANCES, GASTROINTESTINAL DISTURBANCES, PULMONARY SENSITIZATION, PULMONARY FIBROSIS OR PNEUMOCONIOSIS, AND ACUTE HEPATITIS WITH JAUNDICE.

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

SKIN CONTACT:
CHROMIUM:
ACUTE EXPOSURE- CONTACT WITH DUSTS OF CHROMIUM COMPOUNDS MAY CAUSE IRRITATION.
CHRONIC EXPOSURE- REPEATED OR PROLONGED EXPOSURE TO SOME CHROMIUM COMPOUNDS MAY RESULT IN "CHROME HOLES", SENSITIZATION, AND KIDNEY LESIONS. ALLERGIC CONTACT DERMATITIS DUE TO CONTACT WITH CHROME-PLATED OBJECTS IS USUALLY FOUND TO BE DUE TO THE PRESENCE OF NICKEL.

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

EYE CONTACT:
CHROMIUM:
ACUTE EXPOSURE- CONTACT WITH DUSTS OF CHROMIUM COMPOUNDS MAY CAUSE IRRITATION.
CHRONIC EXPOSURE- REPEATED OR PROLONGED CONTACT WITH SOME CHROMIUM COMPOUNDS MAY CAUSE CONJUNCTIVITIS AND LACRIMATION.

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

INGESTION:
CHROMIUM:
ACUTE EXPOSURE- CHROMIUM METAL IS POORLY ABSORBED BY THE INTESTINAL TRACT. ABSORPTION OF SUFFICIENT AMOUNTS OF CHROMIUM COMPOUNDS MAY RESULT IN DIZZINESS, INTENSE THIRST, ABDOMINAL PAIN, VOMITING, SHOCK, OLIGURIA OR ANURIA, AND DEATH FROM UREMIA.
CHRONIC EXPOSURE- EXCESSIVE INGESTION OF SOME CHROMIUM COMPOUNDS MAY RESULT IN KIDNEY DAMAGE.

FIRST AID- TREAT SYMPTOMATICALLY AND SUPPORTIVELY. GET MEDICAL ATTENTION IMMEDIATELY. IF VOMITING OCCURS, KEEP HEAD LOWER THAN HIPS TO PREVENT ASPIRATION.

ANTIDOTE:
THE FOLLOWING ANTIDOTE HAS BEEN RECOMMENDED. HOWEVER, THE DECISION AS TO WHETHER THE SEVERITY OF POISONING REQUIRES ADMINISTRATION OF ANY ANTIDOTE AND ACTUAL DOSE REQUIRED SHOULD BE MADE BY QUALIFIED MEDICAL PERSONNEL.

CHROMIUM POISONING:
USE OF DIMERCAPROL HAS BEEN SUGGESTED ON THE BASIS OF FINDINGS IN ANIMALS. GIVE 3 MG/KG (OR 0.3 ML/10 KG) EVERY 4 HOURS, INTRAMUSCULARLY FOR THE FIRST 2 DAYS AND THEN 2 MG/KG EVERY 12 HOURS FOR A TOTAL OF 10 DAYS (DREISBACH, HANDBOOK OF POISONING, 11TH ED.). ANTIDOTE SHOULD BE ADMINISTERED BY QUALIFIED MEDICAL PERSONNEL.

REACTIVITY SECTION

REACTIVITY:
STABLE UNDER NORMAL TEMPERATURES AND PRESSURES.

INCOMPATIBILITIES:
CHROMIUM:
- ALKALI CARBONATES: ATTACKED.
- ALKALIES (CAUSTIC): ATTACKED.
- AMMONIUM NITRATE (FUSED): VIOLENT OR EXPLOSIVE REACTION.
- BROMINE PENTAFLUORIDE: VIOLENT REACTION AND POSSIBLE IGNITION.
- HYDROGEN PEROXIDE: VIOLENT DECOMPOSITION REACTION.
- LITHIUM (MOLTEN): VIGOROUS REACTION AT ELEVATED TEMPERATURES.
- NITROGEN OXIDE: INCANDESCENT REACTION.
- OXIDIZERS (STRONG): FIRE AND EXPLOSION HAZARD.
- POTASSIUM CHLORATE (FUSED): VIGOROUS INCANDESCENT REACTION.
- SULPHUR DIOXIDE: INCANDESCENT REACTION.

DECOMPOSITION:
THERMAL DECOMPOSITION PRODUCTS MAY INCLUDE TOXIC CHROMIC OXIDE.

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

STORAGE-DISPOSAL

OBSERVE ALL FEDERAL, STATE AND LOCAL REGULATIONS WHEN STORING OR DISPOSING OF THIS SUBSTANCE. FOR ASSISTANCE, CONTACT THE DISTRICT DIRECTOR OF THE ENVIRONMENTAL PROTECTION AGENCY.

STORAGE

STORE AWAY FROM INCOMPATIBLE SUBSTANCES.

KEEP IN A TIGHTLY CLOSED CONTAINER. STORE IN A COOL, DRY, VENTILATED AREA.

CONDITIONS TO AVOID

AVOID DISPERSION OF DUST IN AIR. FINELY DIVIDED PARTICLES, DUST, OR FUMES MAY BE FLAMMABLE OR EXPLOSIVE. KEEP AWAY FROM SPARKS OR IGNITION SOURCES.

SPILLS AND LEAKS

OCCUPATIONAL-SPILL:
FOR LARGE SPILLS, SWEEP UP WITH A MINIMUM OF DUSTING AND PLACE INTO SUITABLE CLEAN, DRY CONTAINERS FOR RECLAMATION OR LATER DISPOSAL.

RESIDUE SHOULD BE CLEANED UP USING A HIGH-EFFICIENCY PARTICULATE FILTER VACUUM.

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

PROTECTIVE EQUIPMENT SECTION

VENTILATION:
PROVIDE LOCAL EXHAUST OR PROCESS ENCLOSURE VENTILATION TO MEET THE PUBLISHED EXPOSURE LIMITS. VENTILATION EQUIPMENT MUST BE EXPLOSION-PROOF.

RESPIRATOR:
THE FOLLOWING RESPIRATORS AND MAXIMUM USE CONCENTRATIONS ARE RECOMMENDATIONS BY THE U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES, NIOSH POCKET GUIDE TO CHEMICAL HAZARDS; NIOSH CRITERIA DOCUMENTS OR BY THE U.S. DEPARTMENT OF LABOR, 29 CFR 1910 SUBPART Z.
THE SPECIFIC RESPIRATOR SELECTED MUST BE BASED ON CONTAMINATION LEVELS FOUND IN THE WORK PLACE, MUST NOT EXCEED THE WORKING LIMITS OF THE RESPIRATOR AND BE JOINTLY APPROVED BY THE NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH AND THE MINE SAFETY AND HEALTH ADMINISTRATION (NIOSH-MSHA).

CHROMIUM, METAL AND INSOLUBLE SALTS (AS CR):

2.5 MG(CR)/M3- ANY DUST AND MIST RESPIRATOR EXCEPT SINGLE-USE RESPIRATOR.

5 MG(CR)/M3- ANY DUST AND MIST RESPIRATOR EXCEPT SINGLE-USE AND QUARTER-MASK RESPIRATOR.
ANY SUPPLIED-AIR RESPIRATOR.
ANY SELF-CONTAINED BREATHING APPARATUS.

12.5 MG(CR)/M3- ANY POWERED AIR-PURIFYING RESPIRATOR WITH A DUST AND MIST FILTER.
ANY SUPPLIED-AIR RESPIRATOR OPERATED IN A CONTINUOUS FLOW

MODE.

25 MG(CR)/M3- ANY AIR-PURIFYING FULL FACEPIECE RESPIRATOR WITH A HIGH-EFFICIENCY PARTICULATE FILTER.
ANY POWERED AIR-PURIFYING RESPIRATOR WITH A TIGHT-FITTING FACEPIECE AND A HIGH-EFFICIENCY PARTICULATE FILTER.
ANY SELF-CONTAINED BREATHING APPARATUS WITH A FULL FACEPIECE.
ANY SUPPLIED-AIR RESPIRATOR WITH A FULL FACEPIECE.

500 MG(CR)/M3- ANY SUPPLIED-AIR RESPIRATOR WITH A FULL FACEPIECE AND OPERATED IN A PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE MODE.

ESCAPE- ANY AIR-PURIFYING FULL FACEPIECE RESPIRATOR WITH A HIGH-EFFICIENCY PARTICULATE FILTER.
ANY APPROPRIATE ESCAPE-TYPE SELF-CONTAINED BREATHING APPARATUS.

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

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

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

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

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

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

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

AUTHORIZED BY- OCCUPATIONAL HEALTH SERVICES, INC.

CREATION DATE: 10/25/84 REVISION DATE: 11/02/89

MATERIAL SAFETY DATA SHEET OHS10340

OCCUPATIONAL HEALTH SERVICES, INC.
450 SEVENTH AVENUE, SUITE 2407
NEW YORK, NEW YORK 10123
(800) 445-MSDS (212) 967-1100

EMERGENCY CONTACT:
JOHN S. BRANSFORD, JR. (615) 292-1180

SUBSTANCE IDENTIFICATION

CAS-NUMBER 8006-61-9
RTEC-NUMBER LX3373000

SUBSTANCE: GASOLINE, AUTOMOTIVE, UNLEADED

TRADE NAMES/SYNONYMS:
UNLEADED GASOLINE: PREMIUM UNLEADED GASOLINE: PETROL: MOTOR SPIRITS: BENZIN: GASOLINE: "A" GRADE GASOLINE (NCRA): "N" GRADE GASOLINE (NCRA): STCC 4908178: UN 1203: OHS10340

CHEMICAL FAMILY:
PETROLEUM HYDROCARBON

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

COMPONENTS AND CONTAMINANTS

COMPONENT: GASOLINE, AUTOMOTIVE, UNLEADED MAY CONTAIN: PERCENT: 100

COMPONENT: BENZENE >0.1% CAS# 71-43-2

OTHER CONTAMINANTS: NONE

EXPOSURE LIMIT:
GASOLINE (BULK HANDLING):
300 PPM (900 MG/M3) OSHA TWA; 500 PPM (1,500 MG/M3) OSHA STEL
300 PPM (900 MG/M3) ACGIH TWA; 500 PPM (1,500 MG/M3) ACGIH STEL

BENZENE:
1 PPM OSHA TWA; 5 PPM OSHA 15 MINUTE STEL;
0.5 PPM OSHA ACTION LEVEL
10 PPM (30 MG/M3) ACGIH TWA;
ACGIH A2-SUSPECTED HUMAN CARCINOGEN
0.1 PPM (0.32 MG/M3) NIOSH RECOMMENDED 8 HOUR TWA;
1 PPM (3.2 MG/M3) NIOSH RECOMMENDED 15 MINUTE CEILING

10 POUNDS CERCLA SECTION 103 REPORTABLE QUANTITY
SUBJECT TO SARA SECTION 313 ANNUAL TOXIC CHEMICAL RELEASE REPORTING
SUBJECT TO CALIFORNIA PROPOSITION 65 CANCER AND/OR REPRODUCTIVE TOXICITY WARNING AND RELEASE REQUIREMENTS- (FEBRUARY 27, 1987)

PHYSICAL DATA

DESCRIPTION: CLEAR COLORLESS TO AMBER, AROMATIC, VOLATILE LIQUID

BOILING POINT: 100-400 F (38-204 C) SPECIFIC GRAVITY: 0.7-0.8

SOLUBILITY IN WATER: INSOLUBLE VAPOR DENSITY: 3.0-4.0

ODOR-THRESHOLD: 0.25 PPM

OTHER SOLVENTS (SOLVENT - SOLUBILITY):
ABSOLUTE ALCOHOL, ETHER, CHLOROFORM, BENZENE

FIRE AND EXPLOSION DATA

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

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

VAPOR-AIR MIXTURES ARE EXPLOSIVE ABOVE FLASH POINT.

FLASH POINT: -45 F (-43 C) (CC) UPPER EXPLOSION LIMIT: 7.6%

LOWER EXPLOSION LIMIT: 1.2% AUTOIGNITION TEMP.: 536-853 F (280-456 C)

FLAMMABILITY CLASS (OSHA): IB

FIREFIGHTING MEDIA:
DRY CHEMICAL, CARBON DIOXIDE, HALON, WATER SPRAY OR STANDARD FOAM (1987 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.4).

FOR LARGER FIRES, USE WATER SPRAY, FOG OR STANDARD FOAM (1987 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.4).

FIREFIGHTING:
MOVE CONTAINER FROM FIRE AREA IF POSSIBLE. COOL FIRE-EXPOSED CONTAINERS WITH WATER FROM SIDE UNTIL WELL AFTER FIRE IS OUT. STAY AWAY FROM STORAGE TANK ENDS. FOR MASSIVE FIRE IN STORAGE AREA, USE UNMANNED HOSE HOLDER OR MONITOR NOZZLES, ELSE WITHDRAW FROM AREA AND LET FIRE BURN. WITHDRAW IMMEDIATELY IN CASE OF RISING SOUND FROM VENTING SAFETY DEVICE OR ANY DISCOLORATION OF STORAGE TANK DUE TO FIRE (1987 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.4, GUIDE PAGE 27).

EXTINGUISH ONLY IF FLOW CAN BE STOPPED; USE WATER IN FLOODING AMOUNTS AS FOG, SOLID STREAMS MAY SPREAD FIRE. COOL CONTAINERS WITH FLOODING AMOUNTS OF WATER, APPLY FROM AS FAR A DISTANCE AS POSSIBLE. AVOID BREATHING VAPORS, KEEP UPWIND. EVACUATE TO A RADIUS OF 1500 FEET FOR UNCONTROLLABLE FIRES. CONSIDER EVACUATION OF DOWNWIND AREA IF MATERIAL IS LEAKING.

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

TRANSPORTATION

DEPARTMENT OF TRANSPORTATION HAZARD CLASSIFICATION 49 CFR 172.101:
FLAMMABLE LIQUID

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

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

TOXICITY

GASOLINE, AUTOMOTIVE, UNLEADED:
(DATA DERIVED FROM UNSPECIFIED AND UNLEADED GASOLINE)
IRRITATION DATA: 500 MG/24 HOURS SKIN-RABBIT MILD; 500 PPM/1 HOUR EYE-MAN MODERATE; 140 PPM/8 HOURS EYE-HUMAN MILD.
TOXICITY DATA: 900 PPM/1 HOUR INHALATION-MAN TCLO; 300 GM/M3/5 MINUTES INHALATION-RAT LC50; 300 GM/M3/5 MINUTES INHALATION-MOUSE LC50; 300 GM/M3/5 MINUTES INHALATION-GUINEA PIG LC50; 30000 PPM/5 MINUTES INHALATION-MAMMAL LCLO; 18,000 MG/KG ORAL-RAT LD50; 13.6 GM/KG ORAL-RAT LD50 (AETODY); TUMORIGENIC DATA (RTECS).
CARCINOGEN STATUS: INADEQUATE HUMAN EVIDENCE, LIMITED ANIMAL EVIDENCE (IARC GROUP-2B). IN STUDIES WITH MICE AND RATS BY INHALATION, AN INCREASED INCIDENCE OF HEPATOCELLULAR ADENOMAS AND CARCINOMAS WAS PRODUCED IN FEMALE BUT NOT MALE MICE; AN INCREASED INCIDENCE OF ADENOMAS AND CARCINOMAS OF THE KIDNEY WAS PRODUCED IN MALE BUT NOT FEMALE RATS.
LOCAL EFFECTS: IRRITANT- INHALATION, SKIN, EYE.
ACUTE TOXICITY LEVEL: RELATIVELY NON-TOXIC BY INHALATION AND INGESTION.
TARGET EFFECTS: CENTRAL NERVOUS SYSTEM DEPRESSANT; SIMPLE ASPHYXIANT.
ADDITIONAL DATA: THE USE OF ALCOHOLIC BEVERAGES ENHANCES THE TOXIC EFFECTS. STIMULANTS SUCH AS EPINEPHRINE MAY INDUCE VENTRICULAR FIBRILLATION.

BENZENE:
IRRITATION DATA: 20 MG/24 HOURS SKIN-RABBIT MODERATE; 15 MG/24 HOURS OPEN SKIN-RABBIT MILD; 88 MG EYE-RABBIT MODERATE; 2 MG/24 HOURS EYE-RABBIT SEVERE.
TOXICITY DATA: 2000 PPM/5 MINUTES INHALATION-HUMAN LCLO; 2 PPM/5 MINUTES INHALATION-HUMAN LCLO; 65 MG/M3/5 YEARS INHALATION-HUMAN LCLO; 100 PPM INHALATION-HUMAN TCLO; 150 PPM/1 YEAR INTERMITTENT INHALATION-MAN TCLO; 20,000 PPM/5 MINUTES INHALATION-MAMMAL LCLO; 10,000 PPM/7 HOURS INHALATION-RAT LC50; 9980 PPM INHALATION-MOUSE LC50; 146,000 MG/M3 INHALATION-DOG LCLO; 170,000 MG/M3 INHALATION-CAT LCLO; 50 MG/KG ORAL-MAN LDLO; 3306 MG/KG ORAL-RAT LD50; 4700 MG/KG ORAL-MOUSE LD50; 2000 MG/KG ORAL-DOG LDLO; 88 MG/KG INTRAVENOUS-RABBIT LDLO; 2890 UG/KG INTRAPERITONEAL-RAT LD50; 340 MG/KG INTRAPERITONEAL-MOUSE LD50; 527 MG/KG INTRAPERITONEAL-GUINEA PIG LDLO; 194 MG/KG UNREPORTED-MAN LDLO; MUTAGENIC DATA (RTECS); REPRODUCTIVE EFFECTS DATA (RTECS); TUMORIGENIC DATA (RTECS).
CARCINOGEN STATUS: OSHA CARCINOGEN; KNOWN HUMAN CARCINOGEN (NTP); HUMAN SUFFICIENT EVIDENCE, ANIMAL SUFFICIENT EVIDENCE (IARC CLASS 1). THE RELATIONSHIP BETWEEN EXPOSURE TO BENZENE AND THE DEVELOPMENT OF ACUTE MYELOGENOUS LEUKEMIA HAS BEEN ESTABLISHED IN EPIDEMIOLOGICAL STUDIES.
LOCAL EFFECTS: IRRITANT- SKIN, EYE.
ACUTE TOXICITY LEVEL: MODERATELY TOXIC BY INGESTION; SLIGHTLY TOXIC BY INHALATION.
TARGET EFFECTS: CENTRAL NERVOUS SYSTEM DEPRESSANT; BONE MARROW DEPRESSANT. POISONING MAY ALSO AFFECT THE IMMUNE, HEMATOPOIETIC AND NERVOUS SYSTEMS.
AT INCREASED RISK FROM EXPOSURE: PERSONS WITH CERTAIN IMMUNOLOGICAL TENDENCIES.
ADDITIONAL DATA: USE OF ALCOHOLIC BEVERAGES MAY ENHANCE THE TOXIC EFFECTS.

USE OF STIMULANTS SUCH AS EPINEPHRINE MAY CAUSE CARDIAC ARRYTHMIAS.

HEALTH EFFECTS AND FIRST AID

INHALATION:
GASOLINE, AUTOMOTIVE, UNLEADED:
IRRITANT/NARCOTIC/ASPHYXIANT/CARCINOGEN.

ACUTE EXPOSURE- AT 160-270 PPM THROAT IRRITATION MAY OCCUR WITHIN SEVERAL HOURS. AT 2000 PPM MILD ANESTHESIA MAY OCCUR WITHIN 30 MINUTES. OTHER SYMPTOMS OF CENTRAL NERVOUS SYSTEM DEPRESSION MAY INCLUDE HEADACHE, NAUSEA, VOMITING, DIZZINESS, DROWSINESS, FACIAL FLUSHING, BLURRED VISION, SLURRED SPEECH, DIFFICULTY SWALLOWING, STAGGERING, CONFUSION AND EUPHORIA. AT HIGHER LEVELS DYSPNEA, PULMONARY EDEMA AND BRONCHOPNEUMONIA MAY DEVELOP. FURTHER DEPRESSION MAY OCCUR WITH WEAK RESPIRATION AND PULSE, NERVOUSNESS, TWITCHING, IRRITABILITY, AND ATAXIA. SEVERE INTOXICATION MAY RESULT IN DELIRIUM, UNCONSCIOUSNESS, COMA, AND CONVULSIONS WITH EPILEPTIFORM SEIZURES. THE PUPILS MAY BE CONSTRICTED OR, IN COMATOSE STATES, FIXED AND DILATED OR UNEQUAL; NYSTAGMUS MAY ALSO OCCUR. MAY ALSO AFFECT THE LIVER, KIDNEYS, SPLEEN, BRAIN, MYOCARDIUM AND PANCREAS. DEATH MAY BE DUE TO RESPIRATORY OR CIRCULATORY FAILURE OR VENTRICULAR FIBRILLATION. EXTREMELY HIGH CONCENTRATION MAY CAUSE ASPHYXIATION.

CHRONIC EXPOSURE- WITH FEW EXCEPTIONS, MOST OF THE REPORTED EFFECTS OF REPEATED INHALATION ARE FROM INTENTIONAL "SNIFFING" OF GASOLINE RATHER THAN WORKPLACE EXPOSURE. REPORTED SYMPTOMS INCLUDE HEADACHE, NAUSEA, FATIGUE, ANOREXIA AND WEIGHT LOSS, PALLOR, DIZZINESS, INSOMNIA, MEMORY LOSS, NERVOUSNESS, CONFUSION, MUSCULAR WEAKNESS AND CRAMPS, PERIPHERAL NEUROPATHY, POLYNEURITIS, AND NEURASTHENIA. IT IS UNCLEAR WHETHER SOME OF THESE SYMPTOMS MAY HAVE BEEN DUE TO GASOLINE CONTAINING LEAD. LIVER AND AND KIDNEY DAMAGE ARE ALSO POSSIBLE. IN A 90 DAY STUDY, MALE BUT NOT FEMALE RATS EXHIBITED A SEVERE, DOSE-RELATED RENAL TOXICITY. IN ANOTHER STUDY, AN INCREASE IN RENAL ADENOMAS AND CARCINOMAS IN MALE RATS AND AN INCREASE IN HEPATOCELLULAR ADENOMAS AND CARCINOMAS IN FEMALE MICE WERE REPORTED.

BENZENE:
NARCOTIC/BONE MARROW DEPRESSANT/CARCINOGEN.

ACUTE EXPOSURE- HIGH CONCENTRATIONS, AROUND 3000 PPM, MAY CAUSE RESPIRATORY TRACT IRRITATION, AND MORE SEVERE EXPOSURES MAY RESULT IN PULMONARY EDEMA SYSTEMIC EFFECTS ARE MAINLY ON THE CENTRAL NERVOUS SYSTEM AND DEPEND ON THE CONCENTRATION AND EXPOSURE TIME. NO EFFECTS WERE NOTED AT 25 PPM FOR 8 HOURS, BUT SIGNS OF INTOXICATION BEGAN AT 50-150 PPM WITHIN 5 HOURS; AT 500-1500 PPM, WITHIN 1 HOUR; AT 7500 PPM, WITHIN 30 MINUTES; AND 20,000 PPM MAY BE FATAL WITHIN 5-10 MINUTES. EFFECTS MAY INCLUDE NAUSEA, VOMITING, HEADACHE, DIZZINESS, DROWSINESS, WEAKNESS, SOMETIMES PRECEDED BY A BRIEF PERIOD OF EXHILARATION OR EUPHORIA, IRRITABILITY, MALAISE, INCOHERENT SPEECH, STAGGERING, INCREASED PULSE RATE, CHEST PAIN AND TIGHTNESS WITH BREATHLESSNESS, PALLOR, AND TINNITUS. IN SEVERE EXPOSURES THERE MAY BE BLURRED VISION, SHALLOW, RAPID BREATHING, DELIRIUM, CARDIAC ARRHYTHMIAS, UNCONSCIOUSNESS, DEEP ANESTHESIA, PARALYSIS, AND COMA CHARACTERIZED BY MOTOR RESTLESSNESS, TREMORS AND HYPEREFLEXIA, SOMETIMES PRECEDED BY CONVULSIONS. RECOVERY DEPENDS ON THE SEVERITY OF EXPOSURE. BREATHLESSNESS, NERVOUS IRRITABILITY AND UNSTEADY GAIT MAY PERSIST FOR 2-3 WEEKS; A PECULIAR YELLOW SKIN COLOR AND CARDIAC DISTRESS MAY PERSIST FOR 4 WEEKS. LIVER AND KIDNEY EFFECTS MAY OCCUR, BUT ARE USUALLY MILD, TEMPORARY IMPAIRMENTS. CHRONIC EFFECTS MAY ARISE AND PERSIST LONG AFTER AN ACUTE EXPOSURE. ALTHOUGH GENERALLY HEMATOTOXICITY IS NOT A SIGNIFICANT CONCERN IN ACUTE EXPOSURE, DELAYED HEMATOLOGIC EFFECTS, INCLUDING ANEMIA,

HAVE BEEN REPORTED, AS HAVE PETECHIAL HEMORRHAGES, SPONTANEOUS BLEEDING, SECONDARY INFECTIONS, AND SKIN RASHES. IN FATAL EXPOSURES, DEATH MAY BE DUE TO CENTRAL NERVOUS SYSTEM DEPRESSION, CARDIAC OR RESPIRATORY FAILURE AND CIRCULATORY COLLAPSE, OR OCCASIONALLY, SUDDEN VENTRICULAR FIBRILLATION. IT MAY OCCUR WITHIN A FEW MINUTES TO SEVERAL HOURS, OR CARDIAC ARRYTHMIA MAY OCCUR AT ANYTIME WITHIN 24 HOURS. ALSO, DEATH FROM CENTRAL NERVOUS SYSTEM, RESPIRATORY OR HEMORRHAGIC COMPLICATIONS MAY OCCUR UP TO 5 DAYS AFTER EXPOSURE. PATHOLOGIC FINDINGS HAVE INCLUDED RESPIRATORY INFLAMMATION WITH EDEMA AND HEMORRHAGE OF THE LUNGS, RENAL CONGESTION, CEREBRAL EDEMA, AND EXTENSIVE PETECHIAL HEMORRHAGES IN THE BRAIN, PLEURAE, PERICARDIUM, URINARY TRACT, MUCOUS MEMBRANES, AND SKIN. BENZENE CROSSES THE PLACENTAL BARRIER AND THEREFORE MAY AFFECT UNBORN CHILDREN.

CHRONIC EXPOSURE- LONGTERM EXPOSURE MAY CAUSE SYMPTOMS REFERABLE TO THE CENTRAL NERVOUS, HEMATOPOIETIC AND IMMUNE SYSTEMS. EARLY EFFECTS ARE VAGUE AND VARIED AND MAY INCLUDE HEADACHE, LIGHT-HEADEDNESS, DIZZINESS, NAUSEA, ANOREXIA, ABDOMINAL DISCOMFORT, AND FATIGUE. LATER THERE MAY BE DYSPNEA, PALLOR, SLIGHTLY INCREASED TEMPERATURE, DECREASED BLOOD PRESSURE, AND VISUAL DISTURBANCES. DIZZINESS WHEN COLD WATER IS PLACED IN THE EAR AND HEARING IMPAIRMENT HAVE BEEN REPORTED, AS HAVE DIFFUSE CEREBRAL ATROPHY ASSOCIATED WITH ATAXIA, TREMORS AND EMOTIONAL LABILITY. WORKERS EXPOSED TO BENZENE IN COMBINATION WITH OTHER SOLVENTS HAVE EXHIBITED POLYNEURITIS. HEMATOLOGIC EFFECTS VARY WIDELY AND MAY APPEAR AFTER A FEW WEEKS OR MANY YEARS OF EXPOSURE OR EVEN MANY YEARS AFTER EXPOSURE HAS CEASED. THE DEGREE OF EXPOSURE BELOW WHICH NO BLOOD EFFECTS WILL OCCUR CANNOT BE ESTABLISHED WITH CERTAINTY. IN THE EARLY STAGES, THERE MAY BE BLOOD CLOTTING DEFECTS DUE TO FUNCTIONAL, MORPHOLOGICAL AND QUANTITATIVE PLATELET ALTERATION WITH RESULTANT BLEEDING FROM THE NOSE AND GUMS AND EASY BRUISING; LEUKOPENIA WITH PREDOMINANT LYMPHOCYTOPENIA OR NEUTROPENIA; AND ANEMIA WHICH MAY BE NORMOCHROMIC OR MACROCYTIC AND HYPOCHROMIC. HEMATOPOIESIS, BOTH IN THE BONE MARROW AND EXTRAMEDULLARY SITES, MAY BE HYPER- OR HYPOACTIVE WHICH MAY ACCOUNT FOR THE LACK OF CORRELATION, IN SOME CASES, BETWEEN THE BONE MARROW AND THE PERIPHERAL BLOOD PICTURES. ALSO, THE SYMPTOMS DO NOT ALWAYS PARALLEL THE LABORATORY FINDINGS. IF TREATED AT THIS STAGE, THE EFFECTS APPEAR REVERSIBLE, ALTHOUGH RECOVERY MAY BE PROTRACTED AND THERE MAY BE RELAPSES. HEMOLYSIS, DECREASED ERYTHROCYTE SURVIVAL, IRON METABOLISM DISTURBANCES, INTERNAL HEMORRHAGES, AND INCREASED SERUM BILIRUBIN LEVELS HAVE ALSO BEEN REPORTED. EXPOSURE TO HIGH DOSES FOR LONGER PERIODS MAY RESULT IN APLASIA AND FATTY DEGENERATION OF THE BONE MARROW WITH PANCYTOPENIA AND IS CONSIDERED TO BE IRREVERSIBLE. ENORMOUS VARIABILITY IN INDIVIDUAL RESPONSE, INCLUDING NON-DOSE DEPENDENT APLASIA, AND THE FINDING OF EOSINOPHILIA, SUGGESTS THAT IN SOME CASES, THE BLOOD DYSCRASIA MAY PARTIALLY BE AN ALLERGIC REACTION. IN A SERIES OF EPIDEMIOLOGICAL STUDIES THERE WAS A STATISTICALLY SIGNIFICANT EXCESS OF LEUKEMIAS, PREDOMINATELY MYELOGENOUS, IN PERSONS EXPOSED PRIMARILY TO BENZENE. ALSO, MANY CASE REPORTS AND SERIES HAVE DESCRIBED THE ASSOCIATION OF LEUKEMIA AND BENZENE EXPOSURE. MOST WERE ACUTE MYELOGENOUS, ALTHOUGH SOME WERE MONOCYTIC, ERYTHROBLASTIC, OR LYMPHOCYTIC; SOME LYMPHOMAS WERE NOTED ALSO. ALTHOUGH APLASTIC ANEMIA IS PROBABLY THE MORE LIKELY CONSEQUENCE OF LONGTERM EXPOSURE, IT IS NOT UNCOMMON FOR AN INDIVIDUAL SURVIVING THIS, TO GO THROUGH A PRELEUKEMIC PHASE INTO FRANK LEUKEMIA. CONVERSELY, LEUKEMIA WITHOUT PRECEDENT APLASTIC ANEMIA CAN OCCUR. IN ONE STUDY THE RANGE OF TIME FROM THE START OF THE EXPOSURE TO THE DIAGNOSIS OF LEUKEMIA WAS 3-24 YEARS. IT HAS BEEN SUGGESTED THAT THE CHROMOSOMAL ABERRATIONS WHICH CAN ARISE IN PERIPHERAL BLOOD AND BONE MARROW CELLS AND PERSIST FOR A LONG TIME AFTER EXPOSURE CEASES, MAY BE ASSOCIATED WITH THE INCREASED INCIDENCE OF LEUKEMIA. THE IMMUNOSUPPRESSIVE EFFECT HAS ALSO BEEN SUGGESTED AS ASSOCIATED WITH THE LEUKEMOGENESIS. ADVERSE EFFECTS ON THE IMMUNOLOGICAL SYSTEM HAVE BEEN SHOWN TO MAKE RABBITS MORE SUSCEPTIBLE TO TUBERCULOSIS AND PNEUMONIA AND MAY EXPLAIN WHY THE TERMINAL EVENT IN SOME CASES OF

BENZENE INTOXICATION MAY BE OVERWHELMING INFECTION. MENSTRUAL DISTURBANCE HAVE BEEN REPORTED MORE FREQUENTLY IN EXPOSED WOMEN. REPRODUCTIVE EFFECTS HAVE BEEN REPORTED IN ANIMALS.

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

SKIN CONTACT:
GASOLINE, AUTOMOTIVE, UNLEADED:
IRRITANT.
ACUTE EXPOSURE- LIQUID MAY CAUSE IRRITATION WITH ERYTHEMA AND PAIN. PROLONGED OR EXTENSIVE CONTACT MAY CAUSE BLISTERING AND, IN EXTREME CASES EPIDERMAL NECROLYSIS. A 12 YEAR OLD BOY PARTIALLY IMMERSED IN A POOL OF GASOLINE FOR 1 HOUR EXPERIENCED HYPOTENSION, ABDOMINAL TENDERNESS, DISSEMINATED INTRAVASCULAR COAGULATION, TRANSIENT HEMATURIA, NONOLIGURIC RENAL FAILURE AND AN ELEVATED SERUM AMYLASE. AUTOPSY REVEALED CEREBRAL EDEMA, DIFFUSE BILATERAL PNEUMONIA, BIVENTRICULAR CARDIAC ENLARGEMENT, TOXIC NEPHROSIS, FATTY INFILTRATION OF LIVER AND PERIPANCREATIC FAT NECROSIS.
CHRONIC EXPOSURE- REPEATED OR PROLONGED CONTACT WITH THE LIQUID MAY CAUSE IRRITATION, DERMATITIS AND DEFATTING OF THE SKIN WITH DRYING AND CRACKING OR BURNS AND BLISTERING. SOME INDIVIDUALS MAY DEVELOP HYPERSENSITIVITY, PROBABLY DUE TO ADDITIVES.

BENZENE:
IRRITANT.
ACUTE EXPOSURE- DIRECT CONTACT MAY CAUSE IRRITATION. EFFECTS MAY INCLUDE ERYTHEMA, A BURNING SENSATION, AND IN MORE SEVERE CASES, BLISTERING AND EDEMA. PROLONGED CONTACT MAY CAUSE LESIONS RESEMBLING 1ST- AND 2ND- DEGREE BURNS. UNDER NORMAL CONDITIONS, SIGNIFICANT SIGNS OF SYSTEMIC INTOXICATION ARE UNLIKELY FROM SKIN CONTACT ALONE, DUE TO THE SLOW RATE OF ABSORPTION AND THE HIGH VOLATILITY. APPLICATION TO GUINEA PIGS RESULTED IN INCREASED DERMAL PERMEABILITY.
CHRONIC EXPOSURE- REPEATED OR PROLONGED CONTACT DEFATS THE SKIN AND MAY RESULT IN DERMATITIS WITH ERYTHEMA, SCALING, DRYNESS, VESICULATION, AND FISSURING, POSSIBLY ACCOMPANIED BY PARESTHESIAS OF THE FINGERS WHICH MAY PERSIST SEVERAL WEEKS AFTER THE DERMATITIS SUBSIDES. SECONDARY INFECTIONS MAY OCCUR. TESTS ON GUINEA PIGS INDICATE SENSITIZATION IS POSSIBLE. ALTHOUGH STUDIES HAVE FAILED TO ESTABLISH A RELATIONSHIP BETWEEN SKIN CONTACT AND A CARCINOGENIC EFFECT, SOME PAPILLOMAS AND HEMATOPOIETIC EFFECTS HAVE BEEN REPORTED.

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

EYE CONTACT:
GASOLINE, AUTOMOTIVE, UNLEADED:
IRRITANT.
ACUTE EXPOSURE- CONCENTRATIONS BETWEEN 270 AND 900 PPM MAY CAUSE A SENSATION OF IRRITATION OFTEN BEFORE SIGNS SUCH AS CONJUNCTIVAL HYPEREMIA ARE VISIBLE. LIQUID SPLASHED IN THE EYES MAY CAUSE PAIN, SMARTING AND SLIGHT, TRANSIENT CORNEAL EPITHELIAL DISTURBANCE. BLEPHAROSPASM AND CONJUNCTIVAL HYPEREMIA AND EDEMA MAY OCCUR.

CHRONIC EXPOSURE- REPEATED OR PROLONGED EXPOSURE MAY CAUSE CONJUNCTIVITIS AND POSSIBLE GRADUAL, IRREVERSIBLE LOSS OF CORNEAL AND CONJUNCTIVAL SENSITIVITY.

BENZENE:
IRRITANT.
ACUTE EXPOSURE- VAPOR CONCENTRATIONS OF 3000 PPM ARE VERY IRRITATING, EVEN ON BRIEF EXPOSURE. DROPLETS CAUSE MODERATE BURNING SENSATION, BUT ONLY A SLIGHT, TRANSIENT EPITHELIAL INJURY WITH RAPID RECOVERY.
CHRONIC EXPOSURE- REPEATED OR PROLONGED EXPOSURE TO IRRITANTS MAY CAUSE CONJUNCTIVITIS. SEVERAL CASE REPORTS, ONE OF THEM AN ACUTE EXPOSURE, SUGGEST THAT SYSTEMIC EXPOSURE MAY BE ASSOCIATED WITH RETROBULBAR OR OPTIC NEURITIS. 50% OF RATS EXPOSED TO 50 PPM FOR MORE THAN 600 HOURS DEVELOPED CATARACTS.

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

INGESTION:
GASOLINE, AUTOMOTIVE, UNLEADED:
NARCOTIC.
ACUTE EXPOSURE- MAY CAUSE IRRITATION AND BURNING OF THE GASTROINTESTINAL TRACT WITH NAUSEA, VOMITING AND DIARRHEA. ABSORPTION MAY CAUSE INITIAL CENTRAL NERVOUS STIMULATION FOLLOWED BY DEPRESSION. SYMPTOMS MAY INCLUDE A MILD EXCITATION, RESTLESSNESS, NERVOUSNESS, IRRITABILITY, TWITCHING, WEAKNESS, BLURRED VISION, HEADACHE, DIZZINESS, DROWSINESS, INCOORDINATION, CONFUSION, DELIRIUM, UNCONSCIOUSNESS, CONVULSIONS AND COMA. CARDIAC ARRYTHMIAS MAY OCCUR. TRANSIENT LIVER DAMAGE IS POSSIBLE. DIRECT OR INDIRECT ASPIRATION MAY CAUSE CHEMICAL PNEUMONITIS WITH PULMONARY EDEMA AND HEMORRHAGE, POSSIBLY COMPLICATED BY BACTERIAL PNEUMONIA, AND LESS FREQUENTLY, BY EMPHYSEMA AND PNEUMONTHORAX. SIGNS OF PULMONARY INVOLVEMENT MAY INCLUDE COUGHING, DYSPNEA, SUBSTERNAL PAIN, SUDDEN DEVELOPMENT OF RAPID BREATHING, CYANOSIS, TACHYCARDIA AND FEVER. EVEN SMALL AMOUNTS MAY BE FATAL WITH DEATH CAUSED BY CARDIAC ARREST, ASPHYXIA OR RESPIRATORY PARALYSIS. DEPENDING ON AMOUNT ASPIRATED, DEATH MAY OCCUR RAPIDLY OR WITHIN 24 HOURS.
CHRONIC EXPOSURE- NO DATA AVAILABLE.

BENZENE:
NARCOTIC/CARCINOGEN.
ACUTE EXPOSURE- MAY CAUSE LOCAL IRRITATION AND BURNING SENSATION IN THE MOUTH, THROAT, AND STOMACH. SIGNS AND SYMPTOMS OF SYSTEMIC INTOXICATION MAY INCLUDE NAUSEA, VOMITING, HEADACHE, DIZZINESS, WEAKNESS, STAGGERING, CHEST PAIN AND TIGHTNESS, SHALLOW, RAPID PULSE, BREATHLESSNESS, PALLOR FOLLOWED BY FLUSHING, AND A FEAR OF IMPENDING DEATH. THERE MAY BE VISUAL DISTURBANCES AND CONVULSIONS. VIOLENT EXCITEMENT, EUPHORIA OR DELIRIUM MAY PRECEDE WEARINESS, FATIGUE AND SLEEPINESS FOLLOWED BY UNCONSCIOUSNESS, COMA AND DEATH. THOSE WHO SURVIVE THE CENTRAL NERVOUS SYSTEM EFFECTS MAY DEVELOP BRONCHITIS, PNEUMONIA, PULMONARY EDEMA, AND INTRAPULMONARY HEMORRHAGE. ASPIRATION MAY CAUSE IMMEDIATE PULMONARY EDEMA AND HEMORRHAGE. THE USUAL LETHAL DOSE IN HUMANS IS 10-15 MILLILITERS, BUT SMALLER AMOUNTS HAVE BEEN REPORTED TO CAUSE DEATH. A SINGLE EXPOSURE MAY PRODUCE LONGTERM EFFECTS WITH PANCYTOPENIA PERSISTING UP TO A YEAR.
CHRONIC EXPOSURE- DAILY ADMINISTRATION TO HUMANS OF 2-5 GRAMS IN OLIVE OIL HAS CAUSED HEADACHE, VERTIGO, BLADDER IRRITABILITY, IMPOTENCE, GASTRIC DISTURBANCES, AND RENAL DYSFUNCTION. IN FEMALE RATS TREATED WITH 132 SINGLE DAILY DOSES OVER 187 DAYS, NO EFFECTS WERE OBSERVED AT 1 MG/KG; SLIGHT LEUKOPENIA AT 10 MG/KG; AND BOTH LEUKOPENIA AND ANEMIA AT 50 AND 100 MG/KG. IN A 2 YEAR GAVAGE STUDY WITH RATS AND MICE, THERE WAS AN

INCREASED INCIDENCE OF LYMPHOMAS AND TUMORS OF THE ORAL CAVITY, SKIN, LUNGS, OVARIES, AND MAMMARY, HARDERIAN, AND PREPUTIAL GLANDS. IN A ONE YEAR GAVAGE STUDY, RATS GIVEN 50 OR 250 MG/KG, 4-5 DAYS/WEEK FOR 52 WEEKS DID NOT EXHIBIT ACUTE OR SUBACUTE TOXIC EFFECTS, BUT A DOSE CORRELATED INCREASE OF LEUKEMIAS AND MAMMARY CARCINOMAS WAS OBSERVED. REPRODUCTIVE EFFECTS HAVE BEEN REPORTED IN ANIMALS.

FIRST AID- ONLY HYDROCARBONS THAT ARE SOLVENTS FOR A TOXIC AGENT OR ARE THEMSELVES TOXIC NEED TO BE EVACUATED. EXTREME CARE MUST BE USED TO PREVENT ASPIRATION. GASTRIC LAVAGE WITH A CUFFED ENDOTRACHEAL TUBE IN PLACE TO PREVENT FURTHER ASPIRATION SHOULD BE DONE WITHIN 15 MINUTES. IN THE ABSENCE OF DEPRESSION OR CONVULSIONS OR IMPAIRED GAG REFLEX, EMESIS CAN ALSO BE INDUCED USING SYRUP OF IPECAC WITHOUT INCREASING THE HAZARD OF ASPIRATION (DREISBACH, HANDBOOK OF POISONING, 12TH ED.). TREAT SYMPTOMATICALLY AND SUPPORTIVELY. GASTRIC LAVAGE SHOULD BE PERFORMED BY QUALIFIED MEDICAL PERSONNEL. GET MEDICAL ATTENTION IMMEDIATELY.

ANTIDOTE:
NO SPECIFIC ANTIDOTE. TREAT SYMPTOMATICALLY AND SUPPORTIVELY.

REACTIVITY SECTION

REACTIVITY:
STABLE UNDER NORMAL TEMPERATURES AND PRESSURES.

INCOMPATIBILITIES:
GASOLINE, AUTOMOTIVE, UNLEADED:
OXIDIZERS (STRONG): FIRE AND EXPLOSION HAZARD.

DECOMPOSITION:
THERMAL DECOMPOSITION PRODUCTS MAY INCLUDE TOXIC OXIDES OF CARBON.

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

STORAGE-DISPOSAL

OBSERVE ALL FEDERAL, STATE AND LOCAL REGULATIONS WHEN STORING OR DISPOSING OF THIS SUBSTANCE. FOR ASSISTANCE, CONTACT THE DISTRICT DIRECTOR OF THE ENVIRONMENTAL PROTECTION AGENCY.

STORAGE

STORE IN ACCORDANCE WITH 29 CFR 1910.106.

STORE AWAY FROM INCOMPATIBLE SUBSTANCES.

DISPOSAL

DISPOSAL MUST BE IN ACCORDANCE WITH STANDARDS APPLICABLE TO GENERATORS OF HAZARDOUS WASTE, 40 CFR 262. EPA HAZARDOUS WASTE NUMBER D001.

100 POUND CERCLA SECTION 103 REPORTABLE QUANTITY.

CONDITIONS TO AVOID

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

SPILLS AND LEAKS

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

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

PROTECTIVE EQUIPMENT SECTION

VENTILATION:
PROVIDE LOCAL EXHAUST OR PROCESS ENCLOSURE VENTILATION TO MEET PUBLISHED EXPOSURE LIMITS.

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

TYPE "C" SUPPLIED-AIR RESPIRATOR WITH A FULL FACEPIECE OPERATED IN PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE MODE OR WITH A FULL FACEPIECE, HELMET OR HOOD OPERATED IN CONTINOUS-FLOW MODE.

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

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

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

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

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

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

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

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

AUTHORIZED BY- OCCUPATIONAL HEALTH SERVICES, INC.

CREATION DATE: 04/23/85 REVISION DATE: 03/28/90

****

MATERIAL SAFETY DATA SHEET

55 249

I. MATERIAL IDENTIFICATION

Name: Unleaded Gasoline
Conoco Product Code: 1410/1411
Synonyms: Automotive Unleaded Gasoline
Gasoline, Unleaded
Chemical Family: Mixed Petroleum Hydrocarbons
Manufacturer: Conoco Inc.
Address: P. O. Box 1267, Ponca City, OK 74603

CAS Reg. No.: Mixture
Transportation Emergency No.:
(800) 424-9300 (Chemtrec)
Product Information No.:
(405) 767-6000

II. OSHA HAZARD DETERMINATION

Hazardous Ingredients:
Hydrocarbons (Aromatic and paraffinic hydrocarbons)

Benzene (71-43-2)

Physical Effect Properties:
Product/Mixture: Class I A Flammable Liquid per NFPA Code No. 30-1984.

III. PHYSICAL DATA

Appearance and Odor: Water white to straw yellow liquid; gasoline odor.

Boiling Range (°F)	85-437	Specific Gravity (H_2O=1)	0.70-0.77
Vapor Pressure (mmHg) at 68° F	275-475	% Volatile (by volume)	100
Solubility in Water	Insoluble		

IV. REACTIVITY DATA

Stable: X Unstable:

Hazardous Decomposition Products: Carbon monoxide may be formed from incomplete combustion.

Condition to Avoid: Oxidizing materials, heat, flame.

Hazardous Polymerization: Will not occur.

V. FIRE AND EXPLOSION HAZARD DATA

LFL: Less Than 1 UFL: 8

Flash Point (Method used): As low as -50° F (TCC)

Handle and store in accordance with NFPA procedure for Class I A Flammable Liquid.

Extinguishing Media: Use dry chemical, foam, or carbon dioxide.

V. FIRE AND EXPLOSION HAZARD DATA (continued)

Special Fire Fighting Procedures: Water may be ineffective to extinguish, but water should be used to keep fire-exposed containers cool. If a leak or spill has not ignited, use water spray to disperse the vapors and to protect personnel attempting to stop a leak. Water spray may be used to flush spills away from exposure.

Unusual Fire and Explosion Hazards: Highly flammable. Products of combustion may contain carbon mohoxide, carbon dioxide, and other toxic materials. Do not enter enclosed or confined space without proper protective equipment including respiratory protection.

National Fire Protection Association (NFPA) Classification	HAZARD RATING
Health 1 Fire 3 Reactivity 0	Least - 0 Slight - 1 Moderate - 2 High - 3 Extreme - 4

VI. TRANSPORTATION AND STORAGE — DOT HAZARD CLASS: Flammable liquid

Precautions To Be Taken In Handling And Storing: Product is Class I A Flammable Liquid per NFPA Code No. 30-1984. Store and handle accordingly.

Shipping Paper Description: Gasoline, flammable liquid, UN 1203.

Placard: Flammable.

D.O.T. Label: Flammable liquid.

OSHA Label: DANGER, CONTAINS BENZENE, CANCER HAZARD.

Minimize exposure: Product contains hydrocarbons which may cause irritation to eyes, skin, and lungs after prolonged or repeated exposure. The product may also be toxic to the liver, kidney, blood, and blood-forming tissues. Use in poorly ventilated area may cause dizziness, weakness, confusion, or unconsciousness. Aspiration into the lungs may cause pneumonia.

Middle distillates similar to this product have been shown to cause skin cancer in animal skin painting studies when the distillates were repeatedly applied and not washed from the skin.

FIRST AID: If swallowed, do not induce vomiting. Wash thoroughly with soap and water after contact.

Avoid ignition sources.

VII. HEALTH HAZARD INFORMATION

PEL Benzene: TWA, 1 ppm; STEL, 5 ppm TLV Gasoline: TWA, 300 ppm; STEL, 500 ppm
Benzene: TWA, 10 ppm

Ceiling Value Not Established Du Pont AEL Benzene: TWA, 10 ppm

Primary Routes of Exposure/Entry: Inhalation, Skin.

Signs and Symptoms of Exposure/Medical Conditions Aggravated by Exposure:

Studies with mice or rats have shown that some petroleum distillates have caused either damage or tumors of the kidneys or tumors of the liver. However, kidney effects were not seen in similar studies involving guinea pigs, dogs, or monkeys. Also, the significance of the liver tumors in rodents is highly speculative.

Mouse skin painting studies have shown that petroleum middle distillates (boiling range of 100-700°F; gasoline, naphtha, jet fuel, diesel fuel, etc.) can cause skin cancer when repeatedly applied and never washed from the animal's skin. The relative significance of this to human health is uncertain since the petroleum distillates were not washed from the skin and the resulting skin effects (irritation, cell damage, etc.) may play a role in the tumorigenic response.

A few studies have indicated that workers exposed many years to high concentrations of benzene have a slightly higher incidence of leukemia. Benzene can also be toxic to the blood and blood-forming tissues.

The product contains unleaded gasoline which may cause irritation to eyes, skin, and lungs after prolonged or repeated exposure. Extreme exposure or aspiration into the lungs may cause pneumonia. Overexposure may cause weakness, headache, nausea, confusion, blurred vision, drowsiness, and other nervous system effects; greater exposure may cause dizziness, slurred speech, flushed face, unconsciousness, or convulsions.

Is Product Listed as Carcinogen or Potential Carcinogen by: NTP? No IARC? No OSHA? No

VIII. EMERGENCY AND FIRST AID PROCEDURES

Eyes: Immediately flush eyes with plenty of water for at least 15 minutes and seek medical attention.

Skin: Remove contaminated clothing as soon as possible. Wash exposed skin thoroughly with soap and water. If irritation develops, consult a physician.

See Section X for Precautionary Measures.

Inhalation: Remove individual to fresh air. If breathing stops, administer artificial resuscitation. Seek medical attention.

Ingestion: If this material is swallowed, do not induce vomiting. If vomiting begins, lower victim's head in an effort to prevent vomitus from entering lungs. Seek medical attention. Never give anything by mouth to an unconscious person.

Note to Physician: Gastric lavage by qualified medical personnel may be considered, depending on quantity of material ingested.

IX. SPILL, LEAK AND DISPOSAL PROCEDURES

RCRA HAZARDOUS WASTE: Yes __X__ No _____

In Case Of Spill Or Leak: This material is flammable. Appropriate precautions should be taken. Contain spill immediately in smallest area possible. Recover as much of the product itself as possible by such methods as vacuuming, followed by soaking up of residual fluids by use of absorbent materials. Remove contaminated items including contaminated soil and place in proper containers for disposal. Avoid washing, draining, or directing material to storm or sanitary sewers.

Waste Disposal Method: Recycle as much of the recoverable product as possible. Dispose of nonrecyclable material as a RCRA hazardous waste by such methods as incineration, complying with federal, state, and local regulations.

X. PRECAUTIONARY MEASURES

Respiratory Protection: Select appropriate NIOSH-approved respiratory protection where necessary to maintain exposure below acceptable limits.

Ventilation: Use adequate ventilation to meet recommended concentrations. Avoid sparking and explosive mixtures.

Protective Gloves: Chemically resistant as needed to minimize skin contact.

Eye Protection: Goggles or face shield for sprays/mists or if splashing is probable.

Other Protective Equipment: Protective clothing where necessary to minimize skin contact. Soiled clothing should be removed and laundered.

The above data is based on tests and experience which Conoco believes reliable and are supplied for informational purposes only. CONOCO DISCLAIMS ANY LIABILITY FOR DAMAGE OR INJURY WHICH RESULTS FROM THE USE OF THE ABOVE DATA AND NOTHING CONTAINED THEREIN SHALL CONSTITUTE A GUARANTEE, WARRANTY (INCLUDING WARRANTY OF MERCHANTABILITY) OR REPRESENTATION (INCLUDING FREEDOM FROM PATENT LIABILITY) BY CONOCO WITH RESPECT TO THE DATA, THE PRODUCT DESCRIBED, OR THEIR USE FOR ANY SPECIFIC PURPOSE, EVEN IF THAT PURPOSE IS KNOWN TO CONOCO.

conoco MATERIAL SAFETY DATA SHEET

I. MATERIAL IDENTIFICATION

Name: Leaded Regular Gasoline
Conoco Product Code: 1100
Synonyms: Automotive Leaded Gasoline
Chemical Family: Mixed Petroleum Hydrocarbons
Manufacturer: Conoco Inc.
Address: P. O. Box 1267, Ponca City, OK 74603

CAS Reg. No.: Mixture
Transportation Emergency No.:
(800) 424-9300 (Chemtrec)
Product Information No.:
(405) 767-6000

II. OSHA HAZARD DETERMINATION

Hazardous Ingredients:
Hydrocarbons (Aromatic and paraffinic hydrocarbons; e.g., toluene, hexane, etc.)

Benzene (71-43-2)

Physical Effect Properties:
Product/Mixture: Class I A Flammable Liquid per NFPA Code No. 30-1984.

III. PHYSICAL DATA

Appearance and Odor: Bronze or red clear liquid; gasoline odor.

Boiling Range (°F)	85-437	Specific Gravity (H_2O=1)	0.70-0.77
Vapor Pressure (mmHg) @ 68° F	275-475	% Volatile (by volume)	100
Solubility in Water	Insoluble		

IV. REACTIVITY DATA

Stable: X Unstable:

Hazardous Decomposition Products: Carbon monoxide may be formed from incomplete combustion.

Incompatible Materials: Oxidizing materials, heat, flame.

Hazardous Polymerization: Will not occur.

Conditions To Avoid: Undue exposure to air.

V. FIRE AND EXPLOSION HAZARD DATA

LFL: Less Than 1 UFL: 8

Flash Point (Method used): As low as -50°F (TCC)

Autoignition Temperature NFPA: 536-853°F

Handle and store in accordance with NFPA procedure for Class I A Flammable Liquid.

Extinguishing Media: Use dry chemical, foam, or carbon dioxide.

V. FIRE AND EXPLOSION HAZARD DATA (continued)

Special Fire Fighting Procedures: Water may be ineffective to extinguish, but water should be used to keep fire-exposed containers cool. If a leak or spill has not ignited, use water spray to disperse the vapors and to protect personnel attempting to stop a leak. Water spray may be used to flush spills away from exposure.

Unusual Fire and Explosion Hazards: Highly flammable. Products of combustion may contain carbon monoxide, carbon dioxide, and other toxic materials. Do not enter enclosed or confined space without proper protective equipment including respiratory protection.

National Fire Protection Association (NFPA) Classification			HAZARD RATING		
Health 1	Fire 3	Reactivity 0	Least - 0	Slight - 1	Moderate - 2
				High - 3	Extreme - 4

VI. TRANSPORTATION AND STORAGE — DOT HAZARD CLASS: Flammable liquid

Precautions To Be Taken In Handling And Storing: Product is Class I A Flammable Liquid per NFPA Code No. 30-1984. Store and handle accordingly.

Shipping Paper Description: Gasoline, flammable liquid, UN 1203.

Placard: Flammable.

D.O.T. Label: Flammable Liquid.

OSHA Label: DANGER, CONTAINS BENZENE, CANCER HAZARD.

Minimize exposure: Product contains hydrocarbons which may cause irritation to eyes, skin, and lungs after prolonged or repeated exposure. The product may also be toxic to the liver, kidney, blood, and blood-forming tissues. The use in poorly ventilated areas may cause dizziness, weakness, confusion, or unconsciousness. Aspiration into the lungs may cause pneumonia.

Middle distillates similar to this product have been shown to cause skin cancer in animal skin painting studies when the distillates were repeatedly applied and not washed from the skin.

FIRST AID: If swallowed, do not induce vomiting. Wash thoroughly with soap and water after contact.

Avoid ignition sources.

VII. HEALTH HAZARD INFORMATION

PEL Benzene: TWA, 1 ppm; STEL, 5 ppm

TLV Gasoline: TWA, 300 ppm; STEL, 500 ppm; Benzene: TWA, 10 ppm

Ceiling Value Not Established Du Pont AEL Benzene: TWA, 10 ppm

Primary Routes of Exposure/Entry: Inhalation, Skin.

Signs and Symptoms of Exposure/Medical Conditions Aggravated by Exposure:

Studies with rats or mice have shown that some petroleum distillates have caused either damage or tumors of the kidneys or tumors of the liver. However, kidney effects were not seen in similar studies involving guinea pigs, dogs, or monkeys. Also, the significance of the liver tumors in rodents is highly speculative.

Mouse skin painting studies have shown that petroleum middle distillates (boiling range of 100-700°F; gasoline, naphtha, jet fuel, diesel fuel, etc.) can cause skin cancer when repeatedly applied and never washed from the animal's skin. The relative significance of this to human health is uncertain since the petroleum distillates were not washed from the skin and the resulting skin effects (irritation, cell damage, etc.) may play a role in the tumorigenic response.

A few studies have indicated that workers exposed many years to high concentrations of benzene have a slightly higher incidence of leukemia. Benzene can also be toxic to the blood and blood-forming tissues.

The product contains petroleum hydrocarbons which may cause irritation to eyes, skin, and lungs after prolonged or repeated exposure. Extreme exposure or aspiration into the lungs may cause pneumonia. Overexposure may cause weakness, headache, nausea, confusion, blurred vision, drowsiness, and other nervous system effects; greater exposure may cause dizziness, slurred speech, flushed face, unconsciousness, or convulsions.

Is Product Listed as Carcinogen or Potential Carcinogen by: NTP? No IARC? No OSHA? No

VIII. EMERGENCY AND FIRST AID PROCEDURES

Eyes: Immediately flush eyes with plenty of water for at least 15 minutes and seek medical attention.

Skin: Remove contaminated clothing as soon as possible. Wash exposed skin thoroughly with soap and water. If irritation develops, consult a physician.

See Section X for Precautionary Measures.

Inhalation: Remove individual to fresh air. If breathing stops, administer artificial resuscitation. Seek medical attention.

Ingestion: If this material is swallowed, do not induce vomiting. If vomiting begins, lower victim's head in an effort to prevent vomitus from entering lungs. Seek medical attention. Never give anything by mouth to an unconscious person.

Note to Physician: Gastric lavage by qualified medical personnel may be considered, depending on quantity of material ingested.

IX. SPILL, LEAK AND DISPOSAL PROCEDURES

RCRA HAZARDOUS WASTE: Yes X No ____

In Case of Spill or Leak: This material is flammable. Appropriate precautions should be taken. Contain spill immediately in smallest area possible. Recover as much of the product itself as possible by such methods as vacuuming, followed by soaking up of residual fluids by use of absorbent materials. Remove contaminated items including contaminated soil and place in proper containers for disposal. Avoid washing, draining or directing material to storm or sanitary sewers.

Waste Disposal Method: Recycle as much of the recoverable product as possible. Dispose of nonrecyclable material as a RCRA hazardous waste by such methods as incineration, complying with federal, state and local regulations.

X. PRECAUTIONARY MEASURES

Respiratory Protection: Use appropriate NIOSH-approved respiratory protection where atmospheric concentrations may exceed acceptable exposure limits.

Ventilation: Use adequate ventilation to meet recommended concentrations. Avoid sparking hazards and explosive mixtures.

Protective Gloves: Chemically resistant such as neoprene or NBR as needed to minimize skin contact.

Eye Protection: Face shield for sprays/mists.

Other Protective Equipment: Coveralls or other protective apparel should be worn if splashing is probable. Launder contaminated clothing before reuse. Extremely contaminated leather shoes should be discarded.

Maintenance Procedures: Avoid all ignition sources until the contaminated storage container is isolated and clear of all flammable and toxic vapor concentrations. Use adequate ventilation to remove vapor from container. Bonding shall be provided when transferring product between metal containers.

The above data is based on tests and experience which Conoco believes reliable and are supplied for informational purposes only. CONOCO DISCLAIMS ANY LIABILITY FOR DAMAGE OR INJURY WHICH RESULTS FROM THE USE OF THE ABOVE DATA AND NOTHING CONTAINED THEREIN SHALL CONSTITUTE A GUARANTEE, WARRANTY (INCLUDING WARRANTY OF MERCHANTABILITY) OR REPRESENTATION (INCLUDING FREEDOM FROM PATENT LIABILITY) BY CONOCO WITH RESPECT TO THE DATA, THE PRODUCT DESCRIBED, OR THEIR USE FOR ANY SPECIFIC PURPOSE, EVEN IF THAT PURPOSE IS KNOWN TO CONOCO.

MATERIAL SAFETY DATA SHEET OHS10341

OCCUPATIONAL HEALTH SERVICES, INC.
450 SEVENTH AVENUE, SUITE 2407
NEW YORK, NEW YORK 10123
(800) 445-MSDS (212) 967-1100

EMERGENCY CONTACT:
JOHN S. BRANSFORD, JR. (615) 292-1180

SUBSTANCE IDENTIFICATION

CAS-NUMBER 8006-61-9
RTEC-NUMBER LX3300000

SUBSTANCE: GASOLINE, AUTOMOTIVE, LEADED

TRADE NAMES/SYNONYMS:
PETROL: MOTOR SPIRITS: BENZIN: GASOLINE: 00342 TEXACO REGULAR (TEXACO): "R" GRADE GASOLINE (NCRA): UNION 76 LEADED REGULAR (UNOCAL CORPORATION): STCC 4908178: UN 1203: OHS10341

CHEMICAL FAMILY:
PETROLEUM HYDROCARBON

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

COMPONENTS AND CONTAMINANTS

COMPONENT: GASOLINE, AUTOMOTIVE, LEADED MAY CONTAIN: PERCENT: >99

COMPONENT: BENZENE >0.1% CAS# 71-43-2

COMPONENT: TETRAETHYL LEAD CAS# 78-00-2 PERCENT: <0.1

COMPONENT: TETRAMETHYL LEAD CAS# 75-74-1 PERCENT: <0.1

OTHER CONTAMINANTS: NONE

EXPOSURE LIMIT:
GASOLINE (BULK HANDLING):
300 PPM (900 MG/M3) OSHA TWA; 500 PPM (1,500 MG/M3) OSHA STEL
300 PPM (900 MG/M3) ACGIH TWA; 500 PPM (1,500 MG/M3) ACGIH STEL

BENZENE:
1 PPM OSHA TWA; 5 PPM OSHA 15 MINUTE STEL;
0.5 PPM OSHA ACTION LEVEL
10 PPM (30 MG/M3) ACGIH TWA;
ACGIH A2-SUSPECTED HUMAN CARCINOGEN
0.1 PPM (0.32 MG/M3) NIOSH RECOMMENDED 8 HOUR TWA;
1 PPM (3.2 MG/M3) NIOSH RECOMMENDED 15 MINUTE CEILING

10 POUNDS CERCLA SECTION 103 REPORTABLE QUANTITY
SUBJECT TO SARA SECTION 313 ANNUAL TOXIC CHEMICAL RELEASE REPORTING
SUBJECT TO CALIFORNIA PROPOSITION 65 CANCER AND/OR REPRODUCTIVE TOXICITY WARNING AND RELEASE REQUIREMENTS- (FEBRUARY 27, 1987)

PHYSICAL DATA

DESCRIPTION: CLEAR COLORLESS TO AMBER, AROMATIC, VOLATILE LIQUID

BOILING POINT: 100-400 F (38-204 C) SPECIFIC GRAVITY: 0.7-0.8

SOLUBILITY IN WATER: INSOLUBLE VAPOR DENSITY: 3.0-4.0

ODOR-THRESHOLD: 0.25 PPM

OTHER SOLVENTS (SOLVENT - SOLUBILITY):
ABSOLUTE ALCOHOL, ETHER, CHLOROFORM, BENZENE

FIRE AND EXPLOSION DATA

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

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

VAPOR-AIR MIXTURES ARE EXPLOSIVE ABOVE FLASH POINT.

FLASH POINT: -45 F (-43 C) (CC) UPPER EXPLOSION LIMIT: 7.6%

LOWER EXPLOSION LIMIT: 1.2% AUTOIGNITION TEMP.: 536-853 F (280-456 C)

FLAMMABILITY CLASS (OSHA): IB

FIREFIGHTING MEDIA:
DRY CHEMICAL, CARBON DIOXIDE, HALON, WATER SPRAY OR STANDARD FOAM (1987 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.4).

FOR LARGER FIRES, USE WATER SPRAY, FOG OR STANDARD FOAM (1987 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.4).

FIREFIGHTING:
MOVE CONTAINER FROM FIRE AREA IF POSSIBLE. COOL FIRE-EXPOSED CONTAINERS WITH WATER FROM SIDE UNTIL WELL AFTER FIRE IS OUT. STAY AWAY FROM STORAGE TANK ENDS. FOR MASSIVE FIRE IN STORAGE AREA, USE UNMANNED HOSE HOLDER OR MONITOR NOZZLES, ELSE WITHDRAW FROM AREA AND LET FIRE BURN. WITHDRAW IMMEDIATELY IN CASE OF RISING SOUND FROM VENTING SAFETY DEVICE OR ANY DISCOLORATION OF STORAGE TANK DUE TO FIRE (1987 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.4, GUIDE PAGE 27).

EXTINGUISH ONLY IF FLOW CAN BE STOPPED; USE WATER IN FLOODING AMOUNTS AS FOG, SOLID STREAMS MAY SPREAD FIRE. COOL CONTAINERS WITH FLOODING AMOUNTS OF WATER, APPLY FROM AS FAR A DISTANCE AS POSSIBLE. AVOID BREATHING VAPORS, KEEP UPWIND. EVACUATE TO A RADIUS OF 1500 FEET FOR UNCONTROLLABLE FIRES. CONSIDER EVACUATION OF DOWNWIND AREA IF MATERIAL IS LEAKING.

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

TRANSPORTATION

DEPARTMENT OF TRANSPORTATION HAZARD CLASSIFICATION 49 CFR 172.101:
FLAMMABLE LIQUID

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

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

TOXICITY

GASOLINE, AUTOMOTIVE, LEADED:
(DATA DERIVED FROM UNPECIFIED AND UNLEADED GASOLINE)
IRRITATION DATA: 500 MG/24 HOURS SKIN-RABBIT MILD; 500 PPM/1 HOUR EYE-MAN MODERATE; 140 PPM/8 HOURS EYE-HUMAN MILD.
TOXICITY DATA: 900 PPM/1 HOUR INHALATION-MAN TCLO; 300 GM/M3/5 MINUTES INHALATION-RAT LC50; 300 GM/M3/5 MINUTES INHALATION-MOUSE LC50; 300 GM/M3/5 MINUTES INHALATION-GUINEA PIG LC50; 30000 PPM/5 MINUTES INHALATION-MAMMAL LCLO; 18,000 MG/KG ORAL-RAT LD50; 13.6 GM/KG ORAL-RAT LD50 (AETODY); TUMORIGENIC DATA (RTECS).
CARCINOGEN STATUS: HUMAN INADEQUATE EVIDENCE (IARC GROUP-2B). IN STUDIES OF UNLEADED GASOLINE WITH MICE AND RATS BY INHALATION, AN INCREASED INCIDENCE OF HEPATOCELLULAR ADENOMAS AND CARCINOMAS WAS PRODUCED IN FEMALE BUT NOT MALE MICE; AN INCREASED INCIDENCE OF ADENOMAS AND CARCINOMAS OF THE KIDNEY WAS PRODUCED IN MALE BUT NOT FEMALE RATS.
LOCAL EFFECTS: IRRITANT- MUCOUS MEMBRANE, SKIN, EYE.
ACUTE TOXICITY: RELATIVELY NON-TOXIC BY INHALATION AND INGESTION.
TARGET EFFECTS: CENTRAL NERVOUS SYSTEM DEPRESSANT; SIMPLE ASPHYXIANT.
ADDITIONAL DATA: THE USE OF ALCOHOLIC BEVERAGES ENHANCES THE TOXIC EFFECTS. STIMULANTS SUCH AS EPINEPHRINE MAY INDUCE VENTRICULAR FIBRILLATION. CHRONIC ABSORPTION OF NEUROTOXIC ALKYL LEAD ADDITIVES MAY CAUSE LEAD POISONING.

BENZENE:
IRRITATION DATA: 20 MG/24 HOURS SKIN-RABBIT MODERATE; 15 MG/24 HOURS OPEN SKIN-RABBIT MILD; 88 MG EYE-RABBIT MODERATE; 2 MG/24 HOURS EYE-RABBIT SEVERE.
TOXICITY DATA: 2000 PPM/5 MINUTES INHALATION-HUMAN LCLO; 2 PPH/5 MINUTES INHALATION-HUMAN LCLO; 65 MG/M3/5 YEARS INHALATION-HUMAN LCLO; 100 PPM INHALATION-HUMAN TCLO; 150 PPM/1 YEAR INTERMITTENT INHALATION-MAN TCLO; 20,000 PPM/5 MINUTES INHALATION-MAMMAL LCLO; 10,000 PPM/7 HOURS INHALATION-RAT LC50; 9980 PPM INHALATION-MOUSE LC50; 146,000 MG/M3 INHALATION-DOG LCLO; 170,000 MG/M3 INHALATION-CAT LCLO; 50 MG/KG ORAL-MAN LDLO; 3306 MG/KG ORAL-RAT LD50; 4700 MG/KG ORAL-MOUSE LD50; 2000 MG/KG ORAL-DOG LDLO; 88 MG/KG INTRAVENOUS-RABBIT LDLO; 2890 UG/KG INTRAPERITONEAL-RAT LD50; 340 MG/KG INTRAPERITONEAL-MOUSE LD50; 527 MG/KG INTRAPERITONEAL-GUINEA PIG LDLO; 194 MG/KG UNREPORTED-MAN LDLO; MUTAGENIC DATA (RTECS); REPRODUCTIVE EFFECTS DATA (RTECS); TUMORIGENIC DATA (RTECS).
CARCINOGEN STATUS: OSHA CARCINOGEN; KNOWN HUMAN CARCINOGEN (NTP); HUMAN SUFFICIENT EVIDENCE, ANIMAL SUFFICIENT EVIDENCE (IARC CLASS 1). THE RELATIONSHIP BETWEEN EXPOSURE TO BENZENE AND THE DEVELOPMENT OF ACUTE MYELOGENOUS LEUKEMIA HAS BEEN ESTABLISHED IN EPIDEMIOLOGICAL STUDIES.
LOCAL EFFECTS: IRRITANT- SKIN, EYE.
ACUTE TOXICITY LEVEL: MODERATELY TOXIC BY INGESTION; SLIGHTLY TOXIC BY INHALATION.

TARGET EFFECTS: CENTRAL NERVOUS SYSTEM DEPRESSANT; BONE MARROW DEPRESSANT. POISONING MAY ALSO AFFECT THE IMMUNE, HEMATOPOIETIC AND NERVOUS SYSTEMS.
AT INCREASED RISK FROM EXPOSURE: PERSONS WITH CERTAIN IMMUNOLOGICAL TENDENCIES.
ADDITIONAL DATA: USE OF ALCOHOLIC BEVERAGES MAY ENHANCE THE TOXIC EFFECTS. USE OF STIMULANTS SUCH AS EPINEPHRINE MAY CAUSE CARDIAC ARRYTHMIAS.

HEALTH EFFECTS AND FIRST AID

INHALATION:
GASOLINE, AUTOMOTIVE, LEADED:
IRRITANT/NARCOTIC/ASPHYXIANT.

ACUTE EXPOSURE- AT 160-270 PPM THROAT IRRITATION MAY OCCUR WITHIN SEVERAL HOURS. AT 2000 PPM MILD ANESTHESIA MAY OCCUR WITHIN 30 MINUTES. OTHER SYMPTOMS OF CENTRAL NERVOUS SYSTEM DEPRESSION MAY INCLUDE HEADACHE, NAUSEA, VOMITING, DIZZINESS, DROWSINESS, FACIAL FLUSHING, BLURRED VISION, SLURRED SPEECH, DIFFICULTY SWALLOWING, STAGGERING, CONFUSION AND EUPHORIA. AT HIGHER LEVELS, DYSPNEA, PULMONARY EDEMA AND BRONCHOPNEUMONIA MAY DEVELOP. FURTHER DEPRESSION MAY OCCUR WITH WEAK RESPIRATION AND PULSE, NERVOUSNESS, TWITCHING, IRRITABILITY, AND ATAXIA. SEVERE INTOXICATION MAY RESULT IN DELIRIUM, UNCONSCIOUSNESS, COMA, AND CONVULSIONS WITH EPILEPTIFORM SEIZURES. THE PUPILS MAY BE CONSTRICTED OR, IN COMATOSE STATES, FIXED AND DILATED OR UNEQUAL; NYSTAGMUS MAY ALSO OCCUR. MAY ALSO AFFECT THE LIVER, KIDNEYS, SPLEEN, BRAIN, MYOCARDIUM AND PANCREAS. DEATH MAY BE DUE TO RESPIRATORY OR CIRCULATORY FAILURE OR VENTRICULAR FIBRILLATION. EXTREMELY HIGH CONCENTRATIONS MAY CAUSE ASPHYXIATION.

CHRONIC EXPOSURE- WITH FEW EXCEPTIONS, MOST OF THE REPORTED EFFECTS OF REPEATED INHALATION ARE FROM INTENTIONAL "SNIFFING" OF GASOLINE RATHER THAN ROUTINE WORKPLACE EXPOSURE. REPORTED SYMPTOMS INCLUDE HEADACHE, NAUSEA, FATIGUE, ANOREXIA AND WEIGHT LOSS, PALLOR, DIZZINESS, INSOMNIA, NERVOUSNESS, MEMORY LOSS, CONFUSION, MUSCULAR WEAKNESS AND CRAMPS, PERIPHERAL NEUROPATHY, POLYNEURITIS, AND NEURASTHENIA. LIVER AND KIDNEY DAMAGE ARE ALSO POSSIBLE. IN ADDITION, IF SUFFICIENT LEAD IS ABSORBED, THERE MAY BE TREMORS, EXAGERRATED TENDON REFLEXES, INCOORDINATION, CEREBELLAR CHANGES INCLUDING MUSCLE TWITCHES, SEVERE ENCEPHALOPATHY, CHRONIC DEMENTIA, AND DEATH.

BENZENE:
NARCOTIC/BONE MARROW DEPRESSANT/CARCINOGEN.

ACUTE EXPOSURE- HIGH CONCENTRATIONS, AROUND 3000 PPM, MAY CAUSE RESPIRATORY TRACT IRRITATION, AND MORE SEVERE EXPOSURES MAY RESULT IN PULMONARY EDEMA. SYSTEMIC EFFECTS ARE MAINLY ON THE CENTRAL NERVOUS SYSTEM AND DEPEND ON THE CONCENTRATION AND EXPOSURE TIME. NO EFFECTS WERE NOTED AT 25 PPM FOR 8 HOURS, BUT SIGNS OF INTOXICATION BEGAN AT 50-150 PPM WITHIN 5 HOURS; AT 500-1500 PPM, WITHIN 1 HOUR; AT 7500 PPM, WITHIN 30 MINUTES; AND 20,000 PPM MAY BE FATAL WITHIN 5-10 MINUTES. EFFECTS MAY INCLUDE NAUSEA, VOMITING, HEADACHE, DIZZINESS, DROWSINESS, WEAKNESS, SOMETIMES PRECEDED BY A BRIEF PERIOD OF EXHILARATION OR EUPHORIA, IRRITABILITY, MALAISE, INCOHERENT SPEECH, STAGGERING, INCREASED PULSE RATE, CHEST PAIN AND TIGHTNESS WITH BREATHLESSNESS, PALLOR, AND TINNITUS. IN SEVERE EXPOSURES THERE MAY BE BLURRED VISION, SHALLOW, RAPID BREATHING, DELIRIUM, CARDIAC ARRHYTHMIAS, UNCONSCIOUSNESS, DEEP ANESTHESIA, PARALYSIS, AND COMA CHARACTERIZED BY MOTOR RESTLESSNESS, TREMORS AND HYPEREFLEXIA, SOMETIMES PRECEDED BY CONVULSIONS. RECOVERY DEPENDS ON THE SEVERITY OF EXPOSURE. BREATHLESSNESS, NERVOUS IRRITABILITY AND UNSTEADY GAIT MAY PERSIST FOR 2-3 WEEKS; A PECULIAR YELLOW SKIN COLOR AND CARDIAC DISTRESS MAY PERSIST FOR 4 WEEKS. LIVER AND KIDNEY EFFECTS MAY OCCUR, BUT ARE USUALLY MILD,

TEMPORARY IMPAIRMENTS. CHRONIC EFFECTS MAY ARISE AND PERSIST LONG AFTER AN ACUTE EXPOSURE. ALTHOUGH GENERALLY HEMATOTOXICITY IS NOT A SIGNIFICANT CONCERN IN ACUTE EXPOSURE, DELAYED HEMATOLOGIC EFFECTS, INCLUDING ANEMIA, HAVE BEEN REPORTED, AS HAVE PETECHIAL HEMORRHAGES, SPONTANEOUS BLEEDING, SECONDARY INFECTIONS, AND SKIN RASHES. IN FATAL EXPOSURES, DEATH MAY BE DUE TO CENTRAL NERVOUS SYSTEM DEPRESSION, CARDIAC OR RESPIRATORY FAILURE AND CIRCULATORY COLLAPSE, OR OCCASIONALLY, SUDDEN VENTRICULAR FIBRILLATION. IT MAY OCCUR WITHIN A FEW MINUTES TO SEVERAL HOURS, OR CARDIAC ARRYTHMIA MAY OCCUR AT ANYTIME WITHIN 24 HOURS. ALSO, DEATH FROM CENTRAL NERVOUS SYSTEM, RESPIRATORY OR HEMORRHAGIC COMPLICATIONS MAY OCCUR UP TO 5 DAYS AFTER EXPOSURE. PATHOLOGIC FINDINGS HAVE INCLUDED RESPIRATORY INFLAMMATION WITH EDEMA AND HEMORRHAGE OF THE LUNGS, RENAL CONGESTION, CEREBRAL EDEMA, AND EXTENSIVE PETECHIAL HEMORRHAGES IN THE BRAIN, PLEURAE, PERICARDIUM, URINARY TRACT, MUCOUS MEMBRANES, AND SKIN. BENZENE CROSSES THE PLACENTAL BARRIER AND THEREFORE MAY AFFECT UNBORN CHILDREN.

CHRONIC EXPOSURE- LONGTERM EXPOSURE MAY CAUSE SYMPTOMS REFERABLE TO THE CENTRAL NERVOUS, HEMATOPOIETIC AND IMMUNE SYSTEMS. EARLY EFFECTS ARE VAGUE AND VARIED AND MAY INCLUDE HEADACHE, LIGHT-HEADEDNESS, DIZZINESS, NAUSEA, ANOREXIA, ABDOMINAL DISCOMFORT, AND FATIGUE. LATER THERE MAY BE DYSPNEA, PALLOR, SLIGHTLY INCREASED TEMPERATURE, DECREASED BLOOD PRESSURE, AND VISUAL DISTURBANCES. DIZZINESS WHEN COLD WATER IS PLACED IN THE EAR AND HEARING IMPAIRMENT HAVE BEEN REPORTED, AS HAVE DIFFUSE CEREBRAL ATROPHY ASSOCIATED WITH ATAXIA, TREMORS AND EMOTIONAL LABILITY. WORKERS EXPOSED TO BENZENE IN COMBINATION WITH OTHER SOLVENTS HAVE EXHIBITED POLYNEURITIS. HEMATOLOGIC EFFECTS VARY WIDELY AND MAY APPEAR AFTER A FEW WEEKS OR MANY YEARS OF EXPOSURE OR EVEN MANY YEARS AFTER EXPOSURE HAS CEASED. THE DEGREE OF EXPOSURE BELOW WHICH NO BLOOD EFFECTS WILL OCCUR CANNOT BE ESTABLISHED WITH CERTAINTY. IN THE EARLY STAGES, THERE MAY BE BLOOD CLOTTING DEFECTS DUE TO FUNCTIONAL, MORPHOLOGICAL AND QUANTITATIVE PLATELET ALTERATION WITH RESULTANT BLEEDING FROM THE NOSE AND GUMS AND EASY BRUISING; LEUKOPENIA WITH PREDOMINANT LYMPHOCYTOPENIA OR NEUTROPENIA; AND ANEMIA WHICH MAY BE NORMOCHROMIC OR MACROCYTIC AND HYPOCHROMIC. HEMATOPOIESIS, BOTH IN THE BONE MARROW AND EXTRAMEDULLARY SITES, MAY BE HYPER- OR HYPOACTIVE WHICH MAY ACCOUNT FOR THE LACK OF CORRELATION, IN SOME CASES, BETWEEN THE BONE MARROW AND THE PERIPHERAL BLOOD PICTURES. ALSO, THE SYMPTOMS DO NOT ALWAYS PARALLEL THE LABORATORY FINDINGS. IF TREATED AT THIS STAGE, THE EFFECTS APPEAR REVERSIBLE, ALTHOUGH RECOVERY MAY BE PROTRACTED AND THERE MAY BE RELAPSES. HEMOLYSIS, DECREASED ERYTHROCYTE SURVIVAL, IRON METABOLISM DISTURBANCES, INTERNAL HEMORRHAGES, AND INCREASED SERUM BILIRUBIN LEVELS HAVE ALSO BEEN REPORTED. EXPOSURE TO HIGH DOSES FOR LONGER PERIODS MAY RESULT IN APLASIA AND FATTY DEGENERATION OF THE BONE MARROW WITH PANCYTOPENIA AND IS CONSIDERED TO BE IRREVERSIBLE. ENORMOUS VARIABILITY IN INDIVIDUAL RESPONSE, INCLUDING NON-DOSE DEPENDENT APLASIA, AND THE FINDING OF EOSINOPHILIA, SUGGESTS THAT IN SOME CASES, THE BLOOD DYSCRASIA MAY PARTIALLY BE AN ALLERGIC REACTION. IN A SERIES OF EPIDEMIOLOGICAL STUDIES THERE WAS A STATISTICALLY SIGNIFICANT EXCESS OF LEUKEMIAS, PREDOMINATELY MYELOGENOUS, IN PERSONS EXPOSED PRIMARILY TO BENZENE. ALSO, MANY CASE REPORTS AND SERIES HAVE DESCRIBED THE ASSOCIATION OF LEUKEMIA AND BENZENE EXPOSURE. MOST WERE ACUTE MYELOGENOUS, ALTHOUGH SOME WERE MONOCYTIC, ERYTHROBLASTIC, OR LYMPHOCYTIC; SOME LYMPHOMAS WERE NOTED ALSO. ALTHOUGH APLASTIC ANEMIA IS PROBABLY THE MORE LIKELY CONSEQUENCE OF LONGTERM EXPOSURE, IT IS NOT UNCOMMON FOR AN INDIVIDUAL SURVIVING THIS, TO GO THROUGH A PRELEUKEMIC PHASE INTO FRANK LEUKEMIA. CONVERSELY, LEUKEMIA WITHOUT PRECEDENT APLASTIC ANEMIA CAN OCCUR. IN ONE STUDY THE RANGE OF TIME FROM THE START OF THE EXPOSURE TO THE DIAGNOSIS OF LEUKEMIA WAS 3-24 YEARS. IT HAS BEEN SUGGESTED THAT THE CHROMOSOMAL ABERRATIONS WHICH CAN ARISE IN PERIPHERAL BLOOD AND BONE MARROW CELLS AND PERSIST FOR A LONG TIME AFTER EXPOSURE CEASES, MAY BE ASSOCIATED WITH THE INCREASED INCIDENCE OF LEUKEMIA. THE IMMUNOSUPPRESSIVE EFFECT HAS ALSO BEEN SUGGESTED AS

ASSOCIATED WITH THE LEUKEMOGENESIS. ADVERSE EFFECTS ON THE IMMUNOLOGICAL SYSTEM HAVE BEEN SHOWN TO MAKE RABBITS MORE SUSCEPTIBLE TO TUBERCULOSIS AND PNEUMONIA AND MAY EXPLAIN WHY THE TERMINAL EVENT IN SOME CASES OF BENZENE INTOXICATION MAY BE OVERWHELMING INFECTION. MENSTRUAL DISTURBANCES HAVE BEEN REPORTED MORE FREQUENTLY IN EXPOSED WOMEN. REPRODUCTIVE EFFECTS HAVE BEEN REPORTED IN ANIMALS.

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

SKIN CONTACT:
GASOLINE, AUTOMOTIVE, LEADED:
IRRITANT.

ACUTE EXPOSURE- LIQUID MAY CAUSE IRRITATION WITH ERYTHEMA AND PAIN. PROLONGED OR EXTENSIVE CONTACT MAY CAUSE BLISTERING AND, IN EXTREME CASES, EPIDERMAL NECROLYSIS. A 12 YEAR OLD BOY PARTIALLY IMMERSED IN A POOL OF GASOLINE FOR 1 HOUR EXPERIENCED HYPOTENSION, ABDOMINAL TENDERNESS, DISSEMINATED INTRAVASCULAR COAGULATION, TRANSIENT HEMATURIA, NONOLIGURIC RENAL FAILURE AND AN ELEVATED SERUM AMYLASE. AUTOPSY REVEALED CEREBRAL EDEMA, DIFFUSE BILATERAL PNEUMONIA, BIVENTRICULAR CARDIAC ENLARGEMENT, TOXIC NEPHROSIS, FATTY INFILTRATION OF LIVER AND PERIPANCREATIC FAT NECROSIS.

CHRONIC EXPOSURE- REPEATED OR PROLONGED CONTACT WITH THE LIQUID MAY CAUSE IRRITATION, DERMATITIS AND DEFATTING OF THE SKIN WITH DRYING AND CRACKING OR BURNS AND BLISTERING. CERTAIN INDIVIDUALS MAY DEVELOP HYPERSENSITIVITY, PROBABLY DUE TO ADDITIVES. REPEATED OR PROLONGED ABSORPTION OF MASSIVE AMOUNTS OF LEADED GASOLINE MAY RESULT IN THOSE SYMPTOMS AS DESCRIBED IN CHRONIC INHALATION FOR THE "SNIFFING" OF LEADED GASOLINE.

BENZENE:
IRRITANT.

ACUTE EXPOSURE- DIRECT CONTACT MAY CAUSE IRRITATION. EFFECTS MAY INCLUDE ERYTHEMA, A BURNING SENSATION, AND IN MORE SEVERE CASES, BLISTERING AND EDEMA. PROLONGED CONTACT MAY CAUSE LESIONS RESEMBLING 1ST- AND 2ND- DEGREE BURNS. UNDER NORMAL CONDITIONS, SIGNIFICANT SIGNS OF SYSTEMIC INTOXICATION ARE UNLIKELY FROM SKIN CONTACT ALONE, DUE TO THE SLOW RATE OF ABSORPTION AND THE HIGH VOLATILITY. APPLICATION TO GUINEA PIGS RESULTED IN INCREASED DERMAL PERMEABILITY.

CHRONIC EXPOSURE- REPEATED OR PROLONGED CONTACT DEFATS THE SKIN AND MAY RESULT IN DERMATITIS WITH ERYTHEMA, SCALING, DRYNESS, VESICULATION, AND FISSURING, POSSIBLY ACCOMPANIED BY PARESTHESIAS OF THE FINGERS WHICH MAY PERSIST SEVERAL WEEKS AFTER THE DERMATITIS SUBSIDES. SECONDARY INFECTIONS MAY OCCUR. TESTS ON GUINEA PIGS INDICATE SENSITIZATION IS POSSIBLE. ALTHOUGH STUDIES HAVE FAILED TO ESTABLISH A RELATIONSHIP BETWEEN SKIN CONTACT AND A CARCINOGENIC EFFECT, SOME PAPILLOMAS AND HEMATOPOIETIC EFFECTS HAVE BEEN REPORTED.

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

EYE CONTACT:
GASOLINE, AUTOMOTIVE, LEADED:
IRRITANT.

ACUTE EXPOSURE- CONCENTRATIONS BETWEEN 270 AND 900 PPM MAY CAUSE A SENSATION OF IRRITATION OFTEN BEFORE SIGNS SUCH AS CONJUNCTIVAL HYPEREMIA ARE VISIBLE. LIQUID SPLASHED IN THE EYES MAY CAUSE PAIN, SMARTING AND SLIGHT, TRANSIENT CORNEAL EPITHELIAL DISTURBANCE. BLEPHAROSPASM AND CONJUNCTIVAL HYPEREMIA AND EDEMA MAY OCCUR.

CHRONIC EXPOSURE- MAY CAUSE CONJUNCTIVITIS AND POSSIBLY IRREVERSIBLE AND GRADUAL LOSS OF CORNEAL AND CONJUNCTIVAL SENSITIVITY.

BENZENE:
IRRITANT.

ACUTE EXPOSURE- VAPOR CONCENTRATIONS OF 3000 PPM ARE VERY IRRITATING, EVEN ON BRIEF EXPOSURE. DROPLETS CAUSE MODERATE BURNING SENSATION, BUT ONLY A SLIGHT, TRANSIENT EPITHELIAL INJURY WITH RAPID RECOVERY.

CHRONIC EXPOSURE- REPEATED OR PROLONGED EXPOSURE TO IRRITANTS MAY CAUSE CONJUNCTIVITIS. SEVERAL CASE REPORTS, ONE OF THEM AN ACUTE EXPOSURE, SUGGEST THAT SYSTEMIC EXPOSURE MAY BE ASSOCIATED WITH RETROBULBAR OR OPTIC NEURITIS. 50% OF RATS EXPOSED TO 50 PPM FOR MORE THAN 600 HOURS DEVELOPED CATARACTS.

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

INGESTION:
GASOLINE, AUTOMOTIVE, LEADED:
NARCOTIC.

ACUTE EXPOSURE- MAY CAUSE IRRITATION AND BURNING OF THE GASTROINTESTINAL TRACT WITH NAUSEA, VOMITING, AND DIARRHEA. ABSORPTION MAY CAUSE INITIAL CENTRAL NERVOUS STIMULATION FOLLOWED BY DEPRESSION. SYMPTOMS MAY INCLUDE A MILD EXCITATION, RESTLESSNESS, NERVOUSNESS, IRRITABILITY, TWITCHING, WEAKNESS, BLURRED VISION, HEADACHE, DIZZINESS, DROWSINESS, INCOORDINATION, CONFUSION, DELIRIUM, UNCONSCIOUSNESS, CONVULSIONS AND COMA. CARDIAC ARRYTHMIAS MAY OCCUR. TRANSIENT LIVER DAMAGE IS POSSIBLE. INDIRECT OR DIRECT ASPIRATION MAY CAUSE CHEMICAL PNEUMONITIS WITH PULMONARY EDEMA AND HEMORRHAGE, POSSIBLY COMPLICATED BY BACTERIAL PNEUMONIA, AND LESS FREQUENTLY, BY EMPHYSEMA AND PNEUMOTHORAX. SIGNS OF PULMONARY INVOLVEMENT MAY INCLUDE COUGHING, DYSPNEA, SUBSTERNAL PAIN, SUDDEN DEVELOPMENT OF RAPID BREATHING, CYANOSIS, TACHYCARDIA AND FEVER. EVEN SMALL AMOUNTS MAY BE FATAL WITH DEATH CAUSED BY CARDIAC ARREST, ASPHYXIA OR RESPIRATORY PARALYSIS. DEPENDING ON THE AMOUNT ASPIRATED, DEATH MAY OCCUR RAPIDLY OR WITHIN 24 HOURS.

CHRONIC EXPOSURE- NO DATA AVAILABLE.

BENZENE:
NARCOTIC/CARCINOGEN.

ACUTE EXPOSURE- MAY CAUSE LOCAL IRRITATION AND BURNING SENSATION IN THE MOUTH, THROAT, AND STOMACH. SIGNS AND SYMPTOMS OF SYSTEMIC INTOXICATION MAY INCLUDE NAUSEA, VOMITING, HEADACHE, DIZZINESS, WEAKNESS, STAGGERING, CHEST PAIN AND TIGHTNESS, SHALLOW, RAPID PULSE, BREATHLESSNESS, PALLOR FOLLOWED BY FLUSHING, AND A FEAR OF IMPENDING DEATH. THERE MAY BE VISUAL DISTURBANCES AND CONVULSIONS. VIOLENT EXCITEMENT, EUPHORIA OR DELIRIUM MAY PRECEDE WEARINESS, FATIGUE AND SLEEPINESS FOLLOWED BY UNCONSCIOUSNESS, COMA AND DEATH. THOSE WHO SURVIVE THE CENTRAL NERVOUS SYSTEM EFFECTS MAY DEVELOP BRONCHITIS, PNEUMONIA, PULMONARY EDEMA, AND INTRAPULMONARY HEMORRHAGE. ASPIRATION MAY CAUSE IMMEDIATE PULMONARY EDEMA AND HEMORRHAGE. THE USUAL LETHAL DOSE IN HUMANS IS 10-15 MILLILITERS, BUT SMALLER AMOUNTS HAVE BEEN REPORTED TO CAUSE DEATH. A SINGLE EXPOSURE MAY PRODUCE LONGTERM EFFECTS WITH PANCYTOPENIA PERSISTING UP TO A YEAR.

CHRONIC EXPOSURE- DAILY ADMINISTRATION TO HUMANS OF 2-5 GRAMS IN OLIVE OIL HAS CAUSED HEADACHE, VERTIGO, BLADDER IRRITABILITY, IMPOTENCE, GASTRIC

DISTURBANCES, AND RENAL DYSFUNCTION. IN FEMALE RATS TREATED WITH 132 SINGLE DAILY DOSES OVER 187 DAYS, NO EFFECTS WERE OBSERVED AT 1 MG/KG; SLIGHT LEUKOPENIA AT 10 MG/KG; AND BOTH LEUKOPENIA AND ANEMIA AT 50 AND 100 MG/KG. IN A 2 YEAR GAVAGE STUDY WITH RATS AND MICE, THERE WAS AN INCREASED INCIDENCE OF LYMPHOMAS AND TUMORS OF THE ORAL CAVITY, SKIN, LUNGS, OVARIES, AND MAMMARY, HARDERIAN, AND PREPUTIAL GLANDS. IN A ONE YEAR GAVAGE STUDY, RATS GIVEN 50 OR 250 MG/KG, 4-5 DAYS/WEEK FOR 52 WEEKS DID NOT EXHIBIT ACUTE OR SUBACUTE TOXIC EFFECTS, BUT A DOSE CORRELATED INCREASE OF LEUKEMIAS AND MAMMARY CARCINOMAS WAS OBSERVED. REPRODUCTIVE EFFECTS HAVE BEEN REPORTED IN ANIMALS.

FIRST AID- ONLY HYDROCARBONS THAT ARE SOLVENTS FOR A TOXIC AGENT OR ARE THEMSELVES TOXIC NEED TO BE EVACUATED. EXTREME CARE MUST BE USED TO PREVENT ASPIRATION. GASTRIC LAVAGE WITH A CUFFED ENDOTRACHEAL TUBE IN PLACE TO PREVENT FURTHER ASPIRATION SHOULD BE DONE WITHIN 15 MINUTES. IN THE ABSENCE OF DEPRESSION OR CONVULSIONS OR IMPAIRED GAG REFLEX, EMESIS CAN ALSO BE INDUCED USING SYRUP OF IPECAC WITHOUT INCREASING THE HAZARD OF ASPIRATION (DREISBACH, HANDBOOK OF POISONING, 12TH ED.). TREAT SYMPTOMATICALLY AND SUPPORTIVELY. GASTRIC LAVAGE SHOULD BE PERFORMED BY QUALIFIED MEDICAL PERSONNEL. GET MEDICAL ATTENTION IMMEDIATELY.

ANTIDOTE:
NO SPECIFIC ANTIDOTE. TREAT SYMPTOMATICALLY AND SUPPORTIVELY.

REACTIVITY SECTION

REACTIVITY:
STABLE UNDER NORMAL TEMPERATURES AND PRESSURES.

INCOMPATIBILITIES:
GASOLINE, AUTOMOTIVE, LEADED:
OXIDIZERS (STRONG): FIRE AND EXPLOSION HAZARD.

DECOMPOSITION:
THERMAL DECOMPOSITION PRODUCTS MAY INCLUDE TOXIC OXIDES OF CARBON.

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

STORAGE-DISPOSAL

OBSERVE ALL FEDERAL, STATE AND LOCAL REGULATIONS WHEN STORING OR DISPOSING OF THIS SUBSTANCE. FOR ASSISTANCE, CONTACT THE DISTRICT DIRECTOR OF THE ENVIRONMENTAL PROTECTION AGENCY.

STORAGE

STORE IN ACCORDANCE WITH 29 CFR 1910.106.

STORE AWAY FROM INCOMPATIBLE SUBSTANCES.

DISPOSAL

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

CONDITIONS TO AVOID

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

SPILLS AND LEAKS

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

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

PROTECTIVE EQUIPMENT SECTION

VENTILATION:
PROVIDE LOCAL EXHAUST OR PROCESS ENCLOSURE VENTILATION TO MEET PUBLISHED EXPOSURE LIMITS.

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

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

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

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

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

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

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

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

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

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

AUTHORIZED BY- OCCUPATIONAL HEALTH SERVICES, INC.

CREATION DATE: 04/24/85 REVISION DATE: 03/28/90

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MATERIAL SAFETY DATA SHEET OHS12310

OCCUPATIONAL HEALTH SERVICES, INC.
450 SEVENTH AVENUE, SUITE 2407
NEW YORK, NEW YORK 10123
(800) 445-MSDS (212) 967-1100

EMERGENCY CONTACT:
JOHN S. BRANSFORD, JR. (615) 292-1180

SUBSTANCE IDENTIFICATION

SUBSTANCE: JET FUEL JP-4

TRADE NAMES/SYNONYMS:
JP-4 JET FUEL: STCC 4909215: UN 1863: OHS12310

CHEMICAL FAMILY:
PETROLEUM HYDROCARBON

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

COMPONENTS AND CONTAMINANTS

COMPONENT: JET FUEL JP-4 MAY CONTAIN: PERCENT: 100

COMPONENT: BENZENE >0.1% CAS# 71-43-2

OTHER CONTAMINANTS: MAY CONTAIN SULFUR

EXPOSURE LIMIT:
JET FUEL JP-4:
NO OCCUPATIONAL EXPOSURE LIMITS ESTABLISHED BY OSHA, ACGIH, OR NIOSH.
US AIR FORCE RECOMMENDS:
200 PPM TWA; 300 PPM STEL

BENZENE:
1 PPM OSHA TWA; 5 PPM OSHA 15 MINUTE STEL;
0.5 PPM OSHA ACTION LEVEL
10 PPM (30 MG/M3) ACGIH TWA;
ACGIH A2-SUSPECTED HUMAN CARCINOGEN
0.1 PPM (0.32 MG/M3) NIOSH RECOMMENDED 8 HOUR TWA;
1 PPM (3.2 MG/M3) NIOSH RECOMMENDED 15 MINUTE CEILING

10 POUNDS CERCLA SECTION 103 REPORTABLE QUANTITY
SUBJECT TO SARA SECTION 313 ANNUAL TOXIC CHEMICAL RELEASE REPORTING
SUBJECT TO CALIFORNIA PROPOSITION 65 CANCER AND/OR REPRODUCTIVE TOXICITY WARNING AND RELEASE REQUIREMENTS- (FEBRUARY 27, 1987)

PHYSICAL DATA

DESCRIPTION: COLORLESS TO LIGHT-BROWN WATERY LIQUID WITH A MILD PETROLEUM ODOR

BOILING POINT: 140-518 F (60-270 C) MELTING POINT: -98 F (-72 C)

SPECIFIC GRAVITY: 0.75-0.81 SOLUBILITY IN WATER: INSOLUBLE

VAPOR DENSITY: >1 ODOR-THRESHOLD: 1 PPM

OTHER SOLVENTS (SOLVENT - SOLUBILITY):
SOLUBLE IN HYDROCARBONS

FIRE AND EXPLOSION DATA

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

VAPOR-AIR MIXTURES ARE EXPLOSIVE ABOVE FLASH POINT.

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

FLASH POINT: -20 F (-29 C) (CC) UPPER EXPLOSION LIMIT: 8.0%

LOWER EXPLOSION LIMIT: 1.3% AUTOIGNITION TEMP.: 464 F (240 C)

FLAMMABILITY CLASS (OSHA): IB

FIREFIGHTING MEDIA:
DRY CHEMICAL, CARBON DIOXIDE, HALON, WATER SPRAY OR STANDARD FOAM (1987 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.4).

FOR LARGER FIRES, USE WATER SPRAY, FOG OR STANDARD FOAM (1987 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.4).

FIREFIGHTING:
MOVE CONTAINER FROM FIRE AREA IF POSSIBLE. COOL FIRE-EXPOSED CONTAINERS WITH WATER FROM SIDE UNTIL WELL AFTER FIRE IS OUT. STAY AWAY FROM STORAGE TANK ENDS. FOR MASSIVE FIRE IN STORAGE AREA, USE UNMANNED HOSE HOLDER OR MONITOR NOZZLES, ELSE WITHDRAW FROM AREA AND LET FIRE BURN. WITHDRAW IMMEDIATELY IN CASE OF RISING SOUND FROM VENTING SAFETY DEVICE OR ANY DISCOLORATION OF STORAGE TANK DUE TO FIRE (1987 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.4, GUIDE PAGE 27).

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

TRANSPORTATION

DEPARTMENT OF TRANSPORTATION HAZARD CLASSIFICATION 49 CFR 172.101:
FLAMMABLE LIQUID

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

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

TOXICITY

JET FUEL JP-4:
CARCINOGEN STATUS: HUMAN INADEQUATE EVIDENCE, ANIMAL INADEQUATE EVIDENCE (IARC GROUP-3).
JET FUEL JP-4 TOXICITY HAS NOT BEEN QUANTIFIED. IT MAY CAUSE MILD IRRITATION AND IS A CENTRAL NERVOUS SYSTEM DEPRESSANT.

BENZENE:
IRRITATION DATA: 20 MG/24 HOURS SKIN-RABBIT MODERATE; 15 MG/24 HOURS OPEN SKIN-RABBIT MILD; 88 MG EYE-RABBIT MODERATE; 2 MG/24 HOURS EYE-RABBIT SEVERE.
TOXICITY DATA: 2000 PPM/5 MINUTES INHALATION-HUMAN LCLO; 2 PPH/5 MINUTES INHALATION-HUMAN LCLO; 65 MG/M3/5 YEARS INHALATION-HUMAN LCLO; 100 PPM INHALATION-HUMAN TCLO; 150 PPM/1 YEAR INTERMITTENT INHALATION-MAN TCLO; 20,000 PPM/5 MINUTES INHALATION-MAMMAL LCLO; 10,000 PPM/7 HOURS INHALATION-RAT LC50; 9980 PPM INHALATION-MOUSE LC50; 146,000 MG/M3 INHALATION-DOG LCLO; 170,000 MG/M3 INHALATION-CAT LCLO; 50 MG/KG ORAL-MAN LDLO; 3306 MG/KG ORAL-RAT LD50; 4700 MG/KG ORAL-MOUSE LD50; 2000 MG/KG ORAL-DOG LDLO; 88 MG/KG INTRAVENOUS-RABBIT LDLO; 2890 UG/KG INTRAPERITONEAL-RAT LD50; 340 MG/KG INTRAPERITONEAL-MOUSE LD50; 527 MG/KG INTRAPERITONEAL-GUINEA PIG LDLO; 194 MG/KG UNREPORTED-MAN LDLO; MUTAGENIC DATA (RTECS); REPRODUCTIVE EFFECTS DATA (RTECS); TUMORIGENIC DATA (RTECS).
CARCINOGEN STATUS: OSHA CARCINOGEN; KNOWN HUMAN CARCINOGEN (NTP); HUMAN SUFFICIENT EVIDENCE, ANIMAL SUFFICIENT EVIDENCE (IARC CLASS 1). THE RELATIONSHIP BETWEEN EXPOSURE TO BENZENE AND THE DEVELOPMENT OF ACUTE MYELOGENOUS LEUKEMIA HAS BEEN ESTABLISHED IN EPIDEMIOLOGICAL STUDIES.
LOCAL EFFECTS: IRRITANT- SKIN, EYE.
ACUTE TOXICITY LEVEL: MODERATELY TOXIC BY INGESTION; SLIGHTLY TOXIC BY INHALATION.
TARGET EFFECTS: CENTRAL NERVOUS SYSTEM DEPRESSANT; BONE MARROW DEPRESSANT. POISONING MAY ALSO AFFECT THE IMMUNE, HEMATOPOIETIC AND NERVOUS SYSTEMS.
AT INCREASED RISK FROM EXPOSURE: PERSONS WITH CERTAIN IMMUNOLOGICAL TENDENCIES.
ADDITIONAL DATA: USE OF ALCOHOLIC BEVERAGES MAY ENHANCE THE TOXIC EFFECTS. USE OF STIMULANTS SUCH AS EPINEPHRINE MAY CAUSE CARDIAC ARRYTHMIAS.

HEALTH EFFECTS AND FIRST AID

INHALATION:
JET FUEL JP-4:
NARCOTIC.
ACUTE EXPOSURE- HIGH VAPOR CONCENTRATIONS MAY CAUSE SLIGHT, TEMPORARY IRRITATION AND SMARTING OF THE RESPIRATORY TRACT AND SYMPTOMS OF CENTRAL NERVOUS SYSTEM DEPRESSION SUCH AS HEADACHE, DIZZINESS, ANOREXIA, WEAKNESS, AND INCOORDINATION.
CHRONIC EXPOSURE- THE RANGE AND DEGREE OF EFFECTS FROM REPEATED OR PROLONGED EXPOSURE MAY VARY DEPENDING ON THE SPECIFIC HYDROCARBON COMPOSITION. IF N-HEXANE IS PRESENT, FOR EXAMPLE, NEUROLOGIC EFFECTS MAY BE MORE LIKELY. LONGTERM EXPOSURE TO JET FUEL VAPORS HAS BEEN REPORTED TO CAUSE NAUSEA, DIZZINESS, HEADACHE, PALPITATIONS, PRESSURE IN THE CHEST, POLYNEUROPATHY, NEURASTHENIA, AND PSYCHIATIC SYMPTOMS SUCH AS ANXIETY AND DEPRESSION. IN SEVERAL CHRONIC ANIMAL STUDIES WITH JP-4, FOR PERIODS RANGING FROM 90 DAYS TO 1 YEAR, THE MOST SIGNIFICANT EXPOSURE-RELATED EFFECTS NOTED WERE TOXIC

NEPHROPATHY IN MALE RATS AND REVERSIBLE HEPATOCELLULAR FATTY CHANGE IN FEMALE MICE.

BENZENE:
NARCOTIC/BONE MARROW DEPRESSANT/CARCINOGEN.

ACUTE EXPOSURE- HIGH CONCENTRATIONS, AROUND 3000 PPM, MAY CAUSE RESPIRATORY TRACT IRRITATION, AND MORE SEVERE EXPOSURES MAY RESULT IN PULMONARY EDEMA. SYSTEMIC EFFECTS ARE MAINLY ON THE CENTRAL NERVOUS SYSTEM AND DEPEND ON THE CONCENTRATION AND EXPOSURE TIME. NO EFFECTS WERE NOTED AT 25 PPM FOR 8 HOURS, BUT SIGNS OF INTOXICATION BEGAN AT 50-150 PPM WITHIN 5 HOURS; AT 500-1500 PPM, WITHIN 1 HOUR; AT 7500 PPM, WITHIN 30 MINUTES; AND 20,000 PPM MAY BE FATAL WITHIN 5-10 MINUTES. EFFECTS MAY INCLUDE NAUSEA, VOMITING, HEADACHE, DIZZINESS, DROWSINESS, WEAKNESS, SOMETIMES PRECEDED BY A BRIEF PERIOD OF EXHILARATION OR EUPHORIA, IRRITABILITY, MALAISE, INCOHERENT SPEECH, STAGGERING, INCREASED PULSE RATE, CHEST PAIN AND TIGHTNESS WITH BREATHLESSNESS, PALLOR, AND TINNITUS. IN SEVERE EXPOSURES THERE MAY BE BLURRED VISION, SHALLOW, RAPID BREATHING, DELIRIUM, CARDIAC ARRHYTHMIAS, UNCONSCIOUSNESS, DEEP ANESTHESIA, PARALYSIS, AND COMA CHARACTERIZED BY MOTOR RESTLESSNESS, TREMORS AND HYPEREFLEXIA, SOMETIMES PRECEDED BY CONVULSIONS. RECOVERY DEPENDS ON THE SEVERITY OF EXPOSURE. BREATHLESSNESS, NERVOUS IRRITABILITY AND UNSTEADY GAIT MAY PERSIST FOR 2-3 WEEKS; A PECULIAR YELLOW SKIN COLOR AND CARDIAC DISTRESS MAY PERSIST FOR 4 WEEKS. LIVER AND KIDNEY EFFECTS MAY OCCUR, BUT ARE USUALLY MILD, TEMPORARY IMPAIRMENTS. CHRONIC EFFECTS MAY ARISE AND PERSIST LONG AFTER AN ACUTE EXPOSURE. ALTHOUGH GENERALLY HEMATOTOXICITY IS NOT A SIGNIFICANT CONCERN IN ACUTE EXPOSURE, DELAYED HEMATOLOGIC EFFECTS, INCLUDING ANEMIA, HAVE BEEN REPORTED, AS HAVE PETECHIAL HEMORRHAGES, SPONTANEOUS BLEEDING, SECONDARY INFECTIONS, AND SKIN RASHES. IN FATAL EXPOSURES, DEATH MAY BE DUE TO CENTRAL NERVOUS SYSTEM DEPRESSION, CARDIAC OR RESPIRATORY FAILURE AND CIRCULATORY COLLAPSE, OR OCCASIONALLY, SUDDEN VENTRICULAR FIBRILLATION. IT MAY OCCUR WITHIN A FEW MINUTES TO SEVERAL HOURS, OR CARDIAC ARRYTHMIA MAY OCCUR AT ANYTIME WITHIN 24 HOURS. ALSO, DEATH FROM CENTRAL NERVOUS SYSTEM, RESPIRATORY OR HEMORRHAGIC COMPLICATIONS MAY OCCUR UP TO 5 DAYS AFTER EXPOSURE. PATHOLOGIC FINDINGS HAVE INCLUDED RESPIRATORY INFLAMMATION WITH EDEMA AND HEMORRHAGE OF THE LUNGS, RENAL CONGESTION, CEREBRAL EDEMA, AND EXTENSIVE PETECHIAL HEMORRHAGES IN THE BRAIN, PLEURAE, PERICARDIUM, URINARY TRACT, MUCOUS MEMBRANES, AND SKIN. BENZENE CROSSES THE PLACENTAL BARRIER AND THEREFORE MAY AFFECT UNBORN CHILDREN.

CHRONIC EXPOSURE- LONGTERM EXPOSURE MAY CAUSE SYMPTOMS REFERABLE TO THE CENTRAL NERVOUS, HEMATOPOIETIC AND IMMUNE SYSTEMS. EARLY EFFECTS ARE VAGUE AND VARIED AND MAY INCLUDE HEADACHE, LIGHT-HEADEDNESS, DIZZINESS, NAUSEA, ANOREXIA, ABDOMINAL DISCOMFORT, AND FATIGUE. LATER THERE MAY BE DYSPNEA, PALLOR, SLIGHTLY INCREASED TEMPERATURE, DECREASED BLOOD PRESSURE, AND VISUAL DISTURBANCES. DIZZINESS WHEN COLD WATER IS PLACED IN THE EAR AND HEARING IMPAIRMENT HAVE BEEN REPORTED, AS HAVE DIFFUSE CEREBRAL ATROPHY ASSOCIATED WITH ATAXIA, TREMORS AND EMOTIONAL LABILITY. WORKERS EXPOSED TO BENZENE IN COMBINATION WITH OTHER SOLVENTS HAVE EXHIBITED POLYNEURITIS. HEMATOLOGIC EFFECTS VARY WIDELY AND MAY APPEAR AFTER A FEW WEEKS OR MANY YEARS OF EXPOSURE OR EVEN MANY YEARS AFTER EXPOSURE HAS CEASED. THE DEGREE OF EXPOSURE BELOW WHICH NO BLOOD EFFECTS WILL OCCUR CANNOT BE ESTABLISHED WITH CERTAINTY. IN THE EARLY STAGES, THERE MAY BE BLOOD CLOTTING DEFECTS DUE TO FUNCTIONAL, MORPHOLOGICAL AND QUANTITATIVE PLATELET ALTERATION WITH RESULTANT BLEEDING FROM THE NOSE AND GUMS AND EASY BRUISING; LEUKOPENIA WITH PREDOMINANT LYMPHOCYTOPENIA OR NEUTROPENIA; AND ANEMIA WHICH MAY BE NORMOCHROMIC OR MACROCYTIC AND HYPOCHROMIC. HEMATOPOIESIS, BOTH IN THE BONE MARROW AND EXTRAMEDULLARY SITES, MAY BE HYPER- OR HYPOACTIVE WHICH MAY ACCOUNT FOR THE LACK OF CORRELATION, IN SOME CASES, BETWEEN THE BONE MARROW AND THE PERIPHERAL BLOOD PICTURES. ALSO, THE SYMPTOMS DO NOT ALWAYS PARALLEL THE LABORATORY FINDINGS. IF TREATED AT THIS STAGE, THE EFFECTS

APPEAR REVERSIBLE, ALTHOUGH RECOVERY MAY BE PROTRACTED AND THERE MAY BE RELAPSES. HEMOLYSIS, DECREASED ERYTHROCYTE SURVIVAL, IRON METABOLISM DISTURBANCES, INTERNAL HEMORRHAGES, AND INCREASED SERUM BILIRUBIN LEVELS HAVE ALSO BEEN REPORTED. EXPOSURE TO HIGH DOSES FOR LONGER PERIODS MAY RESULT IN APLASIA AND FATTY DEGENERATION OF THE BONE MARROW WITH PANCYTOPENIA AND IS CONSIDERED TO BE IRREVERSIBLE. ENORMOUS VARIABILITY IN INDIVIDUAL RESPONSE, INCLUDING NON-DOSE DEPENDENT APLASIA, AND THE FINDING OF EOSINOPHILIA, SUGGESTS THAT IN SOME CASES, THE BLOOD DYSCRASIA MAY PARTIALLY BE AN ALLERGIC REACTION. IN A SERIES OF EPIDEMIOLOGICAL STUDIES THERE WAS A STATISTICALLY SIGNIFICANT EXCESS OF LEUKEMIAS, PREDOMINATELY MYELOGENOUS, IN PERSONS EXPOSED PRIMARILY TO BENZENE. ALSO, MANY CASE REPORTS AND SERIES HAVE DESCRIBED THE ASSOCIATION OF LEUKEMIA AND BENZENE EXPOSURE. MOST WERE ACUTE MYELOGENOUS, ALTHOUGH SOME WERE MONOCYTIC, ERYTHROBLASTIC, OR LYMPHOCYTIC; SOME LYMPHOMAS WERE NOTED ALSO. ALTHOUGH APLASTIC ANEMIA IS PROBABLY THE MORE LIKELY CONSEQUENCE OF LONGTERM EXPOSURE, IT IS NOT UNCOMMON FOR AN INDIVIDUAL SURVIVING THIS, TO GO THROUGH A PRELEUKEMIC PHASE INTO FRANK LEUKEMIA. CONVERSELY, LEUKEMIA WITHOUT PRECEDENT APLASTIC ANEMIA CAN OCCUR. IN ONE STUDY THE RANGE OF TIME FROM THE START OF THE EXPOSURE TO THE DIAGNOSIS OF LEUKEMIA WAS 3-24 YEARS. IT HAS BEEN SUGGESTED THAT THE CHROMOSOMAL ABERRATIONS WHICH CAN ARISE IN PERIPHERAL BLOOD AND BONE MARROW CELLS AND PERSIST FOR A LONG TIME AFTER EXPOSURE CEASES, MAY BE ASSOCIATED WITH THE INCREASED INCIDENCE OF LEUKEMIA. THE IMMUNOSUPPRESSIVE EFFECT HAS ALSO BEEN SUGGESTED AS ASSOCIATED WITH THE LEUKEMOGENESIS. ADVERSE EFFECTS ON THE IMMUNOLOGICAL SYSTEM HAVE BEEN SHOWN TO MAKE RABBITS MORE SUSCEPTIBLE TO TUBERCULOSIS AND PNEUMONIA AND MAY EXPLAIN WHY THE TERMINAL EVENT IN SOME CASES OF BENZENE INTOXICATION MAY BE OVERWHELMING INFECTION. MENSTRUAL DISTURBANCES HAVE BEEN REPORTED MORE FREQUENTLY IN EXPOSED WOMEN. REPRODUCTIVE EFFECTS HAVE BEEN REPORTED IN ANIMALS.

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

SKIN CONTACT:

JET FUEL JP-4:

ACUTE EXPOSURE- NO SPECIFIC DATA AVAILABLE. STUDIES ON RABBITS WITH ANOTHER JET FUEL, JET A, REPORTED MILD IRRITATION FROM PATCH TESTS AND NO MORTALITIES AT LEVELS OF 5 GM/KG.

CHRONIC EXPOSURE- REPEATED OR PROLONGED CONTACT MAY CAUSE IRRITATION.

BENZENE:

IRRITANT.

ACUTE EXPOSURE- DIRECT CONTACT MAY CAUSE IRRITATION. EFFECTS MAY INCLUDE ERYTHEMA, A BURNING SENSATION, AND IN MORE SEVERE CASES, BLISTERING AND EDEMA. PROLONGED CONTACT MAY CAUSE LESIONS RESEMBLING 1ST- AND 2ND- DEGREE BURNS. UNDER NORMAL CONDITIONS, SIGNIFICANT SIGNS OF SYSTEMIC INTOXICATION ARE UNLIKELY FROM SKIN CONTACT ALONE, DUE TO THE SLOW RATE OF ABSORPTION AND THE HIGH VOLATILITY. APPLICATION TO GUINEA PIGS RESULTED IN INCREASED DERMAL PERMEABILITY.

CHRONIC EXPOSURE- REPEATED OR PROLONGED CONTACT DEFATS THE SKIN AND MAY RESULT IN DERMATITIS WITH ERYTHEMA, SCALING, DRYNESS, VESICULATION, AND FISSURING, POSSIBLY ACCOMPANIED BY PARESTHESIAS OF THE FINGERS WHICH MAY PERSIST SEVERAL WEEKS AFTER THE DERMATITIS SUBSIDES. SECONDARY INFECTIONS MAY OCCUR. TESTS ON GUINEA PIGS INDICATE SENSITIZATION IS POSSIBLE. ALTHOUGH STUDIES HAVE FAILED TO ESTABLISH A RELATIONSHIP BETWEEN SKIN CONTACT AND A CARCINOGENIC EFFECT, SOME PAPILLOMAS AND HEMATOPOIETIC EFFECTS HAVE BEEN REPORTED.

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

EYE CONTACT:
JET FUEL JP-4:
ACUTE EXPOSURE- NOT EXPECTED TO CAUSE MORE THAN MINOR IRRITATION. IN GENERAL, THE VARIOUS LIQUID HYDROCARBONS OF PETROLEUM CAUSE LITTLE OR NO INJURY ON DIRECT CONTACT.
CHRONIC EXPOSURE- NO DATA AVAILABLE.

BENZENE:
IRRITANT.
ACUTE EXPOSURE- VAPOR CONCENTRATIONS OF 3000 PPM ARE VERY IRRITATING, EVEN ON BRIEF EXPOSURE. DROPLETS CAUSE MODERATE BURNING SENSATION, BUT ONLY A SLIGHT, TRANSIENT EPITHELIAL INJURY WITH RAPID RECOVERY.
CHRONIC EXPOSURE- REPEATED OR PROLONGED EXPOSURE TO IRRITANTS MAY CAUSE CONJUNCTIVITIS. SEVERAL CASE REPORTS, ONE OF THEM AN ACUTE EXPOSURE, SUGGEST THAT SYSTEMIC EXPOSURE MAY BE ASSOCIATED WITH RETROBULBAR OR OPTIC NEURITIS. 50% OF RATS EXPOSED TO 50 PPM FOR MORE THAN 600 HOURS DEVELOPED CATARACTS.

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

INGESTION:
JET FUEL JP-4:
NARCOTIC.
ACUTE EXPOSURE- MAY CAUSE IRRITATION OF THE STOMACH. IF SUFFICIENT AMOUNTS OF PETROLEUM DISTILLATES ARE INGESTED AND RETAINED, CENTRAL NERVOUS SYSTEM DEPRESSION MAY OCCUR WITH SYMPTOMS SUCH AS HEADACHE, DIZZINESS, ANOREXIA, WEAKNESS, AND INCOORDINATION. ASPIRATION MAY RESULT IN PNEUMONITIS WITH PULMONARY EDEMA.
CHRONIC EXPOSURE- NO DATA AVAILABLE.

BENZENE:
NARCOTIC/CARCINOGEN.
ACUTE EXPOSURE- MAY CAUSE LOCAL IRRITATION AND BURNING SENSATION IN THE MOUTH, THROAT, AND STOMACH. SIGNS AND SYMPTOMS OF SYSTEMIC INTOXICATION MAY INCLUDE NAUSEA, VOMITING, HEADACHE, DIZZINESS, WEAKNESS, STAGGERING, CHEST PAIN AND TIGHTNESS, SHALLOW, RAPID PULSE, BREATHLESSNESS, PALLOR FOLLOWED BY FLUSHING, AND A FEAR OF IMPENDING DEATH. THERE MAY BE VISUAL DISTURBANCES AND CONVULSIONS. VIOLENT EXCITEMENT, EUPHORIA OR DELIRIUM MAY PRECEDE WEARINESS, FATIGUE AND SLEEPINESS FOLLOWED BY UNCONSCIOUSNESS, COMA AND DEATH. THOSE WHO SURVIVE THE CENTRAL NERVOUS SYSTEM EFFECTS MAY DEVELOP BRONCHITIS, PNEUMONIA, PULMONARY EDEMA, AND INTRAPULMONARY HEMORRHAGE. ASPIRATION MAY CAUSE IMMEDIATE PULMONARY EDEMA AND HEMORRHAGE. THE USUAL LETHAL DOSE IN HUMANS IS 10-15 MILLILITERS, BUT SMALLER AMOUNTS HAVE BEEN REPORTED TO CAUSE DEATH. A SINGLE EXPOSURE MAY PRODUCE LONGTERM EFFECTS WITH PANCYTOPENIA PERSISTING UP TO A YEAR.
CHRONIC EXPOSURE- DAILY ADMINISTRATION TO HUMANS OF 2-5 GRAMS IN OLIVE OIL HAS CAUSED HEADACHE, VERTIGO, BLADDER IRRITABILITY, IMPOTENCE, GASTRIC DISTURBANCES, AND RENAL DYSFUNCTION. IN FEMALE RATS TREATED WITH 132 SINGLE DAILY DOSES OVER 187 DAYS, NO EFFECTS WERE OBSERVED AT 1 MG/KG; SLIGHT LEUKOPENIA AT 10 MG/KG; AND BOTH LEUKOPENIA AND ANEMIA AT 50 AND 100 MG/KG. IN A 2 YEAR GAVAGE STUDY WITH RATS AND MICE, THERE WAS AN INCREASED INCIDENCE OF LYMPHOMAS AND TUMORS OF THE ORAL CAVITY, SKIN, LUNGS, OVARIES, AND MAMMARY, HARDERIAN, AND PREPUTIAL GLANDS. IN A ONE

YEAR GAVAGE STUDY, RATS GIVEN 50 OR 250 MG/KG, 4-5 DAYS/WEEK FOR 52 WEEKS DID NOT EXHIBIT ACUTE OR SUBACUTE TOXIC EFFECTS, BUT A DOSE CORRELATED INCREASE OF LEUKEMIAS AND MAMMARY CARCINOMAS WAS OBSERVED. REPRODUCTIVE EFFECTS HAVE BEEN REPORTED IN ANIMALS.

FIRST AID- ONLY HYDROCARBONS THAT ARE SOLVENTS FOR A TOXIC AGENT OR ARE THEMSELVES TOXIC NEED TO BE EVACUATED. EXTREME CARE MUST BE USED TO PREVENT ASPIRATION. GASTRIC LAVAGE WITH A CUFFED ENDOTRACHEAL TUBE IN PLACE TO PREVENT FURTHER ASPIRATION SHOULD BE DONE WITHIN 15 MINUTES. IN THE ABSENCE OF DEPRESSION OR CONVULSIONS OR IMPAIRED GAG REFLEX, EMESIS CAN ALSO BE INDUCED USING SYRUP OF IPECAC WITHOUT INCREASING THE HAZARD OF ASPIRATION (DREISBACH, HANDBOOK OF POISONING, 12TH ED.). TREAT SYMPTOMATICALLY AND SUPPORTIVELY. GASTRIC LAVAGE SHOULD BE PERFORMED BY QUALIFIED MEDICAL PERSONNEL. GET MEDICAL ATTENTION IMMEDIATELY.

ANTIDOTE:
NO SPECIFIC ANTIDOTE. TREAT SYMPTOMATICALLY AND SUPPORTIVELY.

REACTIVITY SECTION

REACTIVITY:
STABLE UNDER NORMAL TEMPERATURES AND PRESSURES.

INCOMPATIBILITIES:
JET FUEL JP-4:
FLUORIDE: FIRE AND EXPLOSION HAZARD.
OXIDIZERS (STRONG): FIRE AND EXPLOSION HAZARD.

DECOMPOSITION:
THERMAL DECOMPOSITION PRODUCTS MAY INCLUDE TOXIC OXIDES OF CARBON.

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

STORAGE-DISPOSAL

OBSERVE ALL FEDERAL, STATE AND LOCAL REGULATIONS WHEN STORING OR DISPOSING OF THIS SUBSTANCE. FOR ASSISTANCE, CONTACT THE DISTRICT DIRECTOR OF THE ENVIRONMENTAL PROTECTION AGENCY.

STORAGE

STORE IN ACCORDANCE WITH 29 CFR 1910.106.

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

STORE AWAY FROM INCOMPATIBLE SUBSTANCES.

DISPOSAL

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

CONDITIONS TO AVOID

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

SPILLS AND LEAKS

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

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

PROTECTIVE EQUIPMENT SECTION

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

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

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

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

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

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

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

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

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

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

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

AUTHORIZED BY- OCCUPATIONAL HEALTH SERVICES, INC.

CREATION DATE: 03/15/85 REVISION DATE: 03/28/90

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MATERIAL SAFETY DATA SHEET OHS12320

OCCUPATIONAL HEALTH SERVICES, INC.
450 SEVENTH AVENUE, SUITE 2407
NEW YORK, NEW YORK 10123
(800) 445-MSDS (212) 967-1100

EMERGENCY CONTACT:
JOHN S. BRANSFORD, JR. (615) 292-1180

SUBSTANCE IDENTIFICATION

CAS-NUMBER 8008-20-6
RTEC-NUMBER OA5500000

SUBSTANCE: JET FUEL JP-5

TRADE NAMES/SYNONYMS:
JP-5 JET FUEL: UN 1863: OHS12320

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

COMPONENTS AND CONTAMINANTS

COMPONENT: JET FUEL JP-5 CAS# 8008-20-6 PERCENT: 100

OTHER CONTAMINANTS: MAY CONTAIN BENZENE OR SULFUR

EXPOSURE LIMIT:
JET FUEL:
100 MG/M3 (KEROSENE) NIOSH RECOMMENDED 10 HOUR TWA

PHYSICAL DATA

DESCRIPTION: COLORLESS TO LIGHT-BROWN LIQUID WITH A MILD PETROLEUM ODOR

BOILING POINT: 349 F (176 C) MELTING POINT: <-54 F (<-48 C)

SPECIFIC GRAVITY: 0.8 EVAPORATION RATE: NOT AVAILABLE

SOLUBILITY IN WATER: INSOLUBLE VAPOR DENSITY: >1

VAPOR PRESSURE: NOT AVAILABLE ODOR-THRESHOLD: 1 PPM

FIRE AND EXPLOSION DATA

FIRE AND EXPLOSION HAZARD
MODERATE FIRE HAZARD WHEN EXPOSED TO HEAT OR FLAME.

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

VAPOR-AIR MIXTURES ARE EXPLOSIVE ABOVE FLASH POINT.

FLASH POINT: 95 F (35 C) (CC) UPPER EXPLOSION LIMIT: 4.6%

LOWER EXPLOSION LIMIT: 0.6% AUTOIGNITION TEMP.: 475 F (246 C)

FLAMMABILITY CLASS (OSHA): IC

FIREFIGHTING MEDIA:
DRY CHEMICAL, CARBON DIOXIDE, HALON, WATER SPRAY OR STANDARD FOAM (1987 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.4).

FOR LARGER FIRES, USE WATER SPRAY, FOG OR STANDARD FOAM (1987 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.4).

FIREFIGHTING:
MOVE CONTAINER FROM FIRE AREA IF POSSIBLE. COOL FIRE-EXPOSED CONTAINERS WITH WATER FROM SIDE UNTIL WELL AFTER FIRE IS OUT. STAY AWAY FROM STORAGE TANK ENDS. FOR MASSIVE FIRE IN STORAGE AREA, USE UNMANNED HOSE HOLDER OR MONITOR NOZZLES, ELSE WITHDRAW FROM AREA AND LET FIRE BURN. WITHDRAW IMMEDIATELY IN CASE OF RISING SOUND FROM VENTING SAFETY DEVICE OR ANY DISCOLORATION OF STORAGE TANK DUE TO FIRE (1987 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.4, GUIDE PAGE 27).

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

TRANSPORTATION

DEPARTMENT OF TRANSPORTATION HAZARD CLASSIFICATION 49 CFR 172.101:
FLAMMABLE LIQUID

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

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

TOXICITY

JET FUEL JP-5:
CARCINOGEN STATUS: HUMAN INADEQUATE EVIDENCE, ANIMAL INADEQUATE EVIDENCE (IARC GROUP-3).
JET FUEL JP-5 IS AN EYE, MUCOUS MEMBRANE, AND SKIN IRRITANT AND CENTRAL NERVOUS SYSTEM DEPRESSANT.

EPIDEMIOLOGICAL STUDIES INVOLVING PETROLEUM REFINERY WORKERS INDICATE PERSONS WITH ROUTINE EXPOSURE TO PETROLEUM OR ONE OF ITS CONSTITUENTS MAY BE AT AN INCREASED RISK TO THE DEVELOPMENT OF BENIGN NEOPLASMS, DIGESTIVE SYSTEM CANCERS, AND SKIN CANCER, PARTICULARLY MELANOMA.

HEALTH EFFECTS AND FIRST AID

INHALATION:
JET FUEL JP-5:
IRRITANT/NARCOTIC.

ACUTE EXPOSURE- LESS IS REQUIRED TO PRODUCE ANESTHESIA BY INHALATION THAN BY INGESTION, BUT DUE TO LOW VOLATILITY, THE INHALATION HAZARD IS LOW EXCEPT AS AN AEROSOL OR MIST. IF SUFFICIENT AMOUNTS REACH THE LUNGS EITHER BY INHALATION OR ASPIRATION, NAUSEA, VOMITING AND PULMONARY IRRITATION MAY OCCUR AND PROGRESS TO PULMONARY EDEMA WITH BLOODY SPUTUM AND BRONCHIAL PNEUMONIA WITH FEVER AND COUGH. PNEUMOTHORAX AND EMPHYSEMA MAY COMPLICATE RECOVERY. PETROLEUM DISTILLATES ARE FAT SOLVENTS AND MAY ALTER THE FUNCTION OF NERVES TO PRODUCE DEPRESSION, COMA AND SOMETIMES CONVULSIONS. VENTRICULAR FIBRILLATION MAY OCCUR. AFTER THE FIRST 24 HOURS, THE EXTENT OF PULMONARY INVOLVEMENT INDICATES THE SEVERITY. INFILTRATION OF MORE THAN 30% OF THE LUNGS GENERALLY REQUIRES 2-4 WEEKS FOR RESOLUTION.

CHRONIC EXPOSURE- PROLONGED EXPOSURE MAY CAUSE HEADACHE, EXCITATION, DIZZINESS, WEAKNESS, LANGUOR, WEIGHT LOSS, ANEMIA, NERVOUSNESS, ATAXIA, AND POLYNEURITIS WITH PAIN IN THE LIMBS, PERIPHERAL NUMBNESS AND PARESTHESIAS.

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

SKIN CONTACT:
JET FUEL JP-5:
IRRITANT/NARCOTIC.

ACUTE EXPOSURE- MAY CAUSE IRRITATION AND DEFATTING. ABSORPTION OF SUFFICIENT AMOUNTS MAY PRODUCE SYSTEMIC EFFECTS SUCH AS HEADACHE, DIZZINESS, NAUSEA, STUPOR, AND POSSIBLY CONVULSIONS AND UNCONSCIOUSNESS. IN ACUTE TOXICITY STUDIES, NO MORTALITIES OCCURRED AT LEVELS OF 5 ML/KG IN RABBITS.

CHRONIC EXPOSURE- KEROSINE AND RELATED HYDROCARBONS MAY PRODUCE EPIDERMAL NECROLYSIS. RENAL DAMAGE HAS ALSO BEEN REPORTED. HAIR LOSS, SCALING AND CRACKING OCCURRED IN TESTS ON RABBIT SKIN.

AN EPIDEMIOLOGICAL STUDY OF PETROLEUM REFINERY WORKERS HAS REPORTED ELEVATIONS IN STANDARD MORTALITY RATIOS FOR SKIN CANCER ALONG WITH A DOSE-RESPONSE RELATIONSHIP WHICH INDICATES AN ASSOCIATION BETWEEN ROUTINE WORKPLACE EXPOSURE TO PETROLEUM OR ONE OF ITS CONSTITUENTS AND SKIN CANCER, PARTICULARLY MELANOMA.

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

EYE CONTACT:
JET FUEL JP-5:
IRRITANT

ACUTE EXPOSURE- MAY CAUSE SLIGHT IRRITATION.

CHRONIC EXPOSURE- NO EFFECTS REPORTED; REPEATED EXPOSURE MAY CAUSE CONJUNCTIVITIS.

FIRST AID- WASH EYES IMMEDIATELY WITH LARGE AMOUNTS OF WATER OR NORMAL SALINE, OCCASIONALLY LIFTING UPPER AND LOWER LIDS, UNTIL NO EVIDENCE OF CHEMICAL

REMAINS (APPROXIMATELY 15-20 MINUTES). GET MEDICAL ATTENTION IMMEDIATELY.

INGESTION:
JET FUEL JP-5:
NARCOTIC.
ACUTE EXPOSURE- MAY CAUSE IRRITATION OF THE MOUTH, THROAT AND STOMACH WITH NAUSEA AND VOMITING. IN HUMANS, AS LITTLE AS 1/2 OUNCE HAS BEEN LETHAL, BUT AS MUCH AS 8 OUNCES HAS BEEN TOLERATED. ANIMAL EXPERIMENTS INDICATE THAT ASPIRATION INCREASES THE TOXICITY GREATLY. ASPIRATION OF 1 ML, OR LESS, MAY PRODUCE CHEMICAL PNEUMONITIS, WITH AN INCREASED RESPIRATORY RATE, TACHYCARDIA AND CYANOSIS. PROMINENT ENDOTHELIAL DAMAGE, PULMONARY HEMORRHAGE AND EDEMA, POSSIBLY COMPLICATED BY SECONDARY BACTERIAL PNEUMONIA ARE THE MOST SERIOUS SEQUELAE TO ASPIRATION. DEATH CAUSED BY HEMORRHAGIC PULONARY EDEMA USUALLY OCCURS WITHIN 16-18 HOURS AND SELDOM AFTER 24 HOURS. OCCASIONALLY EMPHYSEMA AND PNEUMOTHORAX MAY OCCUR. BRONCHOPNEUMONIA AND PULMONARY COLLAPSE HAVE BEEN NOTED. RENAL INVOLVEMENT WITH PROTEINURIA IS POSSIBLE FOLLOWING ASPIRATION. IF ASPIRATION DOES NOT OCCUR, LARGE QUANTITIES MAY BE TOLERATED IN THE STOMACH WITHOUT PULMONARY INJURY, ALTHOUGH IT IS UNCLEAR WHETHER PULMONARY SYMPTOMS CAN OCCUR FROM INGESTION WITHOUT ASPIRATION. IF MORE THAN 1 ML/KG IS INGESTED AND RETAINED, SYMPTOMS OF CENTRAL NERVOUS SYSTEM DEPRESSION MAY OCCUR WITH WEAKNESS, DIZZINESS, SLOW AND SHALLOW RESPIRATION, UNCONSCIOUSNESS AND CONVULSIONS. VENTRICULAR FIBRILLATION MAY OCCUR.
CHRONIC EXPOSURE- NOT REPORTED TO OCCUR IN HUMANS. NO DATA AVAILABLE.

FIRST AID- REMOVE CHEMICAL BY GASTRIC LAVAGE WITH ACTIVATED CHARCOAL AND A CUFFED ENDOTRACHEAL TUBE TO PREVENT ASPIRATION. IN THE ABSENCE DEPRESSION, CONVULSION, OR IMPAIRED GAG REFLEX , IPECAC EMESIS MAY BE DONE. WHEN VOMITING OCCURS, KEEP HEAD LOWER THAN HIPS TO HELP PREVENT ASPIRATION. AFTER VOMITING STOPS, GIVE 30-60 MILLILITERS OF FLEET'S PHOSPHO-SODA DILUTED 1:4 IN WATER. MAINTAIN AIRWAY, BLOOD PRESSURE AND RESPIRATION. GET MEDICAL ATTENTION. LAVAGE MUST BE PERFORMED BY QUALIFIED MEDICAL PERSONNEL. (DRIESBACH, HANDBOOK OF POISONING, 11TH ED.)

ANTIDOTE:
NO SPECIFIC ANTIDOTE. TREAT SYMPTOMATICALLY AND SUPPORTIVELY.

REACTIVITY SECTION

REACTIVITY:
STABLE UNDER NORMAL TEMPERATURES AND PRESSURES.

INCOMPATIBILITIES:
JET FUEL JP-5:
STRONG OXIDIZERS: FIRE AND EXPLOSION HAZARD.

DECOMPOSITION:
THERMAL DECOMPOSITION PRODUCTS MAY INCLUDE TOXIC OXIDES OF SULFUR AND CARBON.

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

CONDITIONS TO AVOID

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

SPILLS AND LEAKS

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

PROTECTIVE EQUIPMENT SECTION

VENTILATION:
PROVIDE LOCAL EXHAUST VENTILATION AND/OR GENERAL DILUTION VENTILATION TO MEET PUBLISHED EXPOSURE LIMITS.

RESPIRATOR:
HIGH LEVELS- CHEMICAL CARTRIDGE RESPIRATOR WITH AN ORGANIC VAPOR CARTRIDGE.

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

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

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

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

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

AUTHORIZED BY- OCCUPATIONAL HEALTH SERVICES, INC.

CREATION DATE: 03/15/85 REVISION DATE: 03/28/90

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MATERIAL SAFETY DATA SHEET OHS14930

OCCUPATIONAL HEALTH SERVICES, INC.
450 SEVENTH AVENUE, SUITE 2407
NEW YORK, NEW YORK 10123
(800) 445-MSDS (212) 967-1100

EMERGENCY CONTACT:
JOHN S. BRANSFORD, JR. (615) 292-1180

SUBSTANCE IDENTIFICATION

CAS-NUMBER 75-09-2
RTEC-NUMBER PA8050000

SUBSTANCE: DICHLOROMETHANE

TRADE NAMES/SYNONYMS:
METHANE, DICHLORO-: METHYLENE CHLORIDE: METHYLENE DICHLORIDE: AEROTHENE MM: NARKOTIL: SOLAESTHIN: SOLMETHINE: TC 523 EPOXY DISSOLVER (TECHFORM): LACCO METHYLENE CHLORIDE (PPG INDUSTRIES INC.): AEROTHENE (R) MM SOLVENT (DOW CHEMICAL): EQUIPMENT FLUSHING SOLVENT (LOCTITE CORPORATION): LS-303 (POLYTECH): 20-8135 STRIP SOLVE (BUEHLER LTD.): RCRA U080: STCC 4941132: UN 1593: CH2CL2: OHS14930

CHEMICAL FAMILY:
HALOGEN COMPOUND, ALIPHATIC

MOLECULAR FORMULA: C-H2-CL2 MOLECULAR WEIGHT: 84.93

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

COMPONENTS AND CONTAMINANTS

COMPONENT: DICHLOROMETHANE PERCENT: 100.0

OTHER CONTAMINANTS: NONE

EXPOSURE LIMIT:
DICHLOROMETHANE (METHYLENE CHLORIDE):
500 PPM OSHA TWA; 1000 PPM OSHA CEILING; 2000 PPM/5 MIN IN 2 HOURS OSHA PEAK
50 PPM (174 MG/M3) ACGIH TWA
ACGIH A2- SUSPECTED HUMAN CARCINOGEN.
LOWEST FEASIBLE LIMIT NIOSH RECOMMENDED EXPOSURE CRITERIA

1000 POUNDS CERCLA SECTION 103 REPORTABLE QUANTITY
SUBJECT TO SARA SECTION 313 ANNUAL TOXIC CHEMICAL RELEASE REPORTING
SUBJECT TO CALIFORNIA PROPOSITION 65 CANCER AND/OR REPRODUCTIVE TOXICITY WARNING AND RELEASE REQUIREMENTS- (APRIL 1, 1988)

PHYSICAL DATA

DESCRIPTION: CLEAR, COLORLESS LIQUID WITH A MILD, CHLOROFORM-LIKE ODOR.

BOILING POINT: 104 F (40 C) MELTING POINT: -139 F (-95 C)

SPECIFIC GRAVITY: 1.3266 EVAPORATION RATE: (BUTYL ACETATE=1)
27.5

VOLATILITY: 100%

SOLUBILITY IN WATER: 1.32% @ 20 C

VAPOR DENSITY: 2.9

VAPOR PRESSURE: 400 MMHG @ 24 C

ODOR-THRESHOLD: 25-50 PPM

OTHER SOLVENTS (SOLVENT - SOLUBILITY):
SOLUBLE IN ALCOHOL, ETHER, DIMETHYLFORMAMIDE, PHENOLS, ALDEHYDES, KETONES, GLACIAL ACETIC ACID, TRIETHYL PHOSPHATE, ACETOACETIC ACID, CYCLOHEXYLAMINE, CHLORINATED SOLVENTS.

OTHER PHYSICAL DATA
VISCOSITY: 0.441 CPS @ 20 C

FIRE AND EXPLOSION DATA

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

UPPER EXPLOSION LIMIT: 22%

LOWER EXPLOSION LIMIT: 14%

AUTOIGNITION TEMP.: 1033 F (556 C)

FLAMMABILITY CLASS (OSHA): IIIB

FIREFIGHTING MEDIA:
DRY CHEMICAL, CARBON DIOXIDE OR HALON
(1987 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.4).

FOR LARGER FIRES, USE WATER SPRAY, FOG OR STANDARD FOAM
(1987 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.4).

FIREFIGHTING:
STAY AWAY FROM STORAGE TANK ENDS. COOL CONTAINERS EXPOSED TO FLAMES WITH WATER FROM SIDE UNTIL WELL AFTER FIRE IS OUT (1987 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.4, GUIDE PAGE 74).

EXTINGUISH USING AGENTS SUITABLE FOR SURROUNDING FIRE. USE FLOODING QUANTITIES OF WATER TO COOL AFFECTED CONTAINERS, APPLYING FROM AS FAR A DISTANCE AS POSSIBLE. AVOID BREATHING HAZARDOUS VAPORS, KEEP UNWIND.

TRANSPORTATION

DEPARTMENT OF TRANSPORTATION HAZARD CLASSIFICATION 49CFR172.101:
ORM-A

DEPARTMENT OF TRANSPORTATION LABELING REQUIREMENTS 49CFR172.101 AND SUBPART E:
NONE

DEPARTMENT OF TRANSPORTATION PACKAGING REQUIREMENTS: 49CFR173.605
EXCEPTIONS: 49CFR173.505

TOXICITY

DICHLOROMETHANE (METHYLENE CHLORIDE):
IRRITATION DATA: 162 MG EYE-RABBIT MODERATE; 10 MG EYE-RABBIT MILD; 500 MG/24 HOURS EYE-RABBIT MILD; 810 MG/24 HOURS SKIN-RABBIT SEVERE; 100 MG/24 HOURS SKIN-RABBIT MODERATE.
TOXICITY DATA: 500 PPM/1 YEAR-INTERMITTENT INHALATION-HUMAN TCLO; 500 PPM/8 HOURS INHALATION-HUMAN TCLO; 88000 MG/M3/30 MINUTES INHALATION-RAT LC50; 14400 PPM/7 HOURS INHALATION-MOUSE LC50; 10000 PPM/7 HOURS INHALATION-RABBIT LCLO; 5000 PPM/2 HOURS INHALATION-GUINEA PIG LCLO; 14108 PPM/7 HOURS INHALATION-DOG LCLO; 43400 MG/M3/4.5 HOURS INHALATION-CAT LCLO; 357 MG/KG ORAL-HUMAN LDLO; 1600 MG/KG ORAL-RAT LD50; 1900 MG/KG ORAL-RABBIT LDLO; 3 GM/KG ORAL-DOG LDLO; 6460 MG/KG SUBCUTANEOUS-MOUSE LD50; 2700 MG/KG SUBCUTANEOUS-RABBIT LDLO; 2700 MG/KG SUBCUTANEOUS-DOG LDLO; 200 MG/KG INTRAVENOUS-DOG LDLO; 916 MG/KG INTRAPERITONEAL-RAT LD50; 950 MG/KG INTRAPERITONEAL-DOG LDLO; 437 MG/KG INTRAPERITONEAL-MOUSE LD50; 4770 MG/KG UNREPORTED-MOUSE LD50; MUTAGENIC DATA (RTECS); REPRODUCTIVE EFFECTS DATA (RTECS); TUMORIGENIC DATA (RTECS).
CARCINOGEN STATUS: ANTICIPATED HUMAN CARCINOGEN (NTP); HUMAN INADEQUATE EVIDENCE, ANIMAL SUFFICIENT EVIDENCE (IARC CLASS-2B). EXPOSURE BY INHALATION INCREASED THE INCIDENCE OF BENIGN AND MALIGNANT LUNG AND LIVER TUMORS IN MICE OF EACH SEX AND THE INCIDENCE OR MULTIPLICITY OF BENIGN MAMMARY TUMORS IN RATS OF EACH SEX; IN MALE RATS, AN INCREASED INCIDENCE OF SARCOMAS LOCATED IN THE NECK WAS ALSO OBSERVED.
LOCAL EFFECTS: IRRITANT- INHALATION, SKIN, EYE.
ACUTE TOXICITY LEVEL: MODERATELY TOXIC BY INHALATION AND INGESTION.
TARGET EFFECTS: CENTRAL NERVOUS SYSTEM DEPRESSANT; CHEMICAL ASPHYXIANT. POISONING MAY AFFECT THE BLOOD, LIVER AND KIDNEYS.
AT INCREASED RISK FROM EXPOSURE: PERSONS WITH SKIN, LIVER, KIDNEY, CARDIOVASCULAR DISEASE OR ANEMIA.
ADDITIONAL DATA: CONCURRENT EXPOSURE TO OTHER SOURCES OF CARBON MONOXIDE, SMOKING, OR PHYSICAL ACTIVITY MAY INCREASE THE LEVEL OF CARBOXYHEMOGLOBIN IN THE BLOOD RESULTING IN ADDITIVE EFFECTS. ALCOHOLIC BEVERAGES MAY ENHANCE THE TOXIC EFFECTS. STIMULANTS SUCH AS EPINEPHRINE MAY INDUCE CARDIAC ARRHYTHMIAS. ONE STUDY INDICATED THAT CHRONIC EXPOSURE MAY BE ASSOCIATED WITH AN INCREASED RISK OF SPONTANEOUS ABORTION. DICHLOROMETHANE CROSSES THE PLACENTAL BARRIER AND IS EXCRETED IN HUMAN MILK.

HEALTH EFFECTS AND FIRST AID

INHALATION:
DICHLOROMETHANE (METHYLENE CHLORIDE):
IRRITANT/NARCOTIC/CHEMICAL ASPHYXIANT/CARCINOGEN.
ACUTE EXPOSURE- HUMAN EXPOSURE TO 100 PPM HAS RESULTED IN UPPER RESPIRATORY TRACT IRRITATION; CONCENTRATIONS AS LOW AS 200 PPM HAVE PRODUCED TEMPORARY NEUROBEHAVIOURAL EFFECTS; 500-1000 PPM FOR 1-2 HOURS HAS CAUSED LIGHTHEADEDNESS AND ELEVATED CARBOXYHEMOGLOBIN LEVEL; 2300 PPM FOR 30 MINUTES HAS CAUSED NAUSEA AND NARCOSIS; 5000 PPM HAS CAUSED HEADACHE, FATIGUE, NEURASTHENIC DISORDERS AND DIGESTIVE DISTURBANCES. OTHER SYMPTOMS MAY INCLUDE DIZZINESS, TINGLING, NUMBNESS OF THE EXTREMITIES, A SENSATION OF HEAT, A SENSATION OF FULLNESS IN THE HEAD, DRUNKENNESS, STUPOR, DULLNESS AND MENTAL CONFUSION. MASSIVE EXPOSURE MAY CAUSE PHARYNGEAL EROSION, PULMONARY EDEMA, STAGGERING, HEMOLYSIS WITH GROSS HEMATURIA, RAPID UNCONSCIOUSNESS AND DEATH. RECOVERY IS GENERALLY COMPLETE IF EXPOSURE IS TERMINATED BEFORE ANESTHETIC DEATH. EXPOSURE TO

HIGH LEVELS MAY ALSO CAUSE CARDIAC ARRHYTHMIAS.
CHRONIC EXPOSURE- MORE THAN 100 WORKERS EXPOSED TO LEVELS BELOW 500 PPM HAVE DEVELOPED HEALTH PROBLEMS INCLUDING SIGNIFICANT UPPER RESPIRATORY IRRITATION, EXACERBATION OF CORONARY ARTERY DISEASE, AND A HIGH INCIDENCE OF NEUROTOXICITY; INCREASED COMPLAINTS OF CHEST PAINS WERE REPORTED AT CONCENTRATIONS OF 10 TO 35 PPM. REPEATED HUMAN EXPOSURE TO 500-3600 PPM HAS CAUSED SIGNS OF TOXIC ENCEPHALOPATHY WITH ACOUSTICAL AND OPTICAL DELUSIONS AND HALLUCINATIONS. A CASE OF SERIOUS CEREBRAL DETERIORATION WAS OBSERVED IN AN INDIVIDUAL EXPOSED FOR SEVERAL YEARS TO DICHLOROMETHANE. IN A MORTALITY STUDY OF TWO GROUPS OF WORKERS, ONE EXPOSED TO ACETONE AND THE OTHER TO DICHLOROMETHANE AND ACETONE, A STATISTICALLY SIGNIFICANT DIFFERENCE IN DEATHS FROM DISEASES OF THE CIRCULATORY SYSTEM AND FROM ISCHEMIC HEART DISEASE WERE REPORTED FROM THE DICHLOROMETHANE AND ACETONE GROUP. IN ANOTHER MORTALITY STUDY OF WORKERS EXPOSED TO DICHLOROMETHANE, A SIGNIFICANT INCREASE IN HYPERTENSIVE DISEASE AND A "SUGGESTIVE EXCESS" OF PANCREATIC CANCER WERE REPORTED. LIVER DISEASE HAS BEEN REPORTED IN WORKERS. IN ONE STUDY, AN INCREASE IN SERUM BILIRUBIN WAS OBSERVED IN EXPOSED WORKERS, BUT NO OTHER SIGN OF LIVER INJURY OR HEMOLYSIS WAS REPORTED. ADVERSE LIVER EFFECTS WERE OBSERVED IN SEVERAL ANIMAL SPECIES CHEMICALLY EXPOSED. TESTICULAR ATROPHY WAS REPORTED IN MICE EXPOSED TO 4000 PPM OVER 2 YEARS. REPEATED INHALATION BY RODENTS PRIOR TO AND/OR DURING GESTATION CAUSED FETAL SKELETAL ABNORMALITIES AND BEHAVIORAL EFFECTS IN NEWBORN OFFSPRING. REPEATED INHALATION INCREASED THE INCIDENCE OF BENIGN AND MALIGNANT LUNG AND LIVER TUMORS IN MICE OF EACH SEX AND THE INCIDENCE OR MULTIPLICITY OF BENIGN MAMMARY TUMORS IN RATS OF EACH SEX; IN MALE RATS, AN INCREASED INCIDENCE OF SARCOMAS LOCATED IN THE NECK WAS ALSO OBSERVED.

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

SKIN CONTACT:
DICHLOROMETHANE (METHYLENE CHLORIDE):
IRRITANT.
ACUTE EXPOSURE- MAY CAUSE EFFECTS RANGING FROM MILD IRRITATION TO SEVERE PAIN, PARESTHESIAS, AND POSSIBLY BURNS, DEPENDING ON THE INTENSITY OF CONTACT.
CHRONIC EXPOSURE- PROLONGED OR REPEATED CONTACT MAY CAUSE A DRY, SCALY AND FISSURED DERMATITIS DUE TO DEFATTING ACTION OF LIQUID ON SKIN.

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

EYE CONTACT:
DICHLOROMETHANE (METHYLENE CHLORIDE):
IRRITANT.
ACUTE EXPOSURE- VAPOR CONCENTRATIONS ABOVE 2000 PPM MAY CAUSE IRRITATION. DIRECT CONTACT MAY CAUSE PAIN AND EXTREME IRRITATION, BUT IT IS NOT LIKELY TO CAUSE SERIOUS INJURY. 10 MG APPLIED TO RABBIT EYES PRODUCED KERATITIS, IRITIS, INCREASED CORNEAL THICKNESS, AND INFLAMMATION OF THE CONJUNCTIVA AND EYELIDS WITH SOME EFFECTS LASTING UP TO TWO WEEKS.
CHRONIC EXPOSURE- REPEATED OR PROLONGED EXPOSURE TO IRRITANTS MAY CAUSE CONJUNCTIVITIS.

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

INGESTION:
DICHLOROMETHANE (METHYLENE CHLORIDE):
NARCOTIC/CHEMICAL ASPHYXIANT.
ACUTE EXPOSURE: MAY CAUSE RAPID, THEN SLOWED RESPIRATION, GLOTTAL AND PHARYNGEAL EDEMA, INTRAVASCULAR HEMOLYSIS WITH GROSS HEMATURIA, GASTROINTESTINAL ULCERATION AND HEMORRHAGE, AND CARBOXYHEMOGLOBINEMIA. THESE SYMPTOMS MAY PROGRESS RAPIDLY TO UNCONSCIOUSNESS AND LACK OF RESPONSE TO PAINFUL STIMULI. PHARYNGEAL EROSIONS MAY DISTURB THE SWALLOWING MECHANISM RESULTING IN ASPIRATION PNEUMONIA. IN ADDITION, SYMPTOMS OF CENTRAL NERVOUS SYSTEM DEPRESSION MAY OCCUR FOLLOWED BY CONVULSIONS AND PARESTHESIA OF THE EXTREMITIES. LARGE DOSES MAY CAUSE LIVER AND KIDNEY DAMAGE. THE ESTIMATED LETHAL DOSE FOR AN ADULT IS 25 GRAMS.
CHRONIC EXPOSURE- REPEATED INGESTION BY RATS AND MICE RESULTED IN HISTOMORPHOLOGICAL CHANGES IN THE LIVER.

FIRST AID- REMOVE BY GASTRIC LAVAGE OR EMESIS. MAINTAIN BLOOD PRESSURE AND AIRWAY. GIVE OXYGEN IF RESPIRATION IS DEPRESSED. DO NOT PERFORM GASTRIC LAVAGE OR EMESIS IF VICTIM IS UNCONSCIOUS. GET MEDICAL ATTENTION IMMEDIATELY (DREISBACH, HANDBOOK OF POISONING, 11TH ED.). ADMINISTRATION OF GASTRIC LAVAGE OR OXYGEN SHOULD BE PERFORMED BY QUALIFIED MEDICAL PERSONNEL.

ANTIDOTE:
NO SPECIFIC ANTIDOTE. TREAT SYMPTOMATICALLY AND SUPPORTIVELY.

REACTIVITY SECTION

REACTIVITY:
STABLE UNDER NORMAL TEMPERATURES AND PRESSURES.

INCOMPATIBILITIES:
DICHLOROMETHANE (METHYLENE CHLORIDE):
ALKALI METALS: POSSIBLE EXPLOSIVE REACTION.
ALUMINUM: VIOLENT, UNCONTROLLABLE REACTION ABOVE 95 C.
CAUSTICS (STRONG): VIGOROUS, POSSIBLY VIOLENT REACTION.
COPPER: MAY CORRODE AT ELEVATED TEMPERATURES IN THE PRESENCE OF MOISTURE.
DINITROGEN PENTOXIDE: POSSIBLE EXPLOSION.
DINITROGEN TETROXIDE: FORMS SHOCK-SENSITIVE MIXTURE.
IRON: MAY CORRODE AT ELEVATED TEMPERATURES IN THE PRESENCE OF MOISTURE.
LITHIUM: FORMS SHOCK-SENSITIVE MIXTURE.
MAGNESIUM: POSSIBLE EXPLOSION.
NICKEL: MAY CORRODE AT ELEVATED TEMPERATURES IN THE PRESENCE OF MOISTURE.
NITRIC ACID: EXOTHERMIC REACTION YIELDING DETONABLE SOLUTION.
OXIDIZERS (STRONG): FIRE AND EXPLOSION HAZARD.
OXYGEN (LIQUID): EXPLOSIVE REACTION ON IGNITION.
PLASTICS, RUBBER, AND COATINGS: MAY BE ATTACKED.
POTASSIUM: EXPLOSIVE REACTION.
POTASSIUM HYDROXIDE + N-METHYL-N-NITROSO UREA: POSSIBLE EXPLOSION.
POTASSIUM TERT-BUTOXIDE: IGNITION REACTION.
SODIUM: FORMS SHOCK-SENSITIVE MIXTURE.

SODIUM-POTASSIUM ALLOY: FORMS SHOCK-SENSITIVE MIXTURE.
STAINLESS STEEL: MAY CORRODE AT ELEVATED TEMPERATURES IN THE PRESENCE OF MOISTURE.
TITANIUM: POSSIBLE VIOLENT REACTION.
ZINC: POSSIBLE VIOLENT REACTION.

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

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

STORAGE-DISPOSAL

OBSERVE ALL FEDERAL, STATE AND LOCAL REGULATIONS WHEN STORING OR DISPOSING OF THIS SUBSTANCE. FOR ASSISTANCE, CONTACT THE DISTRICT DIRECTOR OF THE ENVIRONMENTAL PROTECTION AGENCY.

STORAGE

PROTECT AGAINST PHYSICAL DAMAGE. STORE IN COOL, DRY, WELL VENTILATED LOCATION, AWAY FROM ANY AREA WHERE THE FIRE HAZARD MAY BE ACUTE (NFPA 49, HAZARDOUS CHEMICALS DATA, 1975).

STORE AWAY FROM INCOMPATIBLE SUBSTANCES.

DISPOSAL

DISPOSAL MUST BE IN ACCORDANCE WITH STANDARDS APPLICABLE TO GENERATORS OF HAZARDOUS WASTE, 40CFR 262. EPA HAZARDOUS WASTE NUMBER U080.

CONDITIONS TO AVOID

MAY BURN BUT DOES NOT IGNITE READILY. CONTAINER MAY EXPLODE IN HEAT OF FIRE.

SPILLS AND LEAKS

SOIL-RELEASE:
DIG HOLDING AREA SUCH AS LAGOON, POND OR PIT FOR CONTAINMENT.

DIKE FLOW OF SPILLED MATERIAL USING SOIL OR SANDBAGS OR FOAMED BARRIERS SUCH AS POLYURETHANE OR CONCRETE.

USE CEMENT POWDER OR FLY ASH TO ABSORB LIQUID MASS.

AIR-RELEASE:
APPLY WATER SPRAY TO KNOCK DOWN VAPORS.

WATER-SPILL:
TRAP SPILLED MATERIAL AT BOTTOM IN DEEP WATER POCKETS, EXCAVATED HOLDING AREAS OR WITHIN SAND BAG BARRIERS.

USE SUCTION HOSES TO REMOVE TRAPPED SPILL MATERIAL.

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

OCCUPATIONAL-SPILL:
SHUT OFF IGNITION SOURCES. STOP LEAK IF YOU CAN DO IT WITHOUT RISK. FOR SMALL LIQUID SPILLS, TAKE UP WITH SAND, EARTH OR OTHER ABSORBENT MATERIAL. FOR LARGER SPILLS, DIKE FAR AHEAD OF SPILL FOR LATER DISPOSAL. NO SMOKING, FLAMES OR FLARES IN HAZARD AREA! KEEP UNNECESSARY PEOPLE AWAY.

REPORTABLE QUANTITY (RQ): 1000 POUNDS
THE SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT (SARA) SECTION 304 REQUIRES THAT A RELEASE EQUAL TO OR GREATER THAN THE REPORTABLE QUANTITY FOR THIS SUBSTANCE BE IMMEDIATELY REPORTED TO THE LOCAL EMERGENCY PLANNING COMMITTEE AND THE STATE EMERGENCY RESPONSE COMMISSION (40 CFR 355.40). IF THE RELEASE OF THIS SUBSTANCE IS REPORTABLE UNDER CERCLA SECTION 103, THE NATIONAL RESPONSE CENTER MUST BE NOTIFIED IMMEDIATELY AT (800) 424-8802 OR (202) 426-2675 IN THE METROPOLITAN WASHINGTON, D.C. AREA (40 CFR 302.6).

PROTECTIVE EQUIPMENT SECTION

VENTILATION:
PROVIDE LOCAL EXHAUST VENTILATION AND/OR GENERAL DILUTION VENTILATION TO MEET PUBLISHED EXPOSURE LIMITS.

RESPIRATOR:
THE FOLLOWING RESPIRATORS AND MAXIMUM USE CONCENTRATIONS ARE RECOMMENDATIONS BY THE U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES, NIOSH POCKET GUIDE TO CHEMICAL HAZARDS; NIOSH CRITERIA DOCUMENTS OR BY THE U.S. DEPARTMENT OF LABOR, 29 CFR 1910 SUBPART Z.
THE SPECIFIC RESPIRATOR SELECTED MUST BE BASED ON CONTAMINATION LEVELS FOUND IN THE WORK PLACE, MUST NOT EXCEED THE WORKING LIMITS OF THE RESPIRATOR AND BE JOINTLY APPROVED BY THE NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH AND THE MINE SAFETY AND HEALTH ADMINISTRATION (NIOSH-MSHA).

FOR DICHLOROMETHANE (METHYLENE CHLORIDE):
AT ANY DETECTABLE CONCENTRATION:

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

ESCAPE- ANY AIR-PURIFYING FULL FACEPIECE RESPIRATOR (GAS MASK) WITH ORGANIC VAPOR CANISTER.
ANY APPROPRIATE ESCAPE-TYPE SELF-CONTAINED BREATHING APPARATUS.

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

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

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

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

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

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

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

AUTHORIZED BY- OCCUPATIONAL HEALTH SERVICES, INC.

CREATION DATE: 09/26/84 REVISION DATE: 11/27/89

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MATERIAL SAFETY DATA SHEET OHS22900

OCCUPATIONAL HEALTH SERVICES, INC.
450 SEVENTH AVENUE, SUITE 2407
NEW YORK, NEW YORK 10123
(800) 445-MSDS (212) 967-1100

EMERGENCY CONTACT:
JOHN S. BRANSFORD, JR. (615) 292-1180

SUBSTANCE IDENTIFICATION

CAS-NUMBER 127-18-4
RTEC-NUMBER KX3850000

SUBSTANCE: TETRACHLOROETHYLENE

TRADE NAMES/SYNONYMS:
ETHENE, TETRACHLORO-: ETHYLENE, TETRACHLORO-: ANKILOSTIN: DIDAKEN: NEMA: ETHYLENE TETRACHLORIDE: PERCHLOROETHYLENE: PERC: PERCHLOROETHENE: PERCLENE: 1,1,2,2-TETRACHLOROETHYLENE: TETRACAP: TETRACHLOROETHENE: LASER GUARD (DYNATEX CORPORATION): RCRA U210: NCI-C04580: ENT 1,860: STCC 4940355: UN 1897: C2CL4: OHS22900

CHEMICAL FAMILY:
HALOGEN COMPOUND, ALIPHATIC

MOLECULAR FORMULA: CL2-C-C-CL2 MOLECULAR WEIGHT: 165.83

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

COMPONENTS AND CONTAMINANTS

COMPONENT: TETRACHLOROETHYLENE PERCENT: 100.0

OTHER CONTAMINANTS: NONE

EXPOSURE LIMIT:
TETRACHLOROETHYLENE (PERCHLOROETHYLENE):
25 PPM (170 MG/M3) OSHA TWA
50 PPM (335 MG/M3) ACGIH TWA; 200 PPM (1340 MG/M3) ACGIH STEL
LOWEST FEASIBLE LIMIT NIOSH RECOMMENDED EXPOSURE CRITERIA

100 POUND CERCLA SECTION 103 REPORTABLE QUANTITY
SUBJECT TO SARA SECTION 313 ANNUAL TOXIC CHEMICAL RELEASE REPORTING
SUBJECT TO CALIFORNIA PROPOSITION 65 CANCER AND/OR REPRODUCTIVE TOXICITY WARNING AND RELEASE REQUIREMENTS- (APRIL 1, 1988)

PHYSICAL DATA

DESCRIPTION: CLEAR, COLORLESS, VOLATILE LIQUID WITH A MILD ETHER-LIKE ODOR.

BOILING POINT: 250 F (121 C) MELTING POINT: -2 F (-19 C)

SPECIFIC GRAVITY: 1.6227 EVAPORATION RATE: (BUTYL ACETATE=1) 2.8

VOLATILITY: 100% SOLUBILITY IN WATER: 0.015%

VAPOR DENSITY: 5.83 VAPOR PRESSURE: 14 MMHG @ 20 C

ODOR-THRESHOLD: 50 PPM

OTHER SOLVENTS (SOLVENT - SOLUBILITY):
SOLUBLE IN ALCOHOL, ETHER, BENZENE, CHLOROFORM, OILS, HEXANE.

FIRE AND EXPLOSION DATA

FIRE AND EXPLOSION HAZARD
NEGLIGIBLE FIRE HAZARD WHEN EXPOSED TO HEAT OR FLAME.

FIREFIGHTING MEDIA:
DRY CHEMICAL, CARBON DIOXIDE OR HALON
(1987 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.4).

FOR LARGER FIRES, USE WATER SPRAY, FOG OR STANDARD FOAM
(1987 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.4).

FIREFIGHTING:
STAY AWAY FROM STORAGE TANK ENDS. COOL CONTAINERS EXPOSED TO FLAMES WITH WATER FROM SIDE UNTIL WELL AFTER FIRE IS OUT (1987 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.4, GUIDE PAGE 74).

EXTINGUISH USING AGENT(S) SUITABLE FOR TYPE OF SURROUNDING FIRE. AVOID CONTAMINATION OF WATER SOURCES AND SEWERS. BUILD DIKES TO CONTAIN FLOW. AVOID BREATHING VAPORS; KEEP UPWIND.

TRANSPORTATION

DEPARTMENT OF TRANSPORTATION HAZARD CLASSIFICATION 49CFR172.101:
ORM-A

DEPARTMENT OF TRANSPORTATION LABELING REQUIREMENTS 49CFR172.101 AND SUBPART E:
NONE

DEPARTMENT OF TRANSPORTATION PACKAGING REQUIREMENTS: 49CFR173.605
EXCEPTIONS: 49CFR173.505

TOXICITY

TETRACHLOROETHYLENE (PERCHLOROETHYLENE):
IRRITATION DATA: 810 MG/24 HOURS SKIN-RABBIT SEVERE; 500 MG/24 HOURS SKIN-RABBIT MILD; 162 MG EYE-RABBIT MILD; 500 MG/24 HOURS EYE-RABBIT MILD.
TOXICITY DATA: 96 PPM/7 HOURS INHALATION-HUMAN TCLO; 280 PPM/2 HOURS INHALATION-MAN TCLO; 2857 MG/KG INHALATION-MAN LDLO; 600 PPM/10 MINUTES INHALATION-MAN TCLO; 34,200 MG/M3/8 HOURS INHALATION-RAT LC50; 5200 PPM/4 HOURS INHALATION-MOUSE LC50; >10,000 MG/KG SKIN-RABBIT LD50

(DOW MSDS); 2629 MG/KG ORAL-RAT LD50; 8100 MG/KG ORAL-MOUSE LD50; 5000 MG/KG ORAL-RABBIT LDLO; 4000 MG/KG ORAL-CAT LDLO; 4000 MG/KG ORAL-DOG LDLO; 65 GM/KG SUBCUTANEOUS-MOUSE LD50; 2200 MG/KG SUBCUTANEOUS-RABBIT LDLO; 85 MG/KG INTRAVENOUS-DOG LDLO; 4678 MG/KG INTRAPERITONEAL-RAT LD50; 2100 MG/KG INTRAPERITONEAL-DOG LD50; MUTAGENIC DATA (RTECS); REPRODUCTIVE EFFECTS DATA (RTECS); TUMORIGENIC DATA (RTECS).

CARCINOGEN STATUS: ANTICIPATED HUMAN CARCINOGEN (NTP); HUMAN INADEQUATE EVIDENCE, ANIMAL SUFFICIENT EVIDENCE (IARC CLASS-2B). IN MICE, ORAL ADMINISTRATION AND INHALATION PRODUCED HEPATOCELLULAR CARCINOMAS IN BOTH SEXES. EXPOSURE OF RATS BY INHALATION PRODUCED AN INCREASED INCIDENCE OF MONONUCLEAR CELL LEUKEMIA IN BOTH SEXES.

LOCAL EFFECTS: IRRITANT- INHALATION, SKIN, EYES.

ACUTE TOXICITY LEVEL: MODERATELY TOXIC BY INHALATION, INGESTION; SLIGHTLY TOXIC BY SKIN ABSORPTION.

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

AT INCREASED RISK FROM EXPOSURE: PERSONS WITH PRE-EXISTING SKIN, EYE, LIVER, KIDNEY, CARDIOVASCULAR OR NEUROLOGICAL DISORDERS.

ADDITIONAL DATA: ALCOHOL MAY ENHANCE THE TOXIC EFFECTS. STIMULANTS SUCH AS EPINEPHRINE MAY INDUCE VENTRICULAR FIBRILLATION. MAY BE EXCRETED IN BREAST MILK.

HEALTH EFFECTS AND FIRST AID

INHALATION:

TETRACHLOROETHYLENE (PERCHLOROETHYLENE):

IRRITANT/NARCOTIC/CARCINOGEN.

ACUTE EXPOSURE- VAPOR CONCENTRATIONS FROM 100-400 PPM MAY CAUSE IRRITATION OF THE NOSE, THROAT AND MUCOUS MEMBRANES, FLUSHED FACE AND NECK, SINUS CONGESTION, NASAL DISCHARGE, HEADACHE, DIZZINESS, LIGHTHEADEDNESS, DROWSINESS, THICK TONGUE, TIGHTNESS AROUND THE MOUTH, SLURRED SPEECH, CONFUSION, INCOORDINATION, NAUSEA, AND REVERSIBLE LIVER AND KIDNEY CHANGES; 400-600 PPM MAY CAUSE SALIVATION, METALLIC TASTE, PERSPIRATION OF THE HANDS, AND LOSS OF INHIBITIONS; 1000-2000 PPM MAY CAUSE MARKED UPPER RESPIRATORY IRRITATION, ANESTHESIA OF THE LIPS AND NOSE, CONGESTED EUSTACHIAN TUBES, ACHING FACIAL MUSCLES, INEBRIATION, EXHILARTION, MENTAL SLUGGISHNESS, LASSITUDE, GAGGING, FAINTNESS, TINNITUS, DYSPNEA UPON EXERTION, NARCOSIS, AND LIVER AND KIDNEY DAMAGE. OTHER REPORTED SYMPTOMS INCLUDE WEAKNESS, ATAXIA, COUGHING, CHEST PAINS, RAPID, WEAK PULSE, BLURRED VISION, IRRITABILITY, ANOREXIA, VOMITING, HALLUCINATIONS, DISTORTED PERCEPTIONS, ACIDOSIS, LATENT JAUNDICE AND ABNORMAL LIVER FUNCTION TESTS, ALBUMINURIA, HEMATURIA, ANURIA, AND PREMATURE VENTRICULAR BEATS. MASSIVE EXPOSURES MAY CAUSE PULMONARY EDEMA, UNCONSCIOUSNESS, COMA AND DEATH FROM ANESTHESIA OR RESPIRATORY ARREST. IN ONE FATAL CASE, PATHOLOGIC FINDINGS INCLUDED CENTRAL FATTY NECROSIS AND FATTY INFILTRATION OF THE LIVER AND MODERATE CLOUDY SWELLING OF THE RENAL TUBULAR EPITHELIUM. EPINEPHRINE-INDUCED CARDIAC ARRHYTHMIAS HAVE OCCURRED WITH SOME HYDROCARBONS, BUT TESTING OF TETRACHLOROETHYLENE IN DOGS HAS BEEN NEGATIVE.

CHRONIC EXPOSURE- WORKERS EXPOSED TO 1-40 PPM OVER 7.5 YEARS SHOWED ALTERED ELECTRODIAGNOSTIC AND NEUROLOGICAL RATING SCORES; 4 OF 16 EXPOSED TO 60-450 PPM FOR 2-20 YEARS HAD ABNORMAL EEG'S. REPEATED EXPOSURE MAY ALSO CAUSE RESPIRATORY TRACT IRRITATION, CENTRAL NERVOUS SYSTEM DEPRESSION WITHOUT NARCOSIS, CONFUSION, HEADACHE, FATIGUE, DIZZINESS, INEBRIATION, INSOMNIA, NAUSEA, ANOREXIA, ABDOMINAL PAIN, CONSTIPATION, BLURRED VISION, MULTIPLE PREMATURE VENTRICULAR BEATS, AND PERIPHERAL NEUROPATHY WITH NUMBNESS IN THE FINGERS, TREMBLING, NEURITIS, AND MEMORY DEFECTS.

HEPATIC DAMAGE MAY OCCUR AND BE PERSISTENT. EXPOSURE TO LEVELS AROUND 250 PPM FOR 4 MONTHS HAS BEEN REPORTED TO HAVE CAUSED HEMOPTYSIS, COUGHING, SWEATING ATTACKS, JAUNDICE, OLIGURIA, HEMATEMESIS, CARDIOVASCULAR FAILURE AND DEATH. OCCASIONAL IDIOSYNCRATIC REACTIONS HAVE BEEN REPORTED INCLUDING PULMONARY EDEMA, BRONCHIAL ASTHMA, DEPENDENCY, AND HYPERSENSITIVITY. CHRONIC STUDIES IN RATS HAVE PRODUCED LIVER AND KIDNEY DAMAGE. REPRODUCTIVE EFFECTS HAVE BEEN REPORTED IN ANIMALS. INHALATION STUDIES INDICATE AN INCREASED INCIDENCE OF LIVER CARCINOMAS IN MICE AND MONONUCLEAR CELL LEUKEMIA IN RATS.

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

SKIN CONTACT:
TETRACHLOROETHYLENE (PERCHLOROETHYLENE):
IRRITANT.
ACUTE EXPOSURE- BRIEF IMMERSION OF THE HANDS IN THE LIQUID USUALLY CAUSES ONLY MILD IRRITATION. HOWEVER, THE LIQUID ON THE SKIN FOR 40 MINUTES RESULTED IN A PROGRESSIVELY SEVERE BURNING SENSATION, BEGINNING WITHIN 5-10 MINUTES, AND MARKED ERYTHEMA, WHICH SUBSIDED AFTER 1-2 HOURS. SEVERE EXPOSURES MAY RESULT IN VESICULATION AND POSSIBLY BURNS. ABSORPTION MAY OCCUR BUT IS PROBABLY NOT A SIGNIFICANT ROUTE OF EXPOSURE.
CHRONIC EXPOSURE- REPEATED OR PROLONGED SKIN CONTACT MAY PRODUCE DERMATITIS WITH DRY, SCALY, FISSURED SKIN.

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

EYE CONTACT:
TETRACHLOROETYLENE (PERCHLOROETHYLENE):
IRRITANT.
ACUTE EXPOSURE- VAPOR CONCENTRATIONS FROM 100-200 MAY CAUSE MILD IRRITATION. HIGHER LEVELS OR DIRECT CONTACT MAY CAUSE PAIN, LACRIMATION, AND BURNING, BUT SERIOUS INJURY IS UNLIKELY. AT 1500 PMM, THE IRRITATION IS ALMOST INTOLERABLE. TWO STUDIES OF DIRECT APPLICATION TO RABBIT EYES RESULTED IN CONJUNCTIVITIS AND EFFECTS ON THE CORNEAL EPITHELIUM; RECOVERY WAS COMPLETE IN 2 DAYS TO 2 WEEKS.
CHRONIC EXPOSURE- REPEATED OR PROLONGED EXPOSURE MAY CAUSE CONJUNCTIVITIS. ONE STUDY HAS REPORTED AN INCREASED INCIDENCE OF LACRIMAL DUCT DISEASE IN EXPOSED WORKERS.

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

INGESTION:
TETRACHLOROETHYLENE (PERCHLOROETHYLENE):
NARCOTIC/CARCINOGEN.
ACUTE EXPOSURE- MAY CAUSE SEVERE GASTROINTESTINAL IRRITATION WITH NAUSEA, VOMITING, ABDOMINAL CRAMPS AND DIARRHEA, POSSIBLY WITH BLOODY STOOLS. NARCOTIC EFFECTS MAY INCLUDE HEADACHE, DIZZINESS, EXHILARATION, INEBRIATION AND OTHER EFFECTS AS IN ACUTE INHALATION. A DOSE OF 500 MG/KG HAS BEEN

INGESTED AND SURVIVED. DOGS GIVEN LETHAL DOSES EXHIBITED CARDIAC AND RESPIRATORY DEPRESSION; AUTOPSY REVEALED FATTY INFILTRATION OF THE HEART AND LIVER AND MARKED INFLAMMATION AND SHRIVELING OF THE SMALL INTESTINE.
CHRONIC EXPOSURE- LONGTERM INGESTION OF 50 MG/KG PRODUCED LIVER AND KIDNEY DAMAGE IN MICE. CHRONIC INGESTION HAS PRODUCED HEPATOCELLULAR CARCINOMAS IN MICE.

FIRST AID- IF THE PERSON IS CONSCIOUS AND NOT CONVULSING, INDUCE EMESIS BY GIVING SYRUP OF IPECAC (KEEPING THE HEAD BELOW THE HIPS TO PREVENT ASPIRATION), FOLLOWED BY WATER. REPEAT IN 20 MINUTES IF NOT EFFECTIVE INITIALLY. IN PATIENTS WITH DEPRESSED RESPIRATION OR IF EMESIS IS NOT PRODUCED, PERFORM GASTRIC LAVAGE CAUTIOUSLY (DREISBACH, HANDBOOK OF POISONING, 12TH ED.). TREAT SYMPTOMATICALLY AND SUPPORTIVELY. GASTRIC LAVAGE SHOULD BE PERFORMED BY QUALIFIED MEDICAL PERSONNEL. GET MEDICAL ATTENTION IMMEDIATELY.

ANTIDOTE:
NO SPECIFIC ANTIDOTE. TREAT SYMPTOMATICALLY AND SUPPORTIVELY.

REACTIVITY SECTION

REACTIVITY:
STABLE UNDER NORMAL TEMPERATURES AND PRESSURES.

INCOMPATIBILITIES:
TETRACHLOROETYLENE (PERCHLOROETHYLENE):
- ALUMINUM: MAY FORM EXPLOSIVE MIXTURE.
- BARIUM: FORMS A DETONABLE MIXTURE.
- BASES: MAY FORM EXPLOSIVE MIXTURE.
- BERYLLIUM: POSSIBLE EXPLOSIVE MIXTURE.
- DINITROGEN TETRAOXIDE: EXPLOSIVE WHEN SUBJECTED TO EXTREME SHOCK.
- METALS (LIGHT): VIOLENT REACTION.
- OXYGEN (LIQUID): INCOMPATIBLE.
- PLASTICS, RUBBER, AND COATINGS: MAY BE ATTACKED.
- POTASSIUM HYDROXIDE: MAY FORM EXPLOSIVE MIXTURE.
- SODIUM HYDROXIDE: MAY FORM EXPLOSIVE MIXTURE.

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

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

STORAGE-DISPOSAL

OBSERVE ALL FEDERAL, STATE AND LOCAL REGULATIONS WHEN STORING OR DISPOSING OF THIS SUBSTANCE. FOR ASSISTANCE, CONTACT THE DISTRICT DIRECTOR OF THE ENVIRONMENTAL PROTECTION AGENCY.

STORAGE

STORE IN A COOL, DRY, WELL-VENTILATED LOCATION, AWAY FROM ANY AREA WHERE THE FIRE HAZARD MAY BE ACUTE (NFPA 49, HAZARDOUS CHEMICALS DATA, 1975).

STORE AWAY FROM INCOMPATIBLE SUBSTANCES.

DISPOSAL

DISPOSAL MUST BE IN ACCORDANCE WITH STANDARDS APPLICABLE TO GENERATORS OF HAZARDOUS WASTE, 40CFR 262. EPA HAZARDOUS WASTE NUMBER U210.

CONDITIONS TO AVOID

MAY BURN BUT DOES NOT IGNITE READILY. CONTAINER MAY EXPLODE IN HEAT OF FIRE.

SPILLS AND LEAKS

SOIL-RELEASE:
DIG A HOLDING AREA SUCH AS A PIT, POND OR LAGOON TO CONTAIN SPILL AND DIKE SURFACE FLOW USING BARRIER OF SOIL, SANDBAGS, FOAMED POLYURETHANE OR FOAMED CONCRETE. ABSORB LIQUID MASS WITH FLY ASH OR CEMENT POWDER.

AIR-RELEASE:
APPLY WATER SPRAY TO KNOCK DOWN AND REDUCE VAPORS. KNOCK-DOWN WATER IS CORROSIVE AND TOXIC AND SHOULD BE DIKED FOR CONTAINMENT AND LATER DISPOSAL.

WATER-SPILL:
IF DISSOLVED, AT A CONCENTRATION OF 10 PPM OR GREATER, APPLY ACTIVATED CARBON AT TEN TIMES THE AMOUNT THAT HAS BEEN SPILLED.

USE SUCTION HOSES TO REMOVE TRAPPED SPILL MATERIAL.

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

OCCUPATIONAL-SPILL:
SHUT OFF IGNITION SOURCES. STOP LEAK IF YOU CAN DO IT WITHOUT RISK. FOR SMALL LIQUID SPILLS, TAKE UP WITH SAND, EARTH OR OTHER ABSORBENT MATERIAL. FOR LARGER SPILLS, DIKE FAR AHEAD OF SPILL FOR LATER DISPOSAL. NO SMOKING, FLAMES OR FLARES IN HAZARD AREA! KEEP UNNECESSARY PEOPLE AWAY.

REPORTABLE QUANTITY (RQ): 1 POUND
THE SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT (SARA) SECTION 304 REQUIRES THAT A RELEASE EQUAL TO OR GREATER THAN THE REPORTABLE QUANTITY FOR THIS SUBSTANCE BE IMMEDIATELY REPORTED TO THE LOCAL EMERGENCY PLANNING COMMITTEE AND THE STATE EMERGENCY RESPONSE COMMISSION (40 CFR 355.40). IF THE RELEASE OF THIS SUBSTANCE IS REPORTABLE UNDER CERCLA SECTION 103, THE NATIONAL RESPONSE CENTER MUST BE NOTIFIED IMMEDIATELY AT (800) 424-8802 OR (202) 426-2675 IN THE METROPOLITAN WASHINGTON, D.C. AREA (40 CFR 302.6).

PROTECTIVE EQUIPMENT SECTION

VENTILATION:
PROVIDE LOCAL EXHAUST OR PROCESS ENCLOSURE VENTILATION TO MEET PUBLISHED EXPOSURE LIMITS.

RESPIRATOR:
THE FOLLOWING RESPIRATORS AND MAXIMUM USE CONCENTRATIONS ARE RECOMMENDATIONS BY THE U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES, NIOSH POCKET GUIDE TO CHEMICAL HAZARDS; NIOSH CRITERIA DOCUMENTS OR BY THE U.S. DEPARTMENT OF LABOR, 29 CFR 1910 SUBPART Z.
THE SPECIFIC RESPIRATOR SELECTED MUST BE BASED ON CONTAMINATION LEVELS FOUND IN THE WORK PLACE, MUST NOT EXCEED THE WORKING LIMITS OF THE RESPIRATOR AND BE JOINTLY APPROVED BY THE NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH AND THE MINE SAFETY AND HEALTH ADMINISTRATION (NIOSH-MSHA).

TETRACHLOROETHYLENE:

AT ANY DETECTABLE CONCENTRATION:

AIR-PURIFYING FULL FACEPIECE RESPIRATOR (GAS MASK) WITH A CHIN-STYLE OR FRONT- OR BACK-MOUNTED ORGANIC VAPOR CANISTER.
SELF-CONTAINED BREATHING APPARATUS WITH FULL FACEPIECE OPERATED IN PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE MODE.
SUPPLIED-AIR RESPIRATOR WITH FULL FACEPIECE OPERATED IN PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE MODE IN COMBINATION WITH AN AUXILIARY SELF-CONTAINED BREATHING APPARATUS OPERATED IN PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE MODE.

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

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

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

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

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

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

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

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

AUTHORIZED BY- OCCUPATIONAL HEALTH SERVICES, INC.

CREATION DATE: 10/25/84 REVISION DATE: 12/11/89

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MATERIAL SAFETY DATA SHEET OHS14370

OCCUPATIONAL HEALTH SERVICES, INC.
450 SEVENTH AVENUE, SUITE 2407
NEW YORK, NEW YORK 10123
(800) 445-MSDS (212) 967-1100

EMERGENCY CONTACT:
JOHN S. BRANSFORD, JR. (615) 292-1180

SUBSTANCE IDENTIFICATION

CAS-NUMBER 71-55-6
RTEC-NUMBER KJ2975000

SUBSTANCE: METHYL CHLOROFORM

TRADE NAMES/SYNONYMS:
1,1,1-TRICHLOROETHANE: ALPHA-TRICHLOROETHANE: AEROTHENE TT: METHYLTRICHLOROMETHANE: METHYLCHLOROFORM: TRICHLOROMETHYLMETHANE: TRICHLOROETHANE: ETHANE, 1,1,1-TRICHLORO-: CHLORTEN: 1,1,1-TRICHLORETHANE: TRICHLOROETHANE 111 DEGREASE COLD/VAPOR (ASHLAND): ST-1000A CLEANER (STRESSCOAT): BLACO-THANE (BARON-BLAKESLEE): PERM ETHANE DG (DETREX CHEMICALS): SAFETY SOLVENT (LOCTITE CORPORATION): ACTIVATOR 711, 702, 703 (LOCTITE CORPORATION): STCC 4941176: RCRA U226: UN 2831: C2H3CL3: OHS14370

CHEMICAL FAMILY:
HALOGEN COMPOUND, ALIPHATIC

MOLECULAR FORMULA: C-H3-C-CL3 MOLECULAR WEIGHT: 133.40

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

COMPONENTS AND CONTAMINANTS

COMPONENT: METHYL CHLOROFORM PERCENT: 100.0

OTHER CONTAMINANTS: NONE

EXPOSURE LIMIT:
METHYL CHLOROFORM (1,1,1-TRICHLOROETHANE):
350 PPM (1900 MG/M3) OSHA TWA; 450 PPM (2450 MG/M3) OSHA STEL
350 PPM (1900 MG/M3) ACGIH TWA; 450 PPM (2450 MG/M3) ACGIH STEL
350 PPM NIOSH RECOMMENDED 15 MINUTE CEILING

1000 POUNDS CERCLA SECTION 103 REPORTABLE QUANTITY
SUBJECT TO SARA SECTION 313 ANNUAL TOXIC CHEMICAL RELEASE REPORTING

PHYSICAL DATA

DESCRIPTION: CLEAR, COLORLESS LIQUID WITH A MILD CHLOROFORM-LIKE ODOR.

BOILING POINT: 165 F (74 C) MELTING POINT: -26 F (-32 C)

SPECIFIC GRAVITY: 1.3390 EVAPORATION RATE: (BUTYL ACETATE=1) 5.0

SOLUBILITY IN WATER: 0.078% @ 25 C VAPOR DENSITY: 4.55

VAPOR PRESSURE: 100 MMHG @ 20 C ODOR-THRESHOLD: 44-100 PPM

OTHER SOLVENTS (SOLVENT - SOLUBILITY):
SOLUBLE IN ACETONE, BENZENE, CHLOROFORM, METHANOL,
ETHANOL, CARBON DISULFIDE, ETHER, CARBON TETRACHLORIDE, N-HEPTANE.

OTHER PHYSICAL DATA
VISCOSITY: 0.858 CPS @ 20 C

FIRE AND EXPLOSION DATA

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

UPPER EXPLOSION LIMIT: 12.5% LOWER EXPLOSION LIMIT: 7.5%

AUTOIGNITION TEMP.: 998 F (537 C)

FIREFIGHTING MEDIA:
DRY CHEMICAL, CARBON DIOXIDE OR HALON
(1987 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.4).

FOR LARGER FIRES, USE WATER SPRAY, FOG OR STANDARD FOAM
(1987 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.4).

FIREFIGHTING:
STAY AWAY FROM STORAGE TANK ENDS. COOL CONTAINERS EXPOSED TO FLAMES WITH WATER FROM SIDE UNTIL WELL AFTER FIRE IS OUT (1987 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.4, GUIDE PAGE 74).

EXTINGUISH USING AGENTS FOR SURROUNDING FIRE. COOL FIRE-EXPOSED CONTAINERS WITH FLOODING AMOUNTS OF WATER APPLIED FROM AS FAR A DISTANCE AS POSSIBLE. DO NOT ALLOW RUN-OFF WATER INTO SEWERS AND WATER SOURCES. AVOID BREATHING VAPORS.

TRANSPORTATION

DEPARTMENT OF TRANSPORTATION HAZARD CLASSIFICATION 49CFR172.101:
ORM-A

DEPARTMENT OF TRANSPORTATION LABELING REQUIREMENTS 49CFR172.101 AND SUBPART E:
NONE

DEPARTMENT OF TRANSPORTATION PACKAGING REQUIREMENTS: 49CFR173.605
EXCEPTIONS: 49CFR173.505

TOXICITY

METHYL CHLOROFORM (1,1,1-TRICHLOROETHANE):
IRRITATION DATA: 450 PPM/8 HOURS EYE-MAN; 5 GM/12 DAYS INTERMITTENT SKIN-RABBIT MILD; 20 MG/24 HOURS SKIN-RABBIT MODERATE; 100 MG EYE-RABBIT MILD; 2 MG/24 HOURS EYE-RABBIT SEVERE.
TOXICITY DATA: 27 GM/M3/10 MINUTES INHALATION-MAN LCLO; 350 PPM INHALATION-MAN TCLO; 200 PPM/4 HOURS INHALATION-MAN TCLO; 920 PPM/70 MINUTES INHALATION-HUMAN TCLO; 18000 PPM/4 HOURS INHALATION-RAT LC50; 3911 PPM/2 HOURS INHALATION-MOUSE LC50; 24400 MG/M3 INHALATION-CAT LC50; 1 GM/KG SKIN-RABBIT LDLO; 670 MG/KG ORAL-HUMAN TDLO; 10300 MG/KG ORAL-RAT LD50; 11240 MG/KG ORAL-MOUSE LD50; 5660 MG/KG ORAL-RABBIT LD50; 9470 MG/KG ORAL-GUINEA PIG LD50; 750 MG/KG ORAL-DOG LD50; 16 GM/KG SUBCUTANEOUS-MOUSE LD50; 500 MG/KG SUBCUTANEOUS-RABBIT LDLO; 95 MG/KG INTRAVENOUS-DOG LDLO; 3593 MG/KG INTRAPERITONEAL-RAT LD50; 3636 MG/KG INTRAPERITONEAL-MOUSE LD50; 3100 MG/KG INTRAPERITONEAL-DOG LD50; 15800 MG/KG SKIN-RABBIT LD50 (EPA-600/8-82-003F, 1984); MUTAGENIC DATA (RTECS); REPRODUCTIVE EFFECTS DATA (RTECS).
CARCINOGEN STATUS: ANIMAL INADEQUATE EVIDENCE (IARC CLASS-3).
LOCAL EFFECTS: IRRITANT- INHALATION, SKIN, EYE.
ACUTE TOXICITY LEVEL: SLIGHTLY TOXIC BY INHALATION, DERMAL ABSORPTION AND INGESTION.
TARGET EFFECTS: CENTRAL NERVOUS SYSTEM DEPRESSANT. POISONING MAY ALSO AFFECT THE HEART AND POSSIBLY LIVER AND KIDNEYS.
AT INCREASED RISK FROM EXPOSURE: PERSONS WITH PRE-EXISTING SKIN DISORDERS, LIVER DISEASE OR CARDIOVASCULAR DISEASE.
ADDITIONAL DATA: ALCOHOL MAY POTENTIATE BOTH CARDIAC AND HEPATIC TOXICITY. EPINEPHRINE OR OTHER STIMULANTS MAY INDUCE VENTRICULAR ARRHYTHMIAS.

HEALTH EFFECTS AND FIRST AID

INHALATION:
METHYL CHLOROFORM (1,1,1-TRICHLOROETHANE):
IRRITANT/NARCOTIC. 1000 PPM IMMEDIATELY DANGEROUS TO LIFE OR HEALTH.
ACUTE EXPOSURE- EXPOSURE TO 500 PPM FOR 60 MINUTES SHOULD CAUSE NO EFFECT EXCEPT FOR A DISTINCTIVE ODOR WHILE 900-1000 PPM FOR 20 MINUTES MAY CAUSE MILD RESPIRATORY TRACT IRRITATION AND PROMPT BUT MINIMAL IMPAIRMENT OF EQUILIBRIUM WHICH MAY BE ACCOMPANIED BY HEADACHE, LASSITUDE AND ATAXIA. IMPAIRED PERFORMANCE OF BEHAVIORAL TESTS WAS ALSO REPORTED AT 1000 PPM. HIGHER LEVELS OF 2000-5000 PPM MAY CAUSE INCOORDINATION, ANESTHESIA, LOSS OF CONSCIOUSNESS, COMA AND DEATH. EXCESSIVE CONCENTRATIONS OF 10,000 PPM MAY CAUSE DEATH DUE TO RESPIRATORY OR CARDIAC FAILURE. CARDIAC SENSITIZATION MAY BE A CONTRIBUTING FACTOR. OTHER EFFECTS MAY INCLUDE NAUSEA, VOMITING, DROWSINESS, CONVULSIONS, FALL OF BLOOD PRESSURE LIVER AND KIDNEY DAMAGE, BRADYCARDIA AND BLOOD CLOTTING CHANGES.
CHRONIC EXPOSURE- NO ADVERSE EFFECTS RELATED TO EXPOSURE WERE REPORTED IN VOLUNTEERS EXPOSED TO 500 PPM FOR 7 HOURS A DAY FOR 5 DAYS, OR IN WORKERS EXPOSED TO 200 PPM FOR SEVERAL MONTHS TO 6 YEARS. EXPOSURE OF ANIMALS FOR 3 MONTHS AT CONCENTRATIONS FROM 1000 TO 10,000 PPM CAUSED SYMPTOMS OF CENTRAL NERVOUS SYSTEM DEPRESSION AND SOME PATHOLOGICAL CHANGES IN THE LIVERS AND LUNGS OF SOME SPECIES. REPRODUCTIVE EFFECTS HAVE BEEN REPORTED IN ANIMALS.

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

IMMEDIATELY.

SKIN CONTACT:
METHYL CHLOROFORM (1,1,1-TRICHLOROETHANE):
IRRITANT.
ACUTE EXPOSURE- DIRECT CONTACT MAY CAUSE IRRITATION AND REDNESS. VAPORS ARE POORLY ABSORBED, BUT THE LIQUID, ESPECIALLY IF CONFINED UNDER AN IMPERMEABLE BARRIER MAY BE ABSORBED TO SOME EXTENT. THIS ALONE IS UNLIKELY TO RESULT IN TOXIC EFFECTS, BUT MAY ADD TO THE EFFECTS OF INHALATION EXPOSURE.
CHRONIC EXPOSURE- REPEATED SKIN CONTACT MAY PRODUCE A DRY, SCALY, FISSURED DERMATITIS DUE TO THE DEFATTING PROPERTIES OF THE LIQUID, AND POSSIBLY BURNS.

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

EYE CONTACT:
METHYL CHLOROFORM (1,1,1-TRICHLOROETHANE):
IRRITANT.
ACUTE EXPOSURE- EXPOSURE TO 500 PPM MAY CAUSE IRRITATION AND REDNESS. DIRECT CONTACT WITH THE LIQUID MAY CAUSE TEMPORARY INJURY WITH COMPLETE RECOVERY EXPECTED IN 48 HOURS. DIRECT APPLICATION TO THE EYES OF RABBITS HAS CAUSED CONJUNCTIVAL IRRITATION, BUT NO CORNEAL DAMAGE.
CHRONIC EXPOSURE- REPEATED OR PROLONGED CONTACT MAY CAUSE CONJUNCTIVITIS.

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

INGESTION:
METHYL CHLOROFORM (1,1,1-TRICHLOROETHANE):
NARCOTIC.
ACUTE EXPOSURE- MAY CAUSE NAUSEA, VOMITING, DIARRHEA, GASTROINTESTINAL DISTURBANCES AND ABDOMINAL PAIN FOLLOWED BY CENTRAL NERVOUS SYSTEM DEPRESSION WITH HEADACHE, DIZZINESS, WEAKNESS, INCOORDINATION, MENTAL CONFUSION AND UNCONSCIOUSNESS. DEATH MAY OCCUR FROM CHRONIC RESPIRATORY FAILURE. OTHER SYMPTOMS AS DESCRIBED IN ACUTE INHALATION MAY ALSO OCCUR. MYOCARDIAL SENSITIZATION TO EPINEPHRINE AND SUBSEQUENT DEATH DUE TO CARDIAC ARREST MAY OCCUR. ASPIRATION MAY RESULT IN PULMONARY EDEMA OR CHEMICAL PNEUMONITIS.
CHRONIC EXPOSURE- REPRODUCTIVE EFFECTS HAVE BEEN REPORTED IN ANIMALS.

FIRST AID- TREAT SYMPTOMATICALLY AND SUPPORTIVELY. GET MEDICAL ATTENTION AND ADVICE ON WHETHER TO USE GASTRIC LAVAGE. EXTREME CARE MUST BE TAKEN TO PREVENT ASPIRATION. A CUFFED ENDOTRACHEAL TUBE USED BY QUALIFIED MEDICAL PERSONNEL MIGHT BE ADVISABLE. KEEP HEAD LOWER THAN HIPS TO PREVENT ASPIRATION SHOULD VOMITING OCCUR.

ANTIDOTE:
NO SPECIFIC ANTIDOTE. TREAT SYMPTOMATICALLY AND SUPPORTIVELY.

REACTIVITY SECTION

REACTIVITY:
SLOWLY DECOMPOSES OVER TIME YIELDING HYDROGEN CHLORIDE. AN INHIBITOR MAY BE ADDED TO SCAVENGE THE ACID THAT IS FORMED AND PREVENT CORROSION TO METALS. WATER MAY REACT WITH THE INHIBITOR AND ALLOW THE NATURAL DECOMPOSITION TO OCCUR.

INCOMPATIBILITIES:
METHYL CHLOROFORM (1,1,1-TRICHLOROETHANE):
- ACETONE: EXOTHERMIC REACTION.
- ALKALI (STRONG): POSSIBLE VIOLENT REACTION.
- ALUMINUM AND ALLOYS: MAY DECOMPOSE VIOLENTLY.
- BARIUM: FIRE AND EXPLOSION HAZARD.
- MAGNESIUM: VIOLENT DECOMPOSITION WITH EVOLUTION OF HYDROGEN CHLORIDE.
- METALS (POWDERED): FIRE AND EXPLOSION HAZARD.
- NITROGEN TETROXIDE: FORMS EXPLOSIVE MIXTURE.
- OXIDIZERS (STRONG): POSSIBLE VIOLENT REACTION.
- OXYGEN (GAS): POSSIBLE EXPLOSION WHEN HEATED @ 100 C.
- OXYGEN (LIQUID): POSSIBLE VIOLENT EXPLOSION.
- POTASH: FORMS FLAMMABLE OR EXPLOSIVE PRODUCT.
- POTASSIUM AND ALLOYS: FORMS SHOCK-SENSITIVE MIXTURE.
- POTASSIUM HYDROXIDE: FORMATION OF SPONTANEOUSLY FLAMMABLE PRODUCT.
- RUBBER, PLASTICS, COATINGS: MAY BE ATTACKED.
- SODIUM AND ALLOYS: FIRE AND EXPLOSION HAZARD.
- SODIUM HYDROXIDE: FORMS SPONTANEOUSLY FLAMMABLE PRODUCT.
- SODIUM-POTASSIUM ALLOY: POSSIBLE EXPLOSION.
- TIN AND ALLOYS: INCOMPATIBLE.
- ZINC AND ALLOYS: INCOMPATIBLE.

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

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

STORAGE-DISPOSAL

OBSERVE ALL FEDERAL, STATE AND LOCAL REGULATIONS WHEN STORING OR DISPOSING OF THIS SUBSTANCE. FOR ASSISTANCE, CONTACT THE DISTRICT DIRECTOR OF THE ENVIRONMENTAL PROTECTION AGENCY.

STORAGE

STORE IN A COOL, DRY, WELL-VENTILATED LOCATION, AWAY FROM ANY AREA WHERE THE FIRE HAZARD MAY BE ACUTE (NFPA 49, HAZARDOUS CHEMICALS DATA, 1975).

STORE AWAY FROM INCOMPATIBLE SUBSTANCES.

DISPOSAL

DISPOSAL MUST BE IN ACCORDANCE WITH STANDARDS APPLICABLE TO GENERATORS OF HAZARDOUS WASTE, 40CFR 262. EPA HAZARDOUS WASTE NUMBER U226.

CONDITIONS TO AVOID

MAY BURN BUT DOES NOT IGNITE READILY. CONTAINER MAY EXPLODE IN HEAT OF FIRE.

SPILLS AND LEAKS

SOIL-RELEASE:
DIG A HOLDING AREA SUCH AS A PIT, POND OR LAGOON TO CONTAIN SPILL AND DIKE SURFACE FLOW USING BARRIER OF SOIL, SANDBAGS, FOAMED POLYURETHANE OR FOAMED CONCRETE. ABSORB LIQUID MASS WITH FLY ASH OR CEMENT POWDER.

WATER-SPILL:
LIMIT SPILL MOTION AND DISPERSION WITH NATURAL BARRIERS OR OIL SPILL CONTROL BOOMS.

TRAP SPILLED MATERIAL AT BOTTOM IN DEEP WATER POCKETS, EXCAVATED HOLDING AREAS OR WITHIN SAND BAG BARRIERS.

USE SUCTION HOSES TO REMOVE TRAPPED SPILL MATERIAL.

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

OCCUPATIONAL-SPILL:
SHUT OFF IGNITION SOURCES. STOP LEAK IF YOU CAN DO IT WITHOUT RISK. FOR SMALL LIQUID SPILLS, TAKE UP WITH SAND, EARTH OR OTHER ABSORBENT MATERIAL. FOR LARGER SPILLS, DIKE FAR AHEAD OF SPILL FOR LATER DISPOSAL. NO SMOKING, FLAMES OR FLARES IN HAZARD AREA! KEEP UNNECESSARY PEOPLE AWAY.

REPORTABLE QUANTITY (RQ): 1000 POUNDS
THE SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT (SARA) SECTION 304 REQUIRES THAT A RELEASE EQUAL TO OR GREATER THAN THE REPORTABLE QUANTITY FOR THIS SUBSTANCE BE IMMEDIATELY REPORTED TO THE LOCAL EMERGENCY PLANNING COMMITTEE AND THE STATE EMERGENCY RESPONSE COMMISSION (40 CFR 355.40). IF THE RELEASE OF THIS SUBSTANCE IS REPORTABLE UNDER CERCLA SECTION 103, THE NATIONAL RESPONSE CENTER MUST BE NOTIFIED IMMEDIATELY AT (800) 424-8802 OR (202) 426-2675 IN THE METROPOLITAN WASHINGTON, D.C. AREA (40 CFR 302.6).

PROTECTIVE EQUIPMENT SECTION

VENTILATION:
PROVIDE LOCAL EXHAUST OR PROCESS ENCLOSURE VENTILATION TO MEET PUBLISHED EXPOSURE LIMITS.

RESPIRATOR:
THE FOLLOWING RESPIRATORS AND MAXIMUM USE CONCENTRATIONS ARE RECOMMENDATIONS BY THE U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES, NIOSH POCKET GUIDE TO CHEMICAL HAZARDS; NIOSH CRITERIA DOCUMENTS OR BY THE U.S. DEPARTMENT OF LABOR, 29 CFR 1910 SUBPART Z.
THE SPECIFIC RESPIRATOR SELECTED MUST BE BASED ON CONTAMINATION LEVELS FOUND

IN THE WORK PLACE, MUST NOT EXCEED THE WORKING LIMITS OF THE RESPIRATOR AND BE JOINTLY APPROVED BY THE NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH AND THE MINE SAFETY AND HEALTH ADMINISTRATION (NIOSH-MSHA).

METHYL CHLOROFORM (1,1,1-TRICHLOROETHANE):

1000 PPM- ANY SUPPLIED-AIR RESPIRATOR WITH FULL FACEPIECE.
ANY SELF-CONTAINED BREATHING APPARATUS WITH FULL FACEPIECE.

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

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

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

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

CLOTHING:
EMPLOYEE MUST WEAR APPROPRIATE PROTECTIVE (IMPERVIOUS) CLOTHING AND EQUIPMENT TO PREVENT ANY POSSIBILITY OF SKIN CONTACT WITH THIS SUBSTANCE.

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

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

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

AUTHORIZED BY- OCCUPATIONAL HEALTH SERVICES, INC.

CREATION DATE: 10/25/84 REVISION DATE: 12/06/89

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MATERIAL SAFETY DATA SHEET OHS23850

OCCUPATIONAL HEALTH SERVICES, INC.
450 SEVENTH AVENUE, SUITE 2407
NEW YORK, NEW YORK 10123
(800) 445-MSDS (212) 967-1100

EMERGENCY CONTACT:
JOHN S. BRANSFORD, JR. (615) 292-1180

SUBSTANCE IDENTIFICATION

CAS-NUMBER 79-01-6
RTEC-NUMBER KX4550000

SUBSTANCE: TRICHLOROETHYLENE

TRADE NAMES/SYNONYMS:
ACETYLENE TRICHLORIDE: ETHYLENE TRICHLORIDE: ALGYLEN: 1-CHLORO-2,2-DICHLOROETHYLENE: 1,1-DICHLORO-2-CHLOROETHYLENE: TCE: ANAMENTH: ETHINYL TRICHLORIDE: TRICHLOROETHENE: 1,1,2-TRICHLOROETHYLENE: ETHYLENE, TRICHLORO-: CHLORYLEN: 1,1,2-TRICHLOROETHENE: ETHENE, TRICHLORO-: NEU-TRI (R) SOLVENT (DOW CHEMICAL): BLACO-TRI (BARON-BLAKESLEE): UN 1710: RCRA U228: STCC 4941171: C2HCL3: OHS23850

CHEMICAL FAMILY:
HALOGEN COMPOUND, ALIPHATIC

MOLECULAR FORMULA: CL-C-H-C-CL2 MOLECULAR WEIGHT: 131.39

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

COMPONENTS AND CONTAMINANTS

COMPONENT: TRICHLOROETHYLENE PERCENT: >99

OTHER CONTAMINANTS: TRACES OF AMINES OR EPOXIDES AS INHIBITORS.

EXPOSURE LIMIT:
TRICHLOROETHYLENE:
50 PPM (270 MG/M3) OSHA TWA; 200 PPM (1080 MG/M3) OSHA STEL
50 PPM (270 MG/M3) ACGIH TWA; 200 PPM (1080 MG/M3) ACGIH STEL
25 PPM NIOSH RECOMMENDED 10 HOUR TWA

100 POUNDS CERCLA SECTION 103 REPORTABLE QUANTITY
SUBJECT TO SARA SECTION 313 ANNUAL TOXIC CHEMICAL RELEASE REPORTING
SUBJECT TO CALIFORNIA PROPOSITION 65 CANCER AND/OR REPRODUCTIVE TOXICITY WARNING AND RELEASE REQUIREMENTS- (APRIL 1, 1988)

PHYSICAL DATA

DESCRIPTION: COLORLESS LIQUID WITH A MILD CHLOROFORM-LIKE ODOR.

BOILING POINT: 189 F (87 C) MELTING POINT: -99 F (-73 C)

SPECIFIC GRAVITY: 1.4642 EVAPORATION RATE: (CARBON TETRACHLORIDE=1) 0.69

SOLUBILITY IN WATER: 0.1% VAPOR DENSITY: 4.53

VAPOR PRESSURE: 58 MMHG @ 20 C ODOR-THRESHOLD: 21 PPM

OTHER SOLVENTS (SOLVENT - SOLUBILITY):
SOLUBLE IN ALCOHOL, ETHER, ACETONE, CHLOROFORM,
BENZENE AND VEGETABLE OILS.

FIRE AND EXPLOSION DATA

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

UPPER EXPLOSION LIMIT: 52% @ 100 C LOWER EXPLOSION LIMIT: 7.8% @ 100 C

AUTOIGNITION TEMP.: 770 F (410 C)

FIREFIGHTING MEDIA:
DRY CHEMICAL, CARBON DIOXIDE OR HALON
(1987 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.4).

FOR LARGER FIRES, USE WATER SPRAY, FOG OR STANDARD FOAM
(1987 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.4).

FIREFIGHTING:
STAY AWAY FROM STORAGE TANK ENDS. COOL CONTAINERS EXPOSED TO FLAMES WITH WATER FROM SIDE UNTIL WELL AFTER FIRE IS OUT (1987 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.4, GUIDE PAGE 74).

USE AGENT SUITABLE FOR TYPE OF FIRE. AVOID BREATHING TOXIC VAPORS, KEEP UPWIND.

TRANSPORTATION

DEPARTMENT OF TRANSPORTATION HAZARD CLASSIFICATION 49CFR172.101:
ORM-A

DEPARTMENT OF TRANSPORTATION LABELING REQUIREMENTS 49CFR172.101 AND SUBPART E:
NONE

DEPARTMENT OF TRANSPORTATION PACKAGING REQUIREMENTS: 49CFR173.605
EXCEPTIONS: 49CFR173.505

TOXICITY

TRICHLOROETHYLENE:
IRRITATION DATA: 2 MG/24 HOURS SKIN-RABBIT SEVERE; 20 MG/24 HOURS EYE-RABBIT MODERATE.
TOXICITY DATA: 6900 MG/M3/10 MINUTES INHALATION-HUMAN TCLO; 160 PPM/83 MINUTES INHALATION-HUMAN TCLO; 812 MG/KG INHALATION-HUMAN TDLO; 110 PPM/8 HOURS

INHALATION-HUMAN TCLO; 2900 PPM INHALATION-HUMAN LCLO; 8000 PPM/4 HOURS INHALATION-RAT LCLO; 8450 PPM/4 HOURS INHALATION-MOUSE LC50; 11,000 PPM INHALATION-RABBIT LCLO; 32,500 MG/M3/2 HOURS INHALATION-CAT LCLO; 37,200 PPM/40 MINUTES INHALATION-GUINEA PIG LCLO; 7 GM/KG ORAL-HUMAN LDLO; 2143 MG/KG ORAL-HUMAN TDLO; 2402 MG/KG ORAL-MOUSE LD50; 7330 MG/KG ORAL-RABBIT LDLO; 5864 MG/KG ORAL-CAT LDLO; 16 GM/KG SUBCUTANEOUS-MOUSE LD50; 1800 MG/KG SUBCUTANEOUS-RABBIT LDLO; 150 MG/KG SUBCUTANEOUS-DOG LDLO; 34 MG/KG INTRAVENOUS-MOUSE LD50; 150 MG/KG INTRAVENOUS-DOG LDLO; 1282 MG/KG INTRAPERITONEAL-RAT LD50; 1900 MG/KG INTRAPERITONEAL-DOG LD50; MUTAGENIC DATA (RTECS); REPRODUCTIVE EFFECTS DATA (RTECS); TUMORIGENIC DATA (RTECS).

CARCINOGEN STATUS: HUMAN INADEQUATE EVIDENCE, ANIMAL LIMITED EVIDENCE (IARC CLASS-3). ORAL ADMINISTRATION PRODUCED LIVER AND LUNG NEOPLASMS IN MICE; INHALATION WAS ASSOCIATED WITH AN INCREASED INCIDENCE OF LYMPHOMAS IN FEMALE MICE, BUT NOT IN RATS OR HAMSTERS.

LOCAL EFFECTS: IRRITANT-SKIN, EYE, INHALATION.

ACUTE TOXICITY LEVEL: MODERATELY TOXIC BY INHALATION AND INGESTION.

TARGET EFFECTS: CENTRAL NERVOUS SYSTEM DEPRESSANT. POISONING MAY AFFECT THE LIVER, KIDNEYS, LUNG AND HEART.

AT INCREASED RISK FROM EXPOSURE: PERSON WITH PRE-EXISTING HEART DISEASE.

ADDITIONAL DATA: THE PRESENCE OF TETRACHLOROETHANE AS AN IMPURITY, OR THE CONSUMPTION OF ALCOHOLIC BEVERAGES, CAFFEINE, OR OTHER DRUGS MAY ENHANCE THE SYSTEMIC TOXICITY. EPINEPHRINE OR OTHER STIMULANTS MAY INDUCE VENTRICULAR ARRHYTHMIAS. MAY CROSS THE PLACENTA.

HEALTH EFFECTS AND FIRST AID

INHALATION:

TRICHLOROETHYLENE:

IRRITANT/NARCOTIC.

1000 PPM IMMEDIATELY DANGEROUS TO LIFE OR HEALTH.

ACUTE EXPOSURE- MAY CAUSE MILD IRRITATION OF THE RESPIRATORY TRACT. LEVELS OF 250-1000 PPM HAVE CAUSED IMPAIRED JUDGEMENT AND COORDINATION. 1000-5000 PPM HAS CAUSED EXCITATION FOLLOWED BY CENTRAL NERVOUS SYSTEM DEPRESSION WITH DROWSINESS, DIZZINESS, HEADACHE, NAUSEA, VOMITING, UNCONSCIOUSNESS AND COMA. IF CONSCIOUSNESS IS REGAINED, NAUSEA AND VOMITING MAY FOLLOW FOR SEVERAL HOURS. PSYCHOTIC EFFECTS MAY INCLUDE EUPHORIA, DISORIENTATION, VISUAL DISTURBANCES AND HALLUCINATIONS, AND DELUSIONS. OTHER EFFECTS MAY INCLUDE ABDOMINAL CRAMPS, PALLOR, HYPOTENSION, ANESTHESIA, TREMORS, PROFUSE PERSPIRATION, CYANOSIS, AND RARELY CONVULSIONS. DEATH MAY OCCUR FROM RESPIRATORY ARREST OR VENTRICULAR FIBRILLATION RESULTING IN PRIMARY CARDIAC FAILURE. LIVER AND KIDNEY DAMAGE MAY ALSO OCCUR. ANIMAL STUDIES HAVE ALSO SHOWN SPLEEN DAMAGE. TRIGEMINAL NERVE DAMAGE AND HEPATOTOXIC EFFECTS HAVE BEEN ATTRIBUTED TO EXPOSURE TO THE IMPURE SUBSTANCE OR TO THE DECOMPOSITION PRODUCTS.

CHRONIC EXPOSURE- REPEATED EXPOSURE TO LEVELS BELOW 300 PPM MAY CAUSE NAUSEA, VOMITING, HEADACHE, ABDOMINAL CRAMPS, SLEEPINESS, DRUNKENNESS, FLUSHING, ANOREXIA, SWELLING OF THE EYES, FACE AND HANDS, AND MILD CARDIAC ARRHYTHMIAS. OTHER SYMPTOMS MAY INCLUDE WHEEZING, JOINT AND MUSCLE PAIN, ANEMIA, AND RARELY JAUNDICE. INTOLERANCE TO ALCOHOL, TREMOR, GIDDINESS, ANXIETY AND CARDIAC ARRHYTHMIAS HAVE BEEN FOUND IN WORKERS CHRONICALLY EXPOSED TO 5-630 PPM. LIVER, KIDNEY AND BRAIN DAMAGE MAY ALSO OCCUR. REPRODUCTIVE EFFECTS HAVE BEEN REPORTED IN ANIMALS. ADMINISTRATION TO FEMALE MICE WAS ASSOCIATED WITH AN INCREASED INCIDENCE OF LYMPHOMAS; HOWEVER, NONE WERE FOUND IN RATS OR HAMSTERS.

FIRST AID- REMOVE FROM EXPOSURE AREA TO FRESH AIR IMMEDIATELY. IF BREATHING

HAS STOPPED, PERFORM ARTIFICIAL RESPIRATION. KEEP PERSON WARM AND AT REST. TREAT SYMPTOMATICALLY AND SUPPORTIVELY. GET MEDICAL ATTENTION IMMEDIATELY.

SKIN CONTACT:
TRICHLOROETHYLENE:
IRRITANT/SENSITIZER.

ACUTE EXPOSURE- MAY CAUSE IRRITATION AND CONTACT DERMATITIS. MAY CAUSE SENSITIZATION IN PREVIOUSLY EXPOSED INDIVIDUALS AND RESULT IN GENERALIZED EXFOLIATAVE OR PAPULOVESICULAR DERMATITIS, AND ERYTHRODERMA. SKIN CONTACT WITH SOAKED CLOTHING FOR A LONG PERIOD OF TIME MAY RESULT IN BLISTERING. MAY BE ABSORBED THROUGH THE SKIN, HOWEVER, DERMAL ABSORPTION IS NOT LIKELY TO BE OF TOXICOLOGICAL SIGNIFICANCE UNDER NORMAL USE.

CHRONIC EXPOSURE- MAY CAUSE A DEFATTING TYPE OF DERMATITIS RESULTING IN ROUGHNESS, CHAPPING, VESICULATION AND SECONDARY INFECTION. REPEATED CONTACT MAY RESULT IN PARALYSIS OF THE FINGERS. SENSITIZATION MAY OCCUR. REPEATED LOW LEVEL EXPOSURE MAY CAUSE INEBRIATION, IRRITABILITY, AND PERSONALITY CHANGES. CHRONIC ABSORPTION MAY ALSO PRODUCE WEIGHT LOSS, NAUSEA, ANOREXIA, FATIGUE, VISUAL IMPAIRMENT, JOINT PAIN AND WHEEZING. JAUNDICE IS RARE.

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

EYE CONTACT:
TRICHLOROETHYLENE:
IRRITANT.

ACUTE EXPOSURE- DIRECT CONTACT WITH VAPOR OR LIQUID MAY CAUSE BURNS OF THE LIDS, CONJUNCTIVA AND CORNEA WITH SYMPTOMS OF REDNESS, TEARING AND BLURRED VISION. A SPLASH IN THE EYE MAY CAUSE SMARTING PAIN AND INJURY TO THE CORNEAL EPITHELIUM WHICH MAY REGENRATE WITH COMPLETE RECOVERY.

CHRONIC EXPOSURE- REPEATED AND PROLONGED EXPOSURE MAY CAUSE CONJUNCTIVITIS, CORNEAL INFLAMMATION, OPTIC NEURITIS, DOUBLE VISION, NYSTAGMUS, CHANGES IN COLOR PERCEPTION AND BLINDNESS.

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

INGESTION:
TRICHLOROETHYLENE:
NARCOTIC/CARCINOGEN.

ACUTE EXPOSURE- MAY CAUSE SEVERE BURNING SENSATION IN THE MOUTH, THROAT, ESOPHAGUS, AND STOMACH, DIARRHEA, INEBRIATION, CONFUSION, TACHYCARDIA, AND CENTRAL NERVOUS SYSTEM DEPRESSION WITH DIZZINESS, NAUSEA, VOMITING, HEADACHE, COLLAPSE, CONVULSIONS, AND COMA FOLLOWED BY DEATH FROM RESPIRATORY, CARDIAC OR HEPATORENAL FAILURE. LOW-LEVEL CONCENTRATIONS MAY CAUSE HEADACHE, AMNESIA, NUMBNESS, WEAKNESS OF THE EXTREMITIES, HEMIPARESIS AND PSYCHOSIS.

CHRONIC EXPOSURE- MAY CAUSE IRRITATION OF MUCOUS MEMBRANES, HEADACHE, DROWSINESS, FATIGUE, GIDDINESS, EXCITABILITY, INDIGESTION, NAUSEA, DISTURBANCES OF SENSATIONS IN THE EXTREMETIES AND OTHER SYMPTOMS NOTED IN CHRONIC INHALATION. REPRODUCTIVE EFFECTS HAVE BEEN REPORTED IN ANIMALS. REPEATED ORAL ADMINISTRATION PRODUCED LIVER AND LUNG NEOPLASMS IN MICE.

FIRST AID- REMOVE BY GASTRIC LAVAGE OR EMESIS. MAINTAIN BLOOD PRESSURE AND

AIRWAY. GIVE OXYGEN IF RESPIRATION IS DEPRESSED. DO NOT PERFORM GASTRIC LAVAGE OR EMESIS IF VICTIM IS UNCONSCIOUS. GET MEDICAL ATTENTION IMMEDIATELY (DREISBACH, HANDBOOK OF POISONING, 11TH ED.). ADMINISTRATION OF GASTRIC LAVAGE OR OXYGEN SHOULD BE PERFORMED BY QUALIFIED MEDICAL PERSONNEL.

ANTIDOTE:
NO SPECIFIC ANTIDOTE. TREAT SYMPTOMATICALLY AND SUPPORTIVELY.

REACTIVITY SECTION

REACTIVITY:
STABLE UNDER NORMAL TEMPERATURES AND PRESSURES IN A CLOSED CONTAINER. UNINHIBITED MATERIAL, ON HEATING OR EXPOSURE TO LIGHT, MAY DECOMPOSE OR POLYMERIZE, RELEASING HYDROGEN CHLORIDE.

INCOMPATIBILITIES:
TRICHLOROETHYLENE:
- ALKALI: FORMS EXPLOSIVE MIXTURE.
- ALUMINUM + DILUTE HYDROCHLORIC ACID: VIOLENT POYMERIZATION.
- ALUMINUM: VIOLENT DECOMPOSITION MAY OCCUR.
- BARIUM: POSSIBLE DETONATION.
- BERYLLIUM: FORMS IMPACT-SENSITIVE MIXTURE.
- BORON: FORMS EXPLOSIVE OR IGNITABLE COMPOUND.
- 1-CHLORO-2,3-EPOXYPROPANE: FORMS EXPLOSIVE MIXTURE.
- 2,4-BIS(4(2',3'-EPOXYPROPOXY)PHENYL)PROPANE: FORMS EXPLOSIVE MIXTURE.
- DI-2,3-EPOXYPROPYL ETHER OF 1,4-BUTANEDIOL: FORMS EXPLOSIVE MIXTURE.
- EPOXIDES: POSSIBLE EXPLOSION.
- LITHIUM: FORMS IMPACT-SENSITIVE MIXTURE.
- MAGNESIUM: FORMS IMPACT-SENSITIVE MIXTURE.
- METALS (POWDERED): FORMS EXPLOSIVE OR IGNITABLE COMPOUND.
- MONO-2,3-EPOXYPROPYL ETHER OF 1,4-BUTANEDIOL: FORMS EXPLOSIVE MIXTURE.
- NITROGEN TETRAOXIDE: FORMS EXPLOSIVE MIXTURE.
- OXIDIZERS (STRONG): FIRE AND EXPLOSION HAZARD.
- OXYGEN (LIQUID): EXPLODES WHEN INITIATED WITH A BLASTING CAP.
- OXYGEN (GAS): EXPLODES UNDER PRESSURE AT ROOM TEMPERATURE.
- PERCHLORIC ACID: VIOLENT REACTION.
- POTASSIUM: FORMS EXPLOSIVE CHLOROACETYLENES.
- POTASSIUM HYDROXIDE: FORMS EXPLOSIVE DICHLOROACETYLENE WHEN HEATED.
- SODIUM: FORMS EXPLOSIVE CHLOROACETYLENES.
- SODIUM HYDROXIDE: FORMS EXPLOSIVE CHLOROACETYLENES.
- TITANIUM: FORMS IMPACT-SENSITIVE MIXTURE.

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

POLYMERIZATION:
MAY POLYMERIZE WHEN CATALYZED BY ALUMINUM CHLORIDE IN A SELF-SUSTAINING REACTION WHICH MAY DEVELOP TEMPERATURES UP TO 1350 C. A STABILIZER IS REQUIRED TO PREVENT POLYMERIZATION WHEN HEATED OR EXPOSED TO SUNLIGHT.

STORAGE-DISPOSAL

OBSERVE ALL FEDERAL, STATE AND LOCAL REGULATIONS WHEN STORING OR DISPOSING OF THIS SUBSTANCE. FOR ASSISTANCE, CONTACT THE DISTRICT DIRECTOR OF THE ENVIRONMENTAL PROTECTION AGENCY.

STORAGE

STORE IN A COOL, DRY, WELL-VENTILATED LOCATION, AWAY FROM ANY AREA WHERE THE FIRE HAZARD MAY BE ACUTE (NFPA 49, HAZARDOUS CHEMICALS DATA, 1975).

STORE AWAY FROM INCOMPATIBLE SUBSTANCES.

DISPOSAL

DISPOSAL MUST BE IN ACCORDANCE WITH STANDARDS APPLICABLE TO GENERATORS OF HAZARDOUS WASTE, 40CFR 262. EPA HAZARDOUS WASTE NUMBER U228.

CONDITIONS TO AVOID

MAY BURN BUT DOES NOT IGNITE READILY. CONTAINER MAY EXPLODE IN HEAT OF FIRE.

SPILLS AND LEAKS

SOIL-RELEASE:
DIG A HOLDING AREA SUCH AS A PIT, POND OR LAGOON TO CONTAIN SPILL AND DIKE SURFACE FLOW USING BARRIER OF SOIL, SANDBAGS, FOAMED POLYURETHANE OR FOAMED CONCRETE. ABSORB LIQUID MASS WITH FLY ASH OR CEMENT POWDER.

AIR-RELEASE:
APPLY WATER SPRAY TO KNOCK DOWN AND REDUCE VAPORS. KNOCK-DOWN WATER IS CORROSIVE AND TOXIC AND SHOULD BE DIKED FOR CONTAINMENT.

WATER-SPILL:
USE ACTIVATED CARBON TO ABSORB SPILLED SUBSTANCE THAT IS DISSOLVED.

USE SUCTION HOSES TO REMOVE TRAPPED SPILL MATERIAL.

USE MECHANICAL DREDGES OR LIFTS TO EXTRACT IMMOBILIZED MASSES OF POLLUTION AND PRECIPITATES.

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

OCCUPATIONAL-SPILL:
SHUT OFF IGNITION SOURCES. STOP LEAK IF YOU CAN DO IT WITHOUT RISK. FOR SMALL LIQUID SPILLS, TAKE UP WITH SAND, EARTH OR OTHER ABSORBENT MATERIAL. FOR LARGER SPILLS, DIKE FAR AHEAD OF SPILL FOR LATER DISPOSAL. NO SMOKING, FLAMES OR FLARES IN HAZARD AREA! KEEP UNNECESSARY PEOPLE AWAY.

REPORTABLE QUANTITY (RQ): 100 POUNDS
THE SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT (SARA) SECTION 304 REQUIRES THAT A RELEASE EQUAL TO OR GREATER THAN THE REPORTABLE QUANTITY FOR THIS

SUBSTANCE BE IMMEDIATELY REPORTED TO THE LOCAL EMERGENCY PLANNING COMMITTEE AND THE STATE EMERGENCY RESPONSE COMMISSION (40 CFR 355.40). IF THE RELEASE OF THIS SUBSTANCE IS REPORTABLE UNDER CERCLA SECTION 103, THE NATIONAL RESPONSE CENTER MUST BE NOTIFIED IMMEDIATELY AT (800) 424-8802 OR (202) 426-2675 IN THE METROPOLITAN WASHINGTON, D.C. AREA (40 CFR 302.6).

PROTECTIVE EQUIPMENT SECTION

VENTILATION:
PROVIDE LOCAL EXHAUST OR PROCESS ENCLOSURE VENTILATION TO MEET PUBLISHED EXPOSURE LIMITS.

RESPIRATOR:
THE FOLLOWING RESPIRATORS AND MAXIMUM USE CONCENTRATIONS ARE RECOMMENDATIONS BY THE U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES, NIOSH POCKET GUIDE TO CHEMICAL HAZARDS; NIOSH CRITERIA DOCUMENTS OR BY THE U.S. DEPARTMENT OF LABOR, 29 CFR 1910 SUBPART Z.
THE SPECIFIC RESPIRATOR SELECTED MUST BE BASED ON CONTAMINATION LEVELS FOUND IN THE WORK PLACE, MUST NOT EXCEED THE WORKING LIMITS OF THE RESPIRATOR AND BE JOINTLY APPROVED BY THE NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH AND THE MINE SAFETY AND HEALTH ADMINISTRATION (NIOSH-MSHA).

TRICHLOROETHYLENE:
AT ANY DETECTABLE CONCENTRATION:
ANY SELF-CONTAINED BREATHING APPARATUS WITH FULL FACEPIECE AND OPERATED IN A PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE MODE.
ANY SUPPLIED-AIR RESPIRATOR WITH A FULLFACE-PIECE AND OPERATED IN PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE MODE IN COMBINATION WITH AN AUXILIARY SELF-CONTAINED BREATHING APPARATUS OPERATED IN PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE MODE.

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

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

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

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

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

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

EYE PROTECTION:
EMPLOYEE MUST WEAR SPLASH-PROOF OR DUST-RESISTANT SAFETY GOGGLES TO PREVENT

EYE CONTACT WITH THIS SUBSTANCE.

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

AUTHORIZED BY- OCCUPATIONAL HEALTH SERVICES, INC.

CREATION DATE: 10/24/84 REVISION DATE: 11/17/89

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MATERIAL SAFETY DATA SHEET OHS23590

OCCUPATIONAL HEALTH SERVICES, INC.
450 SEVENTH AVENUE, SUITE 2407
NEW YORK, NEW YORK 10123
(800) 445-MSDS (212) 967-1100

EMERGENCY CONTACT:
JOHN S. BRANSFORD, JR. (615) 292-1180

SUBSTANCE IDENTIFICATION

CAS-NUMBER 108-88-3
RTEC-NUMBER XS5250000

SUBSTANCE: TOLUENE

TRADE NAMES/SYNONYMS:
BENZENE, METHYL-: METHYLBENZENE: TOLUOL: METHYLBENZOL: PHENYLMETHANE: METHACIDE: PRINT COAT SOLVENT 13-2: O-DOPE THINNER (GC ELECTRONICS): AMSCO SOLV 1410, TOLUENE (UNION OIL COMPANY): DIAPHRAGM REPAIR KIT SOLVENT FOR HL29 & M8-M9 KITS (3M): POLYSTYRENE Q-DOPE THINNER 104102 & 10-4104: RCRA U220: STCC 4909305: UN 1294: C7H8: OHS23590

CHEMICAL FAMILY:
HYDROCARBON, AROMATIC

MOLECULAR FORMULA: C6-H5-C-H3 MOLECULAR WEIGHT: 92.14

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

COMPONENTS AND CONTAMINANTS

COMPONENT: TOLUENE PERCENT: 100.0

OTHER CONTAMINANTS: NONE

EXPOSURE LIMIT:
TOLUENE:
100 PPM (375 MG/M3) OSHA TWA; 150 PPM (560 MG/M3) OSHA STEL
100 PPM (375 MG/M3) ACGIH TWA; 150 PPM (560 MG/M3) ACGIH STEL
100 PPM NIOSH RECOMMENDED TWA; 200 PPM NIOSH RECOMMENDED 10 MINUTE CEILING

1000 POUNDS CERCLA SECTION 103 REPORTABLE QUANTITY
SUBJECT TO SARA SECTION 313 ANNUAL TOXIC CHEMICAL RELEASE REPORTING

PHYSICAL DATA

DESCRIPTION: CLEAR, COLORLESS LIQUID WITH AN AROMATIC ODOR.

BOILING POINT: 231 F (111 C) MELTING POINT: -139 F (-95 C)

SPECIFIC GRAVITY: 0.8669 EVAPORATION RATE: (BUTYL ACETATE=1) 2.24

VOLATILITY: 100% SOLUBILITY IN WATER: 0.05% @ 20 C

VAPOR DENSITY: 3.14 VAPOR PRESSURE: 22 MMHG @ 20 C

ODOR-THRESHOLD: 10-15 PPM

OTHER SOLVENTS (SOLVENT - SOLUBILITY):
SOLUBLE IN ALCOHOL, ETHER, BENZENE, CHLOROFORM,
LIGROIN, GLACIAL ACETIC ACID, CARBON DISULFIDE, ACETONE.

FIRE AND EXPLOSION DATA

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

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

VAPOR-AIR MIXTURES ARE EXPLOSIVE.

DUE TO LOW ELECTROCONDUCTIVITY OF THE SUBSTANCE, FLOW OR AGITATION MAY GENERATE ELECTROSTATIC CHARGES RESULTING IN SPARKS WITH POSSIBLE IGNITION.

FLASH POINT: 40 F (4 C) (CC) UPPER EXPLOSION LIMIT: 7.1%

LOWER EXPLOSION LIMIT: 1.2% AUTOIGNITION TEMP.: 896 F (480 C)

FLAMMABILITY CLASS (OSHA): IB

FIREFIGHTING MEDIA:
DRY CHEMICAL, CARBON DIOXIDE, HALON, WATER SPRAY OR STANDARD FOAM
(1987 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.4).

FOR LARGER FIRES, USE WATER SPRAY, FOG OR STANDARD FOAM
(1987 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.4).

FIREFIGHTING:
MOVE CONTAINER FROM FIRE AREA IF POSSIBLE. COOL FIRE-EXPOSED CONTAINERS WITH WATER FROM SIDE UNTIL WELL AFTER FIRE IS OUT. STAY AWAY FROM STORAGE TANK ENDS. FOR MASSIVE FIRE IN STORAGE AREA, USE UNMANNED HOSE HOLDER OR MONITOR NOZZLES, ELSE WITHDRAW FROM AREA AND LET FIRE BURN. WITHDRAW IMMEDIATELY IN CASE OF RISING SOUND FROM VENTING SAFETY DEVICE OR ANY DISCOLORATION OF STORAGE TANK DUE TO FIRE (1987 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.4, GUIDE PAGE 27).

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

WATER MAY BE INEFFECTIVE (NFPA FIRE PROTECTION GUIDE ON HAZARDOUS MATERIALS, EIGHTH EDITION).

TRANSPORTATION

DEPARTMENT OF TRANSPORTATION HAZARD CLASSIFICATION 49CFR172.101:

FLAMMABLE LIQUID

DEPARTMENT OF TRANSPORTATION LABELING REQUIREMENTS 49CFR172.101 AND SUBPART E: FLAMMABLE LIQUID

DEPARTMENT OF TRANSPORTATION PACKAGING REQUIREMENTS: 49CFR173.119
EXCEPTIONS: 49CFR173.118

TOXICITY

TOLUENE:
IRRITATION DATA: 300 PPM EYE-HUMAN: 870 UG EYE-RABBIT MILD; 2 MG/24 HOURS EYE-RABBIT SEVERE; 100 MG/ 30 SECONDS RINSED EYE-RABBIT MILD; 435 MG SKIN-RABBIT MILD; 500 MG SKIN-RABBIT MODERATE; 20 MG/24 HOURS SKIN-RABBIT MODERATE.
TOXICITY DATA: 200 PPM INHALATION-HUMAN TCLO; 100 PPM INHALATION-MAN TCLO; 4000 PPM/4 HOURS INHALATION-RAT LCLO; 5320 PPM/8 HOURS INHALATION-MOUSE LC50; 1600 PPM INHALATION-GUINEA PIG LCLO; 12124 MG/KG SKIN-RABBIT LD50; 50 MG/KG ORAL-HUMAN LDLO; 5000 MG/KG ORAL-RAT LD50; 2250 MG/KG SUBCUTANEOUS-MOUSE LD50; 1960 MG/KG INTRAVENOUS-RAT LD50; 1332 MG/KG INTRAPERITONEAL-RAT LD50; 1126 MG/KG INTRAPERITONEAL-MOUSE LD50; 6900 MG/KG UNREPORTED-RAT LD50; 2000 MG/KG UNREPORTED-MOUSE LD50; REPRODUCTIVE EFFECTS DATA (RTECS); MUTAGENIC DATA (RTECS).
CARCINOGEN STATUS: NONE.
LOCAL EFFECTS: IRRITANT- SKIN, EYE, INHALATION.
ACUTE TOXICITY LEVEL: MODERATELY TOXIC BY INHALATION, INGESTION; SLIGHTLY TOXIC BY DERMAL ABSORPTION.
TARGET EFFECTS: CENTRAL NERVOUS SYSTEM DEPRESSANT; NEUROTOXIN. POISONING MAY ALSO AFFECT THE HEART, LIVER, KIDNEYS, AND BLOOD.
AT INCREASED RISK FROM EXPOSURE: ASTHMATICS AND PERSONS WITH OTHER RESPIRATORY DIFFICULTIES OR CARDIOVASCULAR DISEASE, SMOKERS, AND CHRONIC ALCOHOL DRINKERS.
ADDITIONAL DATA: STIMULANTS SUCH AS EPINEPHRINE MAY INDUCE VENTRICULAR FIBRILLATION. TOLUENE INHIBITS MITOCHONDRIAL OXIDATIVE PHOSPHORYLATION. ALCOHOL MAY ENHANCE THE TOXIC EFFECTS.

HEALTH EFFECTS AND FIRST AID

INHALATION:
TOLUENE:
IRRITANT/NARCOTIC/NEUROTOXIN.
2000 PPM IMMEDIATELY DANGEROUS TO LIFE OR HEALTH.
ACUTE EXPOSURE- THE LEVEL REQUIRED TO PRODUCE NARCOSIS CAN EXIST WITHOUT ASSOCIATED RESPIRATORY TRACT IRRITATION. ODOR DETECTION IS INSUFFICIENT FOR WARNING DUE TO OLFACTORY FATIGUE. 200-600 PPM FOR UP TO 8 HOURS CAUSED MILD UPPER RESPIRATORY TRACT IRRITATION, FATIGUE, WEAKNESS, CONFUSION, HEADACHE, NAUSEA, IMPAIRED COORDINATION AND REACTION TIME, PARESTHESIAS OF THE SKIN, EUPHORIA, DIZZINESS, AND DILATED PUPILS. 800 PPM CAUSED RAPID IRRITATION, NASAL MUCOUS SECRETION, METALLIC TASTE, DROWSINESS, AND IMPAIRED BALANCE. AFTEREFFECTS INCLUDING NERVOUSNESS, MUSCULAR FATIGUE, AND INSOMNIA LASTED FOR SEVERAL DAYS. A WORKER FOUND UNCONSCIOUS AFTER EXPOSURE TO HIGH VAPOR CONCENTRATIONS FOR 18 HOURS DEVELOPED HEPATIC AND RENAL DAMAGE WITH MYOGLOBINURIA. RECOVERY WAS COMPLETE WITHIN 6 MONTHS. HEMATOLOGIC EFFECTS OCCUR RARELY WITH EXPOSURE TO HIGH CONCENTRATIONS.

RECOVERY USUALLY FOLLOWS REMOVAL FROM EXPOSURE. EXTREME INHALATION MAY CAUSE DEATH BY PARALYSIS OF THE RESPIRATORY CENTER.

CHRONIC EXPOSURE- REPEATED OR PROLONGED EXPOSURE MAY CAUSE MUCOUS MEMBRANE IRRITATION, VOMITING, INSOMNIA, NOSEBLEEDS, CHEST PAIN, EUPHORIA, HEADACHE, VERTIGO, NAUSEA, ANOREXIA, BAD TASTE, MOMENTARY LOSS OF MEMORY, PALPITATIONS, EXTREME WEAKNESS, LOSS OF COORDINATION AND IMPAIRMENT OF REACTION TIME, TINNITUS, ALCOHOL INTOLERANCE, PETECHIAE AND ABNORMAL BLEEDING. SYSTEMIC OCULAR DISTURBANCES, SUCH AS "REDDENING" OF THE VISION HAVE OCCURRED. BONE MARROW HYPOPLASIA AND LEUKOPENIA HAVE BEEN REPORTED OCCASIONALLY, BUT MAY BE DUE TO BENZENE CONTAMINATION. EXAMINATION OF WORKERS EXPOSED TO 100-1100 PPM REVEALED HEPATOMEGALY, MILD MACROCYTOSIS, MODERATE ERYTHROPENIA, AND ABSOLUTE LYMPHOCYTOSIS, BUT NO LEUKOPENIA. OTHER WORKERS EXPOSED TO TOLUENE FUMES DEVELOPED LEUKOPENIA AND ESPECIALLY NEUTROPENIA. WITHIN 6 MONTHS, THEY SHOWED DECREASED PROTHROMBIN LEVEL AND INCREASED COAGULATION TIME. PERIODONTAL EFFECTS WERE ALSO NOTED. CARDIAC SENSITIZATION MAY OCCUR AND MAY RESULT IN CARDIAC ARREST DUE TO VENTRICULAR FIBRILLATION. REPEATED INHALATION OF TOLUENE TO THE POINT OF EUPHORIA HAS CAUSED IRREVERSIBLE ENCEPHALOPATHY WITH CEREBELLAR ATAXIA, RHYTHMIC LIMB MOVEMENTS, UNSTEADINESS, BIZZARE BEHAVIOR, EMOTIONAL LABILITY, OPTIC ATROPHY, AND DIFFUSE CEREBRAL ATROPHY. OTHER NEUROPSYCHIATRIC EFFECTS MAY INCLUDE DIZZINESS, SYNCOPE, PARESTHESIAS, PERIPHERAL NEUROPATHY, HALLUCINATIONS, LETHARGY, AND COMA. INTENTIONAL SNIFFING CAN PRODUCE RENAL TUBULAR DEFECTS WITH METABOLIC ACIDOSIS, ELECTROLYTE ABNORMALITIES AND POTASSIUM LOSS. SEVERE MUSCLE WEAKNESS LEADING TO LIMB PARALYSIS AND CARDIAC ARRHYTHMIAS MAY RESULT FROM THE HYPOKALEMIA; HOWEVER, SENSORY FUNCTION AND TENDON REFLEXES ARE NOT IMPAIRED. GASTROINTESTINAL EFFECTS MAY INCLUDE ABDOMINAL PAIN, NAUSEA, VOMITING, AND HEMATEMESIS. CHROMOSOME CHANGES WERE OBSERVED IN SOME WORKERS UP TO TWO YEARS AFTER CESSATION OF EXPOSURE TO TOLUENE. WOMEN OCCUPATIONALLY EXPOSED TO TOLUENE AND OTHER VARNISH SOLVENTS HAVE REPORTED MENSTRUAL DISORDERS, UNDERWEIGHT OFFSPRING WHO DID NOT NURSE WELL, AND FETAL ASPHYXIA. DYSMENORRHEA HAS BEEN REPORTED IN WOMEN OCCUPATIONALLY EXPOSED TO TOLUENE LEVELS OF 60-100 PPM. REPRODUCTIVE EFFECTS HAVE BEEN REPORTED IN ANIMALS.

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

SKIN CONTACT:
TOLUENE:
IRRITANT.

ACUTE EXPOSURE- CONTACT WITH THE LIQUID MAY CAUSE IRRITATION, SCALING, CRACKING AND DERMATITIS. SKIN ABSORPTION DOES OCCUR, BUT IT IS GENERALLY TOO SLOW TO PRODUCE SIGNS OF ACUTE SYSTEMIC TOXICITY. PARESTHESIAS OF THE SKIN MAY OCCUR FROM VAPOR EXPOSURE.

CHRONIC EXPOSURE- REPEATED OR PROLONGED CONTACT WITH THE LIQUID MAY CAUSE DEFATTING OF THE SKIN, RESULTING IN A DRY, FISSURED DERMATITIS. TEN TO TWENTY APPLICATIONS TO RABBIT SKIN PRODUCED SLIGHT TO MODERATE IRRITATION AND SLIGHT NECROSIS.

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

EYE CONTACT:
TOLUENE:
IRRITANT.

ACUTE EXPOSURE- CONTACT WITH THE LIQUID MAY CAUSE CORNEAL BURNS IF NOT PROMPTLY REMOVED. VAPORS MAY CAUSE NOTICEABLE IRRITATION AND LACRIMATION A 300-800 PPM, AND EXTREMELY HIGH CONCENTRATIONS MAY CAUSE BLURRING OF VISION. CORNEAL LESIONS AND VERY FINE VACUOLES HAVE BEEN REPORTED IN WORKERS EXPOSED TO A SOLVENT MIXTURE CONTAINING TOLUENE. THE LESIONS SUBSIDED FOLLOWING SEVERAL DAYS OF NON-EXPOSURE. SIMILAR LESIONS HAVE BEEN PRODUCED IN CATS FOLLOWING EXPOSURE TO TOLUENE.
CHRONIC EXPOSURE- REPEATED OR PROLONGED CONTACT MAY CAUSE CONJUNCTIVITIS.

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

INGESTION:
TOLUENE:
NARCOTIC.
ACUTE EXPOSURE- MAY CAUSE NAUSEA, VOMITING, COLIC, DIARRHEA, BURNING SENSATION IN THE EPIGASTRIUM, HEADACHE, TINNITUS, DIZZINESS, WEAKNESS, EUPHORIA, DROWSINESS AND INCOORDINATION. IF LARGE AMOUNTS ARE INGESTED, SYMPTOMS MAY PROGRESS TO INCLUDE SHALLOW, RAPID RESPIRATION, TREMORS, VENTRICULAR IRREGULARITIES WITH FIBRILLATION, CONVULSIONS, STUPOR AND UNCONSCIOUSNESS. METABOLIC ACIDOSIS AND LIVER AND KIDNEY DAMAGE MAY OCCUR. APPROXIMATELY 15-30 MILLILITERS IS THE HUMAN LETHAL DOSE. ASPIRATION OF THE LIQUID INTO THE LUNGS MAY CAUSE COUGHING, GAGGING, ACUTE HEMORRHAGIC PNEUMONITIS AND RAPIDLY DEVELOPING PULMONARY EDEMA.
CHRONIC EXPOSURE- NO EFFECTS WERE REPORTED IN RATS FED UP TO 590 MG/KG/DAY FOR 193 DAYS. REPRODUCTIVE EFFECTS HAVE BEEN REPORTED IN ANIMALS.

FIRST AID- EXTREME CARE MUST BE USED TO PREVENT ASPIRATION. USE GASTRIC LAVAGE WITH ACTIVATED CHARCOAL AND A CUFFED ENDOTRACHEAL TUBE WITHIN 15 MINUTES. IN THE ABSENCE OF DEPRESSION OR CONVULSIONS OR IMPAIRED GAG REFLEX, IPECAC EMESIS CAN BE DONE. WHEN VOMITING BEGINS, KEEP HEAD BELOW THE HIPS TO PREVENT ASPIRATION. AFTER VOMITING STOPS, GIVE 30-60 MILLILITERS OF FLEET'S PHOSPHO-SODA DILUTED 1:4 IN WATER. MAINTAIN AIRWAY, BLOOD PRESSURE AND RESPIRATION. (DREISBACH, HANDBOOK OF POISONING, 11TH ED.) GET MEDICAL ATTENTION. TREATMENT MUST BE ADMINISTERED BY QUALIFIED MEDICAL PERSONNEL.

ANTIDOTE:
NO SPECIFIC ANTIDOTE. TREAT SYMPTOMATICALLY AND SUPPORTIVELY.

REACTIVITY SECTION

REACTIVITY:
STABLE UNDER NORMAL TEMPERATURES AND PRESSURES.

INCOMPATIBILITIES:
TOLUENE:
ALLYL CHLORIDE + DICHLOROETHYL ALUMINUM OR ETHYLALUMINUM SESQUICHLORIDE: POSSIBLE EXPLOSION.
BROMINE TRIFLUORIDE (SOLID): VIOLENT REACTION.
1,3-DICHLORO-5,5-DIMETHYL-2,4-IMIDAZOLIDIDIONE: EXPLOSIVE REACTION.
DINITROGEN TETRAFLUORIDE: FORMS EXPLOSIVE MIXTURE.
NITRIC ACID: VIGOROUS REACTION.
NITRIC ACID + SULFURIC ACID: VIOLENT DECOMPOSITION POSSIBLE.
NITROGEN TETROXIDE: EXPLOSIVE REACTION.
OXIDIZERS (STRONG): FIRE AND EXPLOSION HAZARD.

PLASTICS, RUBBER, AND COATINGS: MAY BE ATTACKED.
SILVER PERCHLORATE: FORMS SHOCK-SENSITIVE MIXTURE.
SULFUR DICHLORIDE: VIOLENT REACTION, GREATLY ACCELERATED IN THE PRESENCE OF IRON OR FERRIC CHLORIDE.
SULFURIC ACID: EXOTHERMIC REACTION.
TETRANITROMETHANE: FORMS EXPLOSIVE MIXTURE.
URANIUM HEXAFLUORIDE: VIOLENT REACTION.

DECOMPOSITION:
THERMAL DECOMPOSITION PRODUCTS MAY INCLUDE TOXIC OXIDES OF CARBON.

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

STORAGE-DISPOSAL

OBSERVE ALL FEDERAL, STATE AND LOCAL REGULATIONS WHEN STORING OR DISPOSING OF THIS SUBSTANCE. FOR ASSISTANCE, CONTACT THE DISTRICT DIRECTOR OF THE ENVIRONMENTAL PROTECTION AGENCY.

STORAGE

STORE IN ACCORDANCE WITH 29 CFR 1910.106.

PROTECT AGAINST PHYSICAL DAMAGE. OUTSIDE OR DETACHED STORAGE IS PREFERABLE. INSIDE STORAGE SHOULD BE IN A STANDARD FLAMMABLE LIQUIDS STORAGE ROOM OR CABINET. SEPARATE FROM OXIDIZING MATERIALS (NFPA 49, HAZARDOUS CHEMICALS DATA, 1975).

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

STORE AWAY FROM INCOMPATIBLE SUBSTANCES.

DISPOSAL

DISPOSAL MUST BE IN ACCORDANCE WITH STANDARDS APPLICABLE TO GENERATORS OF HAZARDOUS WASTE, 40CFR 262. EPA HAZARDOUS WASTE NUMBER U220.

CONDITIONS TO AVOID

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

SPILLS AND LEAKS

SOIL-RELEASE:
DIG HOLDING AREA SUCH AS LAGOON, POND OR PIT FOR CONTAINMENT.

DIKE FLOW OF SPILLED MATERIAL USING SOIL OR SANDBAGS OR FOAMED BARRIERS SUCH AS POLYURETHANE OR CONCRETE.

USE CEMENT POWDER OR FLY ASH TO ABSORB LIQUID MASS.

IMMOBILIZE SPILL WITH UNIVERSAL GELLING AGENT.

REDUCE VAPOR AND FIRE HAZARD WITH APPROPRIATE FOAM.

AIR-RELEASE:
KNOCK DOWN VAPORS WITH WATER SPRAY. KEEP UPWIND.

WATER-SPILL:
LIMIT SPILL MOTION AND DISPERSION WITH NATURAL BARRIERS OR OIL SPILL CONTROL BOOMS.

APPLY DETERGENTS, SOAPS, ALCOHOLS OR ANOTHER SURFACE ACTIVE AGENT.

APPLY UNIVERSAL GELLING AGENT TO IMMOBILIZE TRAPPED SPILL AND INCREASE EFFICIENCY OF REMOVAL.

IF DISSOLVED, AT A CONCENTRATION OF 10 PPM OR GREATER, APPLY ACTIVATED CARBON AT TEN TIMES THE AMOUNT THAT HAS BEEN SPILLED.

USE SUCTION HOSES TO REMOVE TRAPPED SPILL MATERIAL.

USE MECHANICAL DREDGES OR LIFTS TO EXTRACT IMMOBILIZED MASSES OF POLLUTION AND PRECIPITATES.

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

REPORTABLE QUANTITY (RQ): 1000 POUNDS
THE SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT (SARA) SECTION 304 REQUIRES THAT A RELEASE EQUAL TO OR GREATER THAN THE REPORTABLE QUANTITY FOR THIS SUBSTANCE BE IMMEDIATELY REPORTED TO THE LOCAL EMERGENCY PLANNING COMMITTEE AND THE STATE EMERGENCY RESPONSE COMMISSION (40 CFR 355.40). IF THE RELEASE OF THIS SUBSTANCE IS REPORTABLE UNDER CERCLA SECTION 103, THE NATIONAL RESPONSE CENTER MUST BE NOTIFIED IMMEDIATELY AT (800) 424-8802 OR (202) 426-2675 IN THE METROPOLITAN WASHINGTON, D.C. AREA (40 CFR 302.6).

PROTECTIVE EQUIPMENT SECTION

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

RESPIRATOR:
THE FOLLOWING RESPIRATORS AND MAXIMUM USE CONCENTRATIONS ARE RECOMMENDATIONS BY THE U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES, NIOSH POCKET GUIDE TO CHEMICAL HAZARDS; NIOSH CRITERIA DOCUMENTS OR BY THE U.S. DEPARTMENT OF LABOR, 29 CFR 1910 SUBPART Z.
THE SPECIFIC RESPIRATOR SELECTED MUST BE BASED ON CONTAMINATION LEVELS FOUND IN THE WORK PLACE, MUST NOT EXCEED THE WORKING LIMITS OF THE RESPIRATOR AND BE JOINTLY APPROVED BY THE NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH AND THE MINE SAFETY AND HEALTH ADMINISTRATION (NIOSH-MSHA).

TOLUENE:
1000 PPM- ANY CHEMICAL CARTRIDGE RESPIRATOR WITH ORGANIC VAPOR CARTRIDGE(S).
ANY SUPPLIED-AIR RESPIRATOR.
ANY POWERED AIR-PURIFYING RESPIRATOR WITH ORGANIC VAPOR CARTRIDGE(S).
ANY SELF-CONTAINED BREATHING APPARATUS.

2000 PPM- ANY SUPPLIED-AIR RESPIRATOR OPERATED IN A CONTINUOUS FLOW MODE.
ANY SELF-CONTAINED BREATHING APPARATUS WITH A FULL FACEPIECE.
ANY SUPPLIED-AIR RESPIRATOR WITH A FULL FACEPIECE.
ANY AIR-PURIFYING FULL FACEPIECE RESPIRATOR (GAS MASK) WITH A CHIN-STYLE OR FRONT OR BACK-MOUNTED ORGANIC VAPOR CANISTER.

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

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

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

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

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

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

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

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

AUTHORIZED BY- OCCUPATIONAL HEALTH SERVICES, INC.

CREATION DATE: 10/25/84 REVISION DATE: 12/28/89

MATERIAL SAFETY DATA SHEET OHS25150

OCCUPATIONAL HEALTH SERVICES, INC.
450 SEVENTH AVENUE, SUITE 2407
NEW YORK, NEW YORK 10123
(800) 445-MSDS (212) 967-1100

EMERGENCY CONTACT:
JOHN S. BRANSFORD, JR. (615) 292-1180

SUBSTANCE IDENTIFICATION

CAS-NUMBER 1330-20-7
RTEC-NUMBER ZE2100000

SUBSTANCE: XYLENE

TRADE NAMES/SYNONYMS:
BENZENE, DIMETHYL-: DILAN: DIMETHYLBENZENE: XYLOL: HUMISEAL THINNER NO.33 (HUMISEAL DIV.): HUMISEAL THINNER NO.SP 420 (HUMISEAL DIV.): SOLVESSO XYLENE (HUMBLE OIL AND REFINING COMPANY): TT-X-9166 REDUCER (ADVANCED COATINGS AND CHEMICALS): DYNACHEM (R) DEVELOPER DCR (THIOKOL/DYNACHEM CORPORATION): THINNER 2000 (KOP-COAT): SOL 9050 XYLENE (CHEMTECH INDUSTRIES, INC.): HUMISEAL THINNER NO. 521 (M.W. RIEDEL AND COMPANY): RCRA U239: STCC 4904350: UN 1307: C8H10: OHS25150

CHEMICAL FAMILY:
HYDROCARBON, AROMATIC

MOLECULAR FORMULA: C6-H4-(C-H3)2 MOLECULAR WEIGHT: 106.16

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

COMPONENTS AND CONTAMINANTS

COMPONENT: XYLENE (O-, M-, P-ISOMERS) PERCENT: 100

OTHER CONTAMINANTS: NONE

EXPOSURE LIMIT:
XYLENE:
100 PPM (435 MG/M3) OSHA TWA; 150 PPM (655 MG/M3) OSHA STEL
100 PPM (435 MG/M3) ACGIH TWA; 150 PPM (655 MG/M3) ACGIH STEL
100 PPM (435 MG/M3) NIOSH RECOMMENDED 10 HOUR TWA; 200 PPM (870 MG/M3) NIOSH RECOMMENDED 10 MINUTE CEILING

1000 POUNDS CERCLA SECTION 103 REPORTABLE QUANTITY
SUBJECT TO SARA SECTION 313 ANNUAL TOXIC CHEMICAL RELEASE REPORTING

PHYSICAL DATA

DESCRIPTION: LIGHT COLORED OR COLORLESS MOBILE LIQUID WITH AN AROMATIC ODOR.

BOILING POINT: 280-291 F (138-144 C) MELTING POINT: -54-55 F (-48-13 C)

SPECIFIC GRAVITY: 0.8611-0.8802 EVAPORATION RATE: (BUTYL ACETATE = 1) 0.6

VOLATILITY: 100%

SOLUBILITY IN WATER: 0.00003%

VAPOR DENSITY: 3.7

VAPOR PRESSURE: 7-9 MMHG @ 20 C

ODOR-THRESHOLD: 0.3 PPM

OTHER SOLVENTS (SOLVENT - SOLUBILITY):
SOLUBLE IN ALCOHOL, ETHER, ACETONE, PETROLEUM ETHER, BENZENE, CARBON TETRACHLORIDE, ORGANIC SOLVENTS.

FIRE AND EXPLOSION DATA

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

DUE TO LOW ELECTROCONDUCTIVITY OF THE SUBSTANCE, FLOW OR AGITATION MAY GENERATE ELECTROSTATIC CHARGES RESULTING IN SPARKS WITH POSSIBLE IGNITION.

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

VAPOR-AIR MIXTURES ARE EXPLOSIVE.

FLASH POINT: 81-90 F (27-32 C) (CC)

UPPER EXPLOSION LIMIT: 7.0%

LOWER EXPLOSION LIMIT: 1.0%

AUTOIGNITION TEMP.: 867-984 F (464-529 C)

FLAMMABILITY CLASS (OSHA): IC

FIREFIGHTING MEDIA:
DRY CHEMICAL, CARBON DIOXIDE, HALON, WATER SPRAY OR STANDARD FOAM (1987 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.4).

FOR LARGER FIRES, USE WATER SPRAY, FOG OR STANDARD FOAM (1987 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.4).

FIREFIGHTING:
MOVE CONTAINER FROM FIRE AREA IF POSSIBLE. COOL FIRE-EXPOSED CONTAINERS WITH WATER FROM SIDE UNTIL WELL AFTER FIRE IS OUT. STAY AWAY FROM STORAGE TANK ENDS. FOR MASSIVE FIRE IN STORAGE AREA, USE UNMANNED HOSE HOLDER OR MONITOR NOZZLES. ELSE WITHDRAW FROM AREA AND LET FIRE BURN. WITHDRAW IMMEDIATELY IN CASE OF RISING SOUND FROM VENTING SAFETY DEVICE OR ANY DISCOLORATION OF STORAGE TANK DUE TO FIRE (1987 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.4, GUIDE PAGE 27).

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

WATER MAY BE INEFFECTIVE (NFPA FIRE PROTECTION GUIDE ON HAZARDOUS MATERIALS, EIGHTH EDITION).

TRANSPORTATION

DEPARTMENT OF TRANSPORTATION HAZARD CLASSIFICATION 49CFR172.101:
FLAMMABLE LIQUID

DEPARTMENT OF TRANSPORTATION LABELING REQUIREMENTS 49CFR172.101 AND SUBPART E:
FLAMMABLE LIQUID

DEPARTMENT OF TRANSPORTATION PACKAGING REQUIREMENTS: 49CFR173.119
EXCEPTIONS: 49CFR173.118

TOXICITY

XYLENE:
IRRITATION DATA: 200 PPM EYE-HUMAN; 87 MG EYE-RABBIT MILD; 5 MG/24 HOURS EYE-RABBIT SEVERE; 100% SKIN-RABBIT MODERATE; 500 MG/24 HOURS SKIN-RABBIT MODERATE.
TOXICITY DATA: 10000 PPM/6 HOURS INHALATION-MAN LCLO; 200 PPM INHALATION-HUMAN TCLO; 5000 PPM/4 HOURS INHALATION-RAT LC50; 450 PPM INHALATION-GUINEA PIG LCLO; 50 MG/KG ORAL-HUMAN LDLO; 4300 MG/KG ORAL-RAT LD50; 1700 MG/KG SUBCUTANEOUS-RAT LD50; 2000 MG/KG INTRAPERITONEAL-MAMMAL LDLO; 2459 MG/KG INTRAPERITONEAL-RAT LD50; 1548 MG/KG INTRAPERITONEAL-MOUSE LD50; 2000 MG/KG INTRAPERITONEAL-GUINEA PIG LDLO; REPRODUCTIVE EFFECTS DATA (RTECS).
CARCINOGEN STATUS: NONE.
LOCAL EFFECTS: IRRITANT- INHALATION, SKIN, EYE.
ACUTE TOXICITY LEVEL: MODERATELY TOXIC BY INHALATION, INGESTION.
TARGET EFFECTS: CENTRAL NERVOUS SYSTEM DEPRESSANT. POISONING MAY ALSO AFFECT THE NERVOUS SYSTEM, LIVER AND KIDNEYS.
AT INCREASED RISK FROM EXPOSURE: PREGNANT WOMEN.
ADDITIONAL INFORMATION: CONSUMPTION OF ALCOHOLIC BEVERAGES MAY ENHANCE THE TOXIC EFFECTS. STIMULANTS SUCH AS EPINEPHRINE OR EPHEDRINE MAY INDUCE VENTRICULAR FIBRILLATION.

HEALTH EFFECTS AND FIRST AID

INHALATION:
XYLENE:
IRRITANT/NARCOTIC. 1000 PPM IMMEDIATELY DANGEROUS TO LIFE OR HEALTH.
ACUTE EXPOSURE- IRRITATION OF THE UPPER RESPIRATORY TRACT MAY OCCUR AT 200 PPM. EXPOSURE TO HIGHER CONCENTRATIONS MAY CAUSE MORE SEVERE IRRITATION AND INITIAL CENTRAL NERVOUS SYSTEM EXCITATION FOLLOWED BY DEPRESSION. SIGNS AND SYMPTOMS MAY INCLUDE RESPIRATORY DIFFICULTY AND SUBSTERNAL PAIN, TRANSIENT EUPHORIA AND EMOTIONAL LABILITY, HEADACHE, NAUSEA, VOMITING, ANOREXIA, ABDOMINAL PAIN, DIZZINESS, DROWSINESS, ATAXIA, AND STAGGERING. THERE MAY BE SALIVATION, SLURRED SPEECH, BLURRED VISION, NYSTAGMUS, TINNITUS, TREMORS, CONFUSION, AND FLUSHING OF THE FACE AND A FEELING OF INCREASED BODY HEAT. IN SEVERE EXPOSURES, THERE MAY BE STUPOR, ANESTHESIA, UNCONSCIOUSNESS, AND COMA WHICH MAY BE PUNCTUATED BY EPISODES OF NEUROIRRITABILITY, BUT RARELY FRANK CONVULSIONS, EXCEPT IN TERMINAL ASPHYXIA. LIVER AND KIDNEY DAMAGE MAY OCCUR, BUT ARE USUALLY MILD AND TRANSIENT. A GROUP OF SUBJECTS WHO INHALED 12.3 UMOL/L OF XYLENE WHILE EXERCISING BECAME SIGNIFICANTLY IMPAIRED ON 3 NEUROPSYCHOLOGICAL TESTS. EXPOSURE OF 3 PAINTERS TO APPROXIMATELY 10,000 PPM FOR 18.5

HOURS RESULTED IN 1 DEATH FROM PULMONARY EDEMA AND PETECHIAL BRAIN HEMORRHAGE. BOTH SURVIVORS WERE UNCONSCIOUSNESS FOR 19-24 HOURS AND EXPERIENCED RETROGRADE AMNESIA, HYPOTHERMIA, AND LUNG CONGESTION. RENAL AND HEPATIC IMPAIRMENT ALSO DEVELOPED. COMPLETE RECOVERY TOOK 15 DAYS. HIGH CONCENTRATIONS MAY CAUSE DEATH FROM SUDDEN VENTRICULAR FIBRILLATION, BUT MORE FREQUENTLY DEATH OCCURS FROM RESPIRATORY ARREST.

CHRONIC EXPOSURE- REPEATED OR PROLONGED INHALATION OF VAPORS ABOVE 200 PPM MAY CAUSE NAUSEA, VOMITING, ABDOMINAL PAIN, AND ANOREXIA. OTHER COMMON COMPLAINTS INCLUDE HEADACHE, FATIGUE, LASSITUDE, IRRITABILITY, BREATHING DIFFICULTIES, AND FLATULENCE. EFFECTS ON THE NERVOUS SYSTEM MAY RESULT IN EXCITATION, FOLLOWED BY DEPRESSION, PARESTHESIAS, TREMORS, APPREHENSION, IMPAIRED MEMORY, INSOMNIA, VERTIGO, AND TINNITUS. EFFECTS ON REACTION TIME, MANUAL COORDINATION, BODY BALANCE AND EEG OCCURRED WITH REPEATED EXPOSURE TO 90 PPM OF M-XYLENE. SWEETISH TASTE IN THE MOUTH, DRY NOSE AND THROAT, STRONG THIRST, MUCOSAL HEMORRHAGE, AND ANEMIA HAVE BEEN REPORTED. EFFECTS ON THE LIVER, KIDNEY, CARDIOVASCULAR SYSTEM, AND THE BONE MARROW HAVE ALSO BEEN REPORTED, ALTHOUGH THE LATTER HAS BEEN QUESTIONED. EXPOSURE OF RABBITS TO 1150 PPM FOR 40-55 DAYS RESULTED IN A REVERSIBLE DECREASE IN THE RED AND WHITE CELL COUNTS AND AN INCREASE IN THE PLATELETS. ONE CASE OF AN APPARENT EPILEPTIFORM SEIZURE FOLLOWING A RELATIVELY BRIEF EXPOSURE HAS OCCURRED. WOMEN MAY DEVELOP MENSTRUAL DISORDERS, SUCH AS MENORRHAGIA OR METRORRHAGIA, INFERTILITY, AND PATHOLOGICAL PREGNANCY CONDITIONS INCLUDING TOXICOSIS, DANGER OF MISCARRIAGE, AND HEMORRHAGING DURING DELIVERY. REPEATED EXPOSURE OF PREGNANT MICE, RATS AND RABBITS TO THE INDIVIDUAL OR THE MIXED ISOMERS HAS RESULTED IN MATERNAL EFFECTS AND EFFECTS ON FERTILITY, ON THE EMBRYO OR FETUS, AND SPECIFIC DEVELOPMENTAL ABNORMALITIES. INCLUDED AMONG THESE EFFECTS ARE FETAL DEATH, FETOTOXICITY, PRE- AND POST-IMPLANTATION MORTALITY, ABORTION, CRANIOFACIAL AND MUSCULOSKELETAL ABNORMALITIES, AND EXTRA EMBRYONIC STRUCTURES.

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

SKIN CONTACT:
XYLENE:
IRRITANT.

ACUTE EXPOSURE- LIQUID XYLENE IS A DEFATTING AGENT AND MAY CAUSE A BURNING SENSATION, DRYING, VASODILATION, ERYTHEMA, AND POSSIBLY BLISTERING. THE LIQUID IS READILY ABSORBED THROUGH INTACT OR BROKEN SKIN AT A RATE OF APPROXIMATELY 4-10 MG/CM2/HOUR, BUT SYSTEMIC EFFECTS HAVE NOT BEEN REPORTED.

CHRONIC EXPOSURE- REPEATED OR PROLONGED CONTACT MAY CAUSE DEFATTING OF THE SKIN WITH DRYING, ERYTHEMA, CRACKING, THICKENING AND BLISTERING. REPEATED APPLICATION OF 95% XYLENE TO RABBIT SKIN CAUSED MODERATE TO MARKED IRRITATION WITH ERYTHEMA AND MODERATE NECROSIS. ONE CASE OF ALLERGIC CONTACT URTICARIA HAS BEEN REPORTED.

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

EYE CONTACT:
XYLENE:
IRRITANT.

ACUTE EXPOSURE- 200 PPM HAS CAUSED CONJUNCTIVAL IRRITATION IN HUMANS; AT HIGHER CONCENTRATIONS, IRRITATION MAY BE SEVERE. VAPOR EXPOSURE HAS ALSO CAUSED TEARING AND PHOTOPHOBIA. AN ACCIDENTAL SPLASH IN THE HUMAN EYE

CAUSED TRANSIENT SUPERFICIAL DAMAGE WITH RAPID RECOVERY, ALTHOUGH REVERSIBLE CORNEAL BURNS HAVE ALSO BEEN REPORTED.
CHRONIC EXPOSURE- REPEATED OR PROLONGED EXPOSURE TO HIGH VAPOR CONCENTRATIONS MAY CAUSE A BURNING SENSATION, CONJUNCTIVITIS AND BLURRED VISION; REVERSIBLE VACUOLAR, EPITHELIAL KERATOPATHY HAS BEEN REPORTED IN SOME WORKERS.

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

INGESTION:
XYLENE:
NARCOTIC.
ACUTE EXPOSURE- MAY CAUSE A BURNING SENSATION IN THE MOUTH AND STOMACH, SALIVATION, SEVERE GASTROINTESTINAL DISTRESS WITH NAUSEA AND VOMITING, POSSIBLY HEMATEMESIS, AND TOXIC EFFECTS INCLUDING SIGNS OF CENTRAL NERVOUS SYSTEM DEPRESSION AND OTHER SYMPTOMS AS IN ACUTE INHALATION, INCLUDING VENTRICULAR FIBRILLATION AND LIVER AND KIDNEY INJURY. INGESTION OF SMALL QUANTITIES OF 90% XYLENE PLUS TOLUENE PRODUCED URINARY DEXTROSE AND UROBILINOGEN EXCRETION WITH TOXIC HEPATITIS, WHICH WAS REVERSIBLE IN 20 DAYS. A DOSE OF 15-30 MILLILITERS (ABOUT 1/2-1 OUNCE) IS THE EXPECTED HUMAN LETHAL DOSE. WITH ASPIRATION OF EVEN A FEW MILLILITERS INTO THE LUNGS, SEVERE COUGHING, DISTRESS, CHEMICAL PNEUMONITIS, RAPIDLY DEVELOPING PULMONARY EDEMA, AND HEMORRHAGE MAY OCCUR.
CHRONIC EXPOSURE- NO DATA AVAILABLE ON THE ORTHO-ISOMER. REPEATED INGESTION OF THE MIXED, META-, OR PARA-ISOMERS BY PREGNANT MICE RESULTED IN EFFECTS ON FERTILITY, ON THE EMBRYO OR FETUS, OR SPECIFIC DEVELOPMENTAL ABNORMALITIES. INCLUDED AMONG THESE EFFECTS WERE FETOTOXICITY, LITTER SIZE, CRANIOFACIAL AND MUSCULOSKELETAL SYSTEM ABNORMALITIES, AND POST-IMPLANTATION MORTALITY.

FIRST AID- EXTREME CARE MUST BE USED TO PREVENT ASPIRATION. GASTRIC LAVAGE WITH A CUFFED ENDOTRACHEAL TUBE IN PLACE TO PREVENT FURTHER ASPIRATION SHOULD BE DONE WITHIN 15 MINUTES. IN THE ABSENCE OF DEPRESSION OR CONVULSIONS OR IMPAIRED GAG REFLEX, EMESIS CAN ALSO BE INDUCED USING SYRUP OF IPECAC WITHOUT INCREASING THE HAZARD OF ASPIRATION (DREISBACH, HANDBOOK OF POISONING, 12TH ED.). TREAT SYMPTOMATICALLY AND SUPPORTIVELY. GASTRIC LAVAGE SHOULD BE PERFORMED BY QUALIFIED MEDICAL PERSONNEL. GET MEDICAL ATTENTION IMMEDIATELY.

ANTIDOTE:
NO SPECIFIC ANTIDOTE. TREAT SYMPTOMATICALLY AND SUPPORTIVELY.

REACTIVITY SECTION

REACTIVITY:
STABLE UNDER NORMAL TEMPERATURES AND PRESSURES.

INCOMPATIBILITIES:
XYLENE:
NITRIC ACID: EXOTHERMIC REACTION.
OXIDIZERS (STRONG): FIRE AND EXPLOSION HAZARD.
PLASTICS, RUBBER, COATINGS: MAY BE ATTACKED.
SULFURIC ACID: EXOTHERMIC REACTION.

DECOMPOSITION:

THERMAL DECOMPOSITION PRODUCTS MAY INCLUDE TOXIC OXIDES OF CARBON.

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

STORAGE-DISPOSAL

OBSERVE ALL FEDERAL, STATE AND LOCAL REGULATIONS WHEN STORING OR DISPOSING OF THIS SUBSTANCE. FOR ASSISTANCE, CONTACT THE DISTRICT DIRECTOR OF THE ENVIRONMENTAL PROTECTION AGENCY.

STORAGE

STORE IN ACCORDANCE WITH 29 CFR 1910.106.

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

PROTECT AGAINST PHYSICAL DAMAGE. OUTSIDE OR DETACHED STORAGE IS PREFERABLE. INSIDE STORAGE SHOULD BE IN A STANDARD FLAMMABLE LIQUIDS STORAGE ROOM OR CABINET. SEPARATE FROM OXIDIZING MATERIALS (NFPA 49, HAZARDOUS CHEMICALS DATA, 1975).

STORE AWAY FROM INCOMPATIBLE SUBSTANCES.

DISPOSAL

DISPOSAL MUST BE IN ACCORDANCE WITH STANDARDS APPLICABLE TO GENERATORS OF HAZARDOUS WASTE, 40CFR 262. EPA HAZARDOUS WASTE NUMBER U239.

CONDITIONS TO AVOID

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

SPILLS AND LEAKS

SOIL-RELEASE:
DIG A HOLDING AREA SUCH AS A PIT, POND OR LAGOON TO CONTAIN SPILL AND DIKE SURFACE FLOW USING BARRIER OF SOIL, SANDBAGS, FOAMED POLYURETHANE OR FOAMED CONCRETE. ABSORB LIQUID MASS WITH FLY ASH OR CEMENT POWDER.

IMMOBILIZE SPILL WITH UNIVERSAL GELLING AGENT.

REDUCE VAPOR AND FIRE HAZARD WITH APPROPRIATE FOAM.

AIR-RELEASE:
KNOCK DOWN VAPORS WITH WATER SPRAY. KEEP UPWIND.

WATER-SPILL:
LIMIT SPILL MOTION AND DISPERSION WITH NATURAL BARRIERS OR OIL SPILL CONTROL BOOMS.

APPLY DETERGENTS, SOAPS, ALCOHOLS OR ANOTHER SURFACE ACTIVE AGENT.

APPLY UNIVERSAL GELLING AGENT TO IMMOBILIZE TRAPPED SPILL AND INCREASE EFFICIENCY OF REMOVAL.

IF DISSOLVED, AT A CONCENTRATION OF 10 PPM OR GREATER, APPLY ACTIVATED CARBON AT TEN TIMES THE AMOUNT THAT HAS BEEN SPILLED.

USE SUCTION HOSES TO REMOVE TRAPPED SPILL MATERIAL.

USE MECHANICAL DREDGES OR LIFTS TO EXTRACT IMMOBILIZED MASSES OF POLLUTION AND PRECIPITATES.

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

REPORTABLE QUANTITY (RQ): 1000 POUNDS
THE SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT (SARA) SECTION 304 REQUIRES THAT A RELEASE EQUAL TO OR GREATER THAN THE REPORTABLE QUANTITY FOR THIS SUBSTANCE BE IMMEDIATELY REPORTED TO THE LOCAL EMERGENCY PLANNING COMMITTEE AND THE STATE EMERGENCY RESPONSE COMMISSION (40 CFR 355.40). IF THE RELEASE OF THIS SUBSTANCE IS REPORTABLE UNDER CERCLA SECTION 103, THE NATIONAL RESPONSE CENTER MUST BE NOTIFIED IMMEDIATELY AT (800) 424-8802 OR (202) 426-2675 IN THE METROPOLITAN WASHINGTON, D.C. AREA (40 CFR 302.6).

PROTECTIVE EQUIPMENT SECTION

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

RESPIRATOR:
THE FOLLOWING RESPIRATORS AND MAXIMUM USE CONCENTRATIONS ARE RECOMMENDATIONS BY THE U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES, NIOSH POCKET GUIDE TO CHEMICAL HAZARDS; NIOSH CRITERIA DOCUMENTS OR BY THE U.S. DEPARTMENT OF LABOR, 29 CFR 1910 SUBPART Z.
THE SPECIFIC RESPIRATOR SELECTED MUST BE BASED ON CONTAMINATION LEVELS FOUND IN THE WORK PLACE, MUST NOT EXCEED THE WORKING LIMITS OF THE RESPIRATOR AND BE JOINTLY APPROVED BY THE NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH AND THE MINE SAFETY AND HEALTH ADMINISTRATION (NIOSH-MSHA).

XYLENE (O-, M-, AND P-ISOMERS):
1000 PPM- ANY CHEMICAL CARTRIDGE RESPIRATOR WITH ORGANIC VAPOR CARTRIDGE(S).
ANY POWERED AIR-PURIFYING RESPIRATOR WITH ORGANIC VAPOR

CARTRIDGE(S).
ANY SUPPLIED-AIR RESPIRATOR.
ANY SELF-CONTAINED BREATHING APPARATUS.

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

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

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

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

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

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

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

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

AUTHORIZED BY- OCCUPATIONAL HEALTH SERVICES, INC.

CREATION DATE: 11/14/84 REVISION DATE: 11/02/89

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OCCUPATIONAL HEALTH SERVICES, INC.
450 SEVENTH AVENUE, SUITE 2407
NEW YORK, NEW YORK 10123
(800) 445-MSDS (212) 967-1100

EMERGENCY CONTACT:
JOHN S. BRANSFORD, JR. (615) 292-1180

SUBSTANCE IDENTIFICATION

CAS-NUMBER 75-01-4
RTEC-NUMBER KU9625000

SUBSTANCE: VINYL CHLORIDE

TRADE NAMES/SYNONYMS:
CHLOROETHYLENE: CHLOROETHENE: CHLORETHENE: TROVIDUR: ETHYLENE MONOCHLORIDE: MONOCHLOROETHYLENE: EXON 470: MONOCHLORO ETHENE: VINYL CHLORIDE MONOMER: VINYL CHLORIDE, INHIBITED: STCC 4905792: RCRA U043: UN 1086: C2H3CL: OHS24940

CHEMICAL FAMILY:
HALOGEN COMPOUND, ALIPHATIC

MOLECULAR FORMULA: C-H2-C-H-CL MOLECULAR WEIGHT: 62.50

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

COMPONENTS AND CONTAMINANTS

COMPONENT: VINYL CHLORIDE PERCENT: >99.9

OTHER CONTAMINANTS: MAY CONTAIN TRACES OF PHENOL OR OTHER INHIBITORS

EXPOSURE LIMIT:
VINYL CHLORIDE:
1.0 PPM OSHA TWA; 5 PPM OSHA 15 MINUTE CEILING;
0.5 PPM OSHA ACTION LEVEL AS AN 8 HOUR TWA
5 PPM ACGIH TWA
ACGIH A1-CONFIRMED HUMAN CARCINOGEN.
LOWEST FEASIBLE LIMIT NIOSH RECOMMENDED EXPOSURE CRITERIA

1 POUND CERCLA SECTION 103 REPORTABLE QUANTITY
SUBJECT TO SARA SECTION 313 ANNUAL TOXIC CHEMICAL RELEASE REPORTING
SUBJECT TO CALIFORNIA PROPOSITION 65 CANCER AND/OR REPRODUCTIVE TOXICITY WARNING AND RELEASE REQUIREMENTS- (FEBRUARY 27, 1987)

PHYSICAL DATA

DESCRIPTION: COLORLESS GAS WITH A MILD, SWEET ODOR.

BOILING POINT: 9 F (-13 C) MELTING POINT: -245 F (-154 C)

SPECIFIC GRAVITY: 0.9106 SOLUBILITY IN WATER: 0.25%

VAPOR DENSITY: 2.2 VAPOR PRESSURE: 2515.6 MMHG @ 21.1 C

ODOR-THRESHOLD: 260 PPM

OTHER SOLVENTS (SOLVENT - SOLUBILITY):
SOLUBLE IN ALCOHOL, ETHER, CARBON TETRACHLORIDE, BENZENE.

OTHER PHYSICAL DATA
VISCOSITY: 0.01072 CP @ 20 C (GAS); 0.280 CP @ -20 C (LIQUID)

FIRE AND EXPLOSION DATA

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

DANGEROUS EXPLOSION HAZARD WHEN EXPOSED TO HEAT OR FLAME.

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

VAPOR-AIR MIXTURES ARE EXPLOSIVE.

DUE TO LOW ELECTROCONDUCTIVITY OF THE SUBSTANCE, FLOW OR AGITATION MAY GENERATE ELECTROSTATIC CHARGES RESULTING IN SPARKS WITH POSSIBLE IGNITION.

FLASH POINT: -108 F (-78 C) UPPER EXPLOSION LIMIT: 33%

LOWER EXPLOSION LIMIT: 3.6% AUTOIGNITION TEMP.: 882 F (472 C)

FIREFIGHTING MEDIA:
DRY CHEMICAL, CARBON DIOXIDE OR HALON
(1987 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.4).

FOR LARGER FIRES, USE WATER SPRAY, FOG OR STANDARD FOAM
(1987 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.4).

FIREFIGHTING:
MOVE CONTAINER FROM FIRE AREA IF POSSIBLE. STAY AWAY FROM STORAGE TANK ENDS. FOR MASSIVE FIRE IN STORAGE AREA, USE UNMANNED HOSE HOLDER OR MONITOR NOZZLES, ELSE WITHDRAW FROM AREA AND LET FIRE BURN. WITHDRAW IMMEDIATELY IN CASE OF RISING SOUND FROM VENTING SAFETY DEVICE OR ANY DISCOLORATION OF STORAGE TANK FROM FIRE. LET STORAGE VESSEL BURN UNLESS LEAK CAN BE STOPPED: FOR SMALLER TANKS OR CYLINDERS, EXTINGUISH/ISOLATE FROM OTHER FLAMMABLE MATERIALS (1987 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.4, GUIDE PAGE 17).

EXTINGUISH ONLY IF FLOW CAN BE STOPPED: USE WATER IN FLOODING QUNATITIES AS FOG. COOL CONTAINERS WITH FLOODING AMOUNTS OF WATER, APPLY FROM AS FAR A DISTANCE AS POSSIBLE. AVOID BREATHING TOXIC VAPORS, KEEP UPWIND. EVACUATE TO A RADIUS OF 2500 FEET FOR UNCONTROLLABLE FIRES. CONSIDER EVACUATION OF DOWNWIND AREA IF MATERIAL IS LEAKING.

STOP FLOW OF GAS (NFPA FIRE PROTECTION GUIDE ON HAZARDOUS MATERIALS, EIGHTH EDITION).

TRANSPORTATION

DEPARTMENT OF TRANSPORTATION HAZARD CLASSIFICTION 49CFR172.101:
FLAMMABLE GAS

DEPARTMENT OF TRANSPORTATION LABELING REQUIREMENTS 49CFR172.101 AND SUBPART E:
FLAMMABLE GAS

DEPARTMENT OF TRANSPORTATION PACKAGING REQUIREMENTS: 49CFR173.304;
49CFR173.314 AND 49CFR173.315
EXCEPTIONS: 49CFR173.306

TOXICITY

VINYL CHLORIDE:
TOXICITY DATA: 500 MG/KG ORAL-RAT LD50; 18 PPH/15 MINUTES INHALATION-RAT LC50; MUTAGENIC DATA (RTECS); REPRODUCTIVE EFFECTS DATA (RTECS); TUMORIGENIC DATA (RTECS).
CARCINOGEN STATUS: OSHA CARCINOGEN; KNOWN HUMAN CARCINOGEN (NTP); HUMAN SUFFICIENT EVIDENCE, ANIMAL SUFFICIENT EVIDENCE (IARC CLASS-1). STUDIES SHOW OCCUPATIONAL EXPOSURE RESULTED IN A SIGNIFICANT INCREASE IN ANGIOSARCOMAS OF THE LIVER, AND ALSO TUMORS OF THE BRAIN, LUNG, AND HEMATOPOIETIC SYSTEMS. VINYL CHLORIDE WAS CARCINOGENIC IN RATS, MICE, AND HAMSTERS FOLLOWING ORAL AND INHALATION EXPOSURE, PRODUCING ANGIOSARCOMAS OF THE LIVER AND ALSO TUMORS AT VARIOUS SITES, AND WAS CARCINOGENIC IN RATS FOLLOWING PRENATAL EXPOSURE.
LOCAL EFFECTS: IRRITANT- SKIN, EYE.
ACUTE TOXICITY LEVEL: TOXIC BY INGESTION; RELATIVELY NON-TOXIC BY INHALATION.
TARGET EFFECTS: CENTRAL NERVOUS SYSTEM DEPRESSANT. POISONING MAY AFFECT THE BLOOD, LIVER, AND LYMPHATIC AND RESPIRATORY SYSTEMS.
ADDITIONAL DATA: STIMULANTS SUCH AS EPINEPHRINE MAY INDUCE VENTRICULAR FIBRILLATION.

HEALTH EFFECTS AND FIRST AID

INHALATION:
VINYL CHLORIDE:
NARCOTIC/CARCINOGEN.
ACUTE EXPOSURE- MAY BE IRRITATING. EXPOSURE TO 1000-16,000 PPM MAY CAUSE CENTRAL NERVOUS SYSTEM DEPRESSION WITH DROWSINESS, VERTIGO, STAGGERING GAIT, TINGLING AND NUMBNESS OF HANDS AND FEET, IMPAIRED HEARING AND VISION, CARDIAC ARRHYTHMIAS AND POSSIBLY UNCONSCIOUSNESS; 20,000-25,000 PPM FOR 3-5 MINUTES MAY CAUSE DIZZINESS, LIGHTHEADEDNESS, DISORIENTATION, NAUSEA AND BURNING SENSATION OF THE SOLES OF THE FEET; AND 120,000 PPM MAY BE FATAL. ADDITIONAL EFFECTS MAY INCLUDE NARCOLEPSY, HEADACHE, UNDUE FATIGUE, MUSCLE AND JOINT PAIN, DYSPNEA, AND ANESTHESIA. DEATH MAY BE DUE TO RESPIRATORY PARALYSIS WITH CARDIAC ARREST. HUMAN AND ANIMAL PATHOLOGIC REPORTS SHOW PULMONARY EDEMA, HYPEREMIA OF KIDNEYS AND LIVER, AND HEPATIC DEGENERATION.
CHRONIC EXPOSURE- REPEATED EXPOSURE MAY RESULT IN DOSE-RELATED SENSORY DISORDERS, AUTONOMIC NERVOUS SYSTEM POLYNEURITIS, SPASTIC ANGIONEURITIS, LEUKOPENIA, THROMBOCYTOPENIA, SPLENOMEGALY, HEPATITIS-LIKE LIVER CHANGES, LIVER MALFUNCTION WITH PORTAL FIBROSIS, IMPOTENCE AND PULMONARY

INSUFFICIENCY. WORKERS INVOLVED IN THE POLYMERIZATION PROCESS MAY EXHIBIT A PECULIAR TRIAD OF SYMPTOMS: MODIFICATION OF PERIPHERAL CIRCULATION RESULTING IN PALLOR, CYANOSIS, AND THEN REDNESS (RAYNAUD'S PHENOMENON); SKELETAL CHANGES OF DISTAL PHALANGES (ACRO-OSTEOLYSIS); AND SCLERODERMA LIKE SKIN CHANGES. PSEUDO-CLUBBING OF THE FINGERS MAY ALSO OCCUR. OCCUPATIONAL EXPOSURE HAS PRODUCED ANGIOSARCOMAS OF THE LIVER AND IS ASSOCIATED WITH TUMOR PRODUCTION AT OTHER SITES. ANIMAL STUDIES SHOW THAT VINYL CHLORIDE IS CARCINOGENIC IN RATS FOLLOWING PRENATAL EXPOSURE. ONE STUDY SUGGESTED AN INCREASED FETAL MORTALITY DUE TO EXPOSURE OF THE FATHERS TO VINYL CHLORIDE. SEVERAL STUDIES HAVE REPORTED AN INCREASED RATE OF BIRTH DEFECTS, ESPECIALLY CENTRAL NERVOUS SYSTEM ANOMALIES, IN THE CHILDREN OF PARENTS RESIDING IN COMMUMITIES WHERE VINYL CHLORIDE PRODUCTION AND POLYMERIZATION PLANTS ARE LOCATED.

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

SKIN CONTACT:
VINYL CHLORIDE:
IRRITANT.

ACUTE EXPOSURE- CONTACT MAY CAUSE IRRITATION WITH REDNESS AND PAIN. DUE TO RAPID EVAPORATION, THE LIQUID MAY CAUSE FROSTBITE WITH REDNESS, TINGLING, AND PAIN OR NUMBNESS. IN MORE SEVERE CASES, THE SKIN MAY BECOME HARD AND WHITE AND DEVELOP BLISTERS.

CHRONIC EXPOSURE- WORKERS HANDLING VINYL CHLORIDE HAVE EXHIBITED A PECULIAR TRIAD OF SYMPTOMS: RAYNAUD'S PHENOMENON, ACRO-OSTEOLYSIS, AND SCLERODERMA LIKE SKIN CHANGES. REPEATED OR PROLONGED EXPOSURE TO IRRITANTS MAY CAUSE DERMATITIS.

FIRST AID- REMOVE CONTAMINATED CLOTHING AND SHOES IMMEDIATELY. WASH AFFECTED AREA WITH SOAP OR MILD DETERGENT AND LARGE AMOUNTS OF WATER UNTIL NO EVIDENCE OF CHEMICAL REMAINS.
IN CASE OF FROSTBITE, WARM AFFECTED SKIN IN WARM WATER AT A TEMPERATURE OF 107 F. IF WARM WATER IS NOT AVAILABLE OR IMPRACTICAL TO USE, GENTLY WRAP AFFECTED PART IN BLANKETS. ENCOURAGE VICTIM TO EXCERCISE AFFECTED PART WHILE IT IS BEING WARMED. ALLOW CIRCULATION TO RETURN NATURALLY (MATHESON GAS, 6TH ED.). GET MEDICAL ATTENTION IMMEDIATELY.

EYE CONTACT:
VINYL CHLORIDE:
IRRITANT.

ACUTE EXPOSURE- CONTACT MAY CAUSE IMMEDIATE AND SEVERE IRRITATION, AND CORNEAL INJURY WITH COMPLETE RECOVERY IN 48 HOURS. DUE TO RAPID EVAPORATION, THE LIQUID MAY CAUSE FROSTBITE WITH REDNESS, PAIN AND BLURRED VISION.

CHRONIC EXPOSURE- REPEATED OR PROLONGED EXPOSURE TO IRRITANTS MAY CAUSE CONJUNCTIVITIS.

FIRST AID- IMMEDIATELY WASH THE EYES WITH LARGE AMOUNTS OF WATER, OCCASIONALLY LIFTING UPPER AND LOWER LIDS, UNTIL NO EVIDENCE OF CHEMICAL REMAINS (APPROXIMATELY 15-20 MINUTES). IF FROSTBITE IS PRESENT, WARM WATER MAY BE PREFERRED. GET MEDICAL ATTENTION IMMEDIATELY.

INGESTION:
VINYL CHLORIDE:

CARCINOGEN/TOXIC.
ACUTE EXPOSURE- THE REPORTED LETHAL DOSE IN RATS IS 500 MG/KG. THE SYMPTOMS WERE NOT REPORTED. IF THE LIQUID IS SWALLOWED, FROSTBITE DAMAGE TO THE LIPS, MOUTH AND MUCOUS MEMBRANES MAY OCCUR.
CHRONIC EXPOSURE- ORAL ADMINISTRATION TO RATS, MICE, AND HAMSTERS RESULTED IN TUMOR PRODUCTION AT VARIOUS SITES, INCLUDING ANGIOSARCOMAS OF THE LIVER.

FIRST AID- IF EXTENSIVE VOMITING HAS NOT OCCURRED, THE SUBSTANCE SHOULD BE REMOVED BY EMESIS OR GASTRIC LAVAGE PROVIDED THAT THE PATIENT IS CONSCIOUS AND CONVULSIONS ARE NOT PRESENT. KEEP HEAD BELOW HIPS DURING VOMITING TO PREVENT ASPIRATION. DO NOT ATTEMPT TO MAKE AN UNCONSCIOUS PERSON VOMIT. TREAT SYMPTOMATICALLY AND SUPPORTIVELY. GET MEDICAL ATTENTION IMMEDIATELY (DREISBACH, HANDBOOK OF POISONING, 12TH ED.). TREATMENT SHOULD BE PERFORMED BY QUALIFIED MEDICAL PERSONNEL.

ANTIDOTE:
NO SPECIFIC ANTIDOTE. TREAT SYMPTOMATICALLY AND SUPPORTIVELY.

REACTIVITY SECTION

REACTIVITY:
FORMS UNSTABLE PEROXIDES WHEN EXPOSED TO AIR WHICH MAY INITIATE POLYMERIZATION. MAY ALSO POLYMERIZE ON EXPOSURE TO HEAT OR LIGHT.

INCOMPATIBILITIES:
VINYL CHLORIDE:
ACETYLIDE-FORMING MATERIALS: MAY FORM EXPLOSIVE COMPOUNDS.
ALUMINUM: MAY CAUSE POLYMERIZATION.
COPPER AND ALLOYS: MAY FORM EXPLOSIVE COMPOUNDS.
IRON: MAY CORRODE IN THE PRESENCE OF WATER.
MONEL: MAY FORM EXPLOSIVE COMPOUND.
NITROGEN OXIDES: EXPLODES.
OXIDIZERS (STRONG): FIRE AND EXPLOSION HAZARD.
PEROXIDES: MAY INITIATE POLYMERIZATION.
STEEL: MAY CORRODE IN THE PRESENCE OF WATER.

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

POLYMERIZATION:
POLYMERIZATION OCCURS ON EXPOSURE TO SUNLIGHT, HEAT, OR AIR. THE PRESENCE OF IMPURITIES MAY RESULT IN EXOTHERMIC SELF-POLYMERIZATION, GENERATING SUFFICIENT HEAT AND PRESSURE TO RUPTURE THE CONTAINER.

STORAGE-DISPOSAL

OBSERVE ALL FEDERAL, STATE AND LOCAL REGULATIONS WHEN STORING OR DISPOSING OF THIS SUBSTANCE. FOR ASSISTANCE, CONTACT THE DISTRICT DIRECTOR OF THE ENVIRONMENTAL PROTECTION AGENCY.

STORAGE

STORE IN ACCORDANCE WITH 29 CFR 1910.101.

PROTECT AGAINST PHYSICAL DAMAGE. OUTSIDE OR DETACHED STORAGE IS PREFERABLE. INSIDE STORAGE SHOULD BE IN A COOL, WELL-VENTILATED, NON-COMBUSTIBLE LOCATION, AWAY FROM ALL POSSIBLE SOURCES OF IGNITION. SEPARATE FROM OXIDIZING MATERIALS. (NFPA 49, HAZARDOUS CHEMICALS DATA, 1975).

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

DISPOSAL

DISPOSAL MUST BE IN ACCORDANCE WITH STANDARDS APPLICABLE TO GENERATORS OF HAZARDOUS WASTE, 40CFR 262. EPA HAZARDOUS WASTE NUMBER U043.

CONDITIONS TO AVOID

MATERIAL IS EXTREMELY FLAMMABLE; AVOID CONTACT WITH HEAT, SPARKS, FLAMES OR OTHER SOURCES OF IGNITION. CONTENTS ARE UNDER PRESSURE; CONTAINERS MAY RUPTURE VIOLENTLY AND TRAVEL A CONSIDERABLE DISTANCE.

SPILLS AND LEAKS

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

OCCUPATIONAL-SPILL:
SHUT OFF IGNITION SOURCES. STOP LEAK IF YOU CAN DO IT WITHOUT RISK. USE WATER SPRAY TO REDUCE VAPORS. ISOLATE AREA UNTIL GAS HAS DISPERSED. NO SMOKING, FLAMES OR FLARES IN HAZARD AREA! KEEP UNNECESSARY PEOPLE AWAY; ISOLATE HAZARD AREA AND DENY ENTRY. VENTILATE CLOSED SPACES BEFORE ENTERING.

REPORTABLE QUANTITY (RQ): 1 POUND
THE SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT (SARA) SECTION 304 REQUIRES THAT A RELEASE EQUAL TO OR GREATER THAN THE REPORTABLE QUANTITY FOR THIS SUBSTANCE BE IMMEDIATELY REPORTED TO THE LOCAL EMERGENCY PLANNING COMMITTEE AND THE STATE EMERGENCY RESPONSE COMMISSION (40 CFR 355.40). IF THE RELEASE OF THIS SUBSTANCE IS REPORTABLE UNDER CERCLA SECTION 103, THE NATIONAL RESPONSE CENTER MUST BE NOTIFIED IMMEDIATELY AT (800) 424-8802 OR (202) 426-2675 IN THE METROPOLITAN WASHINGTON, D.C. AREA (40 CFR 302.6).

PROTECTIVE EQUIPMENT SECTION

VENTILATION:

PROVIDE LOCAL EXHAUST OR PROCESS ENCLOSURE VENTILATION TO MEET THE PUBLISHED EXPOSURE LIMITS. VENTILATION EQUIPMENT MUST BE EXPLOSION-PROOF.

RESPIRATOR:
THE FOLLOWING RESPIRATORS ARE THE MINIMUM LEGAL REQUIREMENTS AS SET FORTH BY THE OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION FOUND IN 29 CFR 1910, SUBPART Z.

REQUIRED RESPIRATORS FOR VINYL CHLORIDE

ATMOSPHERIC CONCENTRATIONS OF VINYL CHLORIDE	REQUIRED APPARATUS
UNKNOWN OR ABOVE 3600 PPM	OPEN-CIRCUIT, SELF CONTAINED BREATHING APPARATUS, PRESSURE DEMAND TYPE, WITH FULL FACEPIECE
NOT OVER 3600 PPM	COMBINATION TYPE 'C' SUPPLIED AIR RESPIRATOR, PRESSURE DEMAND TYPE, WITH A FULL OR HALF FACEPIECE AND AUXILIARY SELF-CONTAINED AIR SUPPLY; OR COMBINATION TYPE SUPPLIED AIR RESPIRATOR, CONTINUOUS FLOW TYPE, WITH A FULL OR HALF FACEPIECE, AND AUXILIARY SELF-CONTAINED AIR SUPPLY.
NOT OVER 1000 PPM	TYPE 'C' SUPPLIED AIR RESPIRATOR, CONTINUOUS FLOW TYPE, WITH A FULL OR HALF FACEPIECE, HELMET OR HOOD.
NOT OVER 100 PPM	COMBINATION TYPE 'C' SUPPLIED AIR RESPIRATOR, DEMAND TYPE, WITH A FULL FACEPIECE, AND AUXILIARY SELF-CONTAINED AIR SUPPLY; OR OPEN-CIRCUIT SELF-CONTAINED BREATHING APPARATUS WITH A FULL FACEPIECE, IN DEMAND MODE; OR TYPE 'C' SUPPLIED AIR RESPIRATOR, DEMAND TYPE, WITH FULL FACEPIECE.
NOT OVER 25 PPM	A POWERED AIR PURIFYING RESPIRATOR WITH HOOD, HELMET, FULL OR HALF FACEPIECE, AND A CANISTER WHICH PROVIDES A SERVICE LIFE OF AT LEAST 4 HOURS FOR CONCENTRATIONS OF VINYL CHRLORIDE UP TO 25 PPM; OR GAS MASK, FRONT- OR BACK-MOUNTED CANISTER WHICH PROVIDES A SERVICE LIFE OF AT LEAST 4 HOURS FOR CONCENTRATIONS OF VINYL CHORIDE UP TO 25 PPM.

NOT OVER 10 PPM	COMBINATION TYPE 'C' SUPPLIED AIR RESPIRATOR, WITH A HALF FACEPIECE AND AUXILIARY SELF-CONTAINED AIR SUPPLY; OR TYPE 'C' SUPPLIED-AIR RESPIRATOR, DEMAND TYPE, WITH A HALF FACEPIECE; OR ANY CHEMICAL CARTRIDGE RESPIRATOR WITH AN ORGANIC VAPOR CARTRIDGE WHICH PROVIDES A SERVICE LIFE OF AT LEAST 1 HOUR FOR CONCENTRATIONS OF VINYL CHLORIDE UP TO 10 PPM.

ENTRY INTO UNKNOWN CONCENTRATIONS OR CONCENTRATIONS GREATER THAN 36,000 PPM (LOWER EXPLOSION LIMIT) MAY BE MADE ONLY FOR THE PURPOSES OF LIFE RESCUE:
AND
ENTRY INTO CONCENTRATIONS OF LESS THAN 36,000 PPM, BUT GREATER THAN 3600 PPM MAY BE MADE ONLY FOR THE PURPOSES OF LIFE RESCUE, FIREFIGHTING OR SECURING EQUIPMENT SO AS TO PREVENT A GREATER HAZARD OF RELEASE OF VINYL CHLORIDE.

THE FOLLOWING RESPIRATORS AND MAXIMUM USE CONCENTRATIONS ARE RECOMMENDATIONS BY THE U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES, NIOSH POCKET GUIDE TO CHEMICAL HAZARDS, OR NIOSH CRITERIA DOCUMENTS.
THE SPECIFIC RESPIRATOR SELECTED MUST BE BASED ON CONTAMINATION LEVELS FOUND IN THE WORK PLACE, MUST NOT EXCEED THE WORKING LIMITS OF THE RESPIRATOR AND BE JOINTLY APPROVED BY THE NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH AND THE MINE SAFETY AND HEALTH ADMINISTRATION (NIOSH-MSHA).

VINYL CHLORIDE (AT ANY DETECTABLE CONCENTRATION):

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

ESCAPE- AIR-PURIFYING FULL FACEPIECE RESPIRATOR (GAS MASK) WITH A CHIN-STYLE OR FRONT- OR BACK-MOUNTED CANISTER PROVIDING PROTECTION AGAINST VINYL CHLORIDE.
ESCAPE-TYPE SELF-CONTAINED BREATHING APPARATUS.

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

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

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

CLOTHING:
EMPLOYEE MUST WEAR APPROPRIATE PROTECTIVE (IMPERVIOUS) CLOTHING AND EQUIPMENT TO PREVENT ANY POSSIBILITY OF SKIN CONTACT WITH THIS SUBSTANCE.

VINYL CHLORIDE:

PROTECTIVE CLOTHING SHOULD MEET THE REQUIREMENTS FOR PROTECTIVE GARMENTS IN 29 CFR 1910.1017(H).

GLOVES:
FOR GAS: WEAR IMPERVIOUS GLOVES. SPECIFIC TYPE OF GLOVE MAY BE TESTED AND/OR RECOMMENDED BY MANUFACTURER.

FOR COMPRESSED LIQUID: WEAR FULL PROTECTIVE, COLD INSULATING GLOVES.

VINYL CHLORIDE:
PROTECTIVE GLOVES SHOULD MEET THE REQUIREMENTS FOR PROTECTIVE GARMENTS IN 29 CFR 1910.1017(H).

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

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

VINYL CHLORIDE:
PROTECTIVE EYE EQUIPMENT SHOULD MEET THE REQUIREMENTS FOR PROTECTIVE GARMENTS IN 29 CFR 1910.1017(H).

AUTHORIZED BY- OCCUPATIONAL HEALTH SERVICES, INC.

CREATION DATE: 10/16/84 REVISION DATE: 12/14/89

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MATERIAL SAFETY DATA SHEET OHS26496

OCCUPATIONAL HEALTH SERVICES, INC.
450 SEVENTH AVENUE, SUITE 2407
NEW YORK, NEW YORK 10123
(800) 445-MSDS (212) 967-1100

EMERGENCY CONTACT:
JOHN S. BRANSFORD, JR. (615) 292-1180

SUBSTANCE IDENTIFICATION

CAS-NUMBER 17060-07-0

SUBSTANCE: 1,2-DICHLOROETHANE-D4

TRADE NAMES/SYNONYMS:
ETHANE-D4, 1,2-DICHLORO-: ETHYLENE DICHLORIDE-D4: ETHYLENE CHLORIDE-D4: GLYCOL DICHLORIDE-D4: 1,2-DICHLORETHANE-D4: ETHANE-1,1,2,2-D4, 1,2-DICHLORO-: ETHANE-1,1,2,2-D4, DICHLORO-: 1,2-DICHLOROETHANE-1,1,2,2-D4: DICHLOROETHANE-1,1,2,2-D4: C2D4CL2: OHS26496

CHEMICAL FAMILY:
HALOGEN COMPOUND, ALIPHATIC: DEUTERIUM DERIVATIVE

MOLECULAR FORMULA: CL-C-D2-C-D2-CL MOLECULAR WEIGHT: 102.96

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

COMPONENTS AND CONTAMINANTS

COMPONENT: 1,2-DICHLOROETHANE-D4 PERCENT: 100.0

OTHER CONTAMINANTS: NONE

EXPOSURE LIMIT:
ETHYLENE DICHLORIDE (1,2-DICHLOROETHANE):
1 PPM (4 MG/M3) OSHA TWA; 2 PPM (8 MG/M3) OSHA STEL
10 PPM (40 MG/M3) ACGIH TWA
1 PPM NIOSH RECOMMENDED 10 HOUR TWA; 2 PPM NIOSH RECOMMENDED 15 MINUTE CEILING

PHYSICAL DATA

DESCRIPTION: HEAVY, COLORLESS LIQUID WITH A PLEASANT ODOR AND SWEET TASTE.

BOILING POINT: 182 F (84 C) (APPROX.)MELTING POINT: -32 F (-35 C) (APPROX.)

SPECIFIC GRAVITY: 1.2351 (APPROX.) VAPOR DENSITY: 3.4 (APPROX.)

OTHER SOLVENTS (SOLVENT - SOLUBILITY):
SOLUBLE IN ALCOHOL, ETHER, ACETONE, BENZENE, AND CHLOROFORM.

OTHER PHYSICAL DATA

VAPOR PRESSURE: 68 MMHG @ 20 C (APPROX.)
WATER SOLUBILITY: 0.81 % @ 20 C (APPROX.)

FIRE AND EXPLOSION DATA

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

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

VAPOR-AIR MIXTURES ARE EXPLOSIVE.

FLASH POINT: 56 F (13 C) (CC)
(APPROX.)

AUTOIGNITION TEMP.: 755 F (413 C)
(APPROX.)

FLAMMABILITY CLASS (OSHA): IB

FIREFIGHTING MEDIA:
DRY CHEMICAL, CARBON DIOXIDE, HALON, WATER SPRAY OR ALCOHOL FOAM (1987 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.4).

FOR LARGER FIRES, USE WATER SPRAY, FOG OR ALCOHOL FOAM (1987 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.4).

FIREFIGHTING:
MOVE CONTAINER FROM FIRE AREA IF POSSIBLE. COOL FIRE-EXPOSED CONTAINERS WITH WATER FROM SIDE UNTIL WELL AFTER FIRE IS OUT. STAY AWAY FROM STORAGE TANK ENDS. FOR MASSIVE FIRE IN STORAGE AREA, USE UNMANNED HOSE HOLDER OR MONITOR NOZZLES, ELSE WITHDRAW FROM AREA AND LET FIRE BURN. WITHDRAW IMMEDIATELY IN CASE OF RISING SOUND FROM VENTING SAFETY DEVICE OR ANY DISCOLORATION OF STORAGE TANK DUE TO FIRE (1987 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.4, GUIDE PAGE 26).

EXTINGUISH ONLY IF FLOW CAN BE STOPPED; USE WATER IN FLOODING AMOUNTS AS FOG. SOLID STREAMS MAY NOT BE EFFECTIVE. COOL CONTAINERS WITH FLOODING AMOUNTS OF WATER, APPLY FROM AS FAR A DISTANCE AS POSSIBLE. AVOID BREATHING VAPORS, KEEP UPWIND.

WATER MAY BE INEFFECTIVE EXCEPT AS A BLANKET (NFPA FIRE PROTECTION GUIDE ON HAZARDOUS MATERIAL, EIGHTH EDITION).

TRANSPORTATION

DEPARTMENT OF TRANSPORTATION HAZARD CLASSIFICATION 49CFR172.101:
FLAMMABLE LIQUID

DEPARTMENT OF TRANSPORTATION LABELING REQUIREMENTS 49CFR172.101 AND SUBPART E:
FLAMMABLE LIQUID

DEPARTMENT OF TRANSPORTATION PACKAGING REQUIREMENTS: 49CFR173.119
EXCEPTIONS: 49CFR173.118

TOXICITY

1,2-DICHLOROETHANE-D4:
THE TOXICITY AND HEALTH EFFECTS ARE PRESUMED TO BE ESSENTIALLY THE SAME AS THE NON-DEUTERATED FORM.

ETHYLENE DICHLORIDE (1,2-DICHLOROETHANE):
IRRITATION DATA: 625 MG OPEN SKIN-RABBIT MILD; 500 MG/24 HOURS SKIN-RABBIT MILD; 63 MG EYE-RABBIT SEVERE; 500 MG/24 HOURS EYE-RABBIT MILD.
TOXICITY DATA: 4000 PPM/1 HOUR INHALATION-MAN TCLO; 1000 PPM/7 HOURS INHALATION-RAT LC50; 3000 PPM/7 HOURS INHALATION-RABBIT LCLO; 5 GM/M3/2 HOURS INHALATION-MOUSE LCLO; 3000 PPM/7 HOURS INHALATION-MONKEY LC50; 1500 PPM/7 HOURS INHALATION-GUINEA PIG LCLO; 3000 PPM/7 HOURS INHALATION-PIG LCLO; 2800 MG/KG SKIN-RABBIT LD50; 714 MG/KG ORAL-MAN LDLO; 892 MG/KG ORAL-MAN TDLO; 428 MG/KG ORAL-HUMAN TDLO; 286 MG/KG ORAL-HUMAN LDLO; 670 MG/KG ORAL-RAT LD50; 489 MG/KG ORAL-MOUSE LD50; 860 MG/KG ORAL-RABBIT LD50; 5700 MG/KG ORAL-DOG LD50; 1 GM/KG SUBCUTANEOUS-RAT LD50; 380 MG/KG SUBCUTANEOUS-MOUSE LDLO; 1200 MG/KG SUBCUTANEOUS-RABBIT LDLO; 175 MG/KG INTRAVENOUS-DOG LDLO; 807 MG/KG INTRAPERITONEAL-RAT LD50; 470 MG/KG INTRAPERITONEAL-MOUSE LD50; 600 MG/KG INTRAPERITONEAL-GUINEA PIG LDLO; MUTAGENIC DATA (RTECS); REPRODUCTIVE EFFECTS DATA (RTECS); TUMORIGENIC DATA (RTECS).
CARCINOGEN STATUS: ANTICIPATED HUMAN CARCINOGEN (NTP); ANIMAL SUFFICIENT EVIDENCE (IARC CLASS-2B). ORAL ADMINISTRATION OF ETHYLENE DICHLORIDE TO MICE AND RATS RESULTED IN A SIGNIFICANT INCREASE IN TUMORS AT VARIOUS SITES IN BOTH SPECIES. IN ABSENCE OF ADEQUATE DATA IN HUMANS, IARC SUGGESTS THAT IT IS REASONABLE FOR PRACTICAL PURPOSES, TO REGARD ETHYLENE DICHLORIDE AS IF IT PRESENTED A CARCINOGENIC RISK TO HUMANS.
LOCAL EFFECTS: IRRITANT- INHALATION, SKIN, EYE.
ACUTE TOXICITY LEVEL: TOXIC BY INHALATION AND INGESTION; SLIGHTLY TOXIC BY DERMAL ABSORPTION.
TARGET EFFECTS: CENTRAL NERVOUS SYSTEM DEPRESSANT; HEPATOTOXIN; NEPHROTOXIN. POISONING MAY ALSO AFFECT THE CARDIOVASCULAR SYSTEM, RESPIRATORY SYSTEM AND THE ADRENAL GLANDS.
ADDITIONAL INFORMATION: THE USE OF ALCOHOLIC BEVERAGES MAY ENHANCE THE TOXIC EFFECTS. MAY CROSS THE PLACENTA AND BE EXCRETED IN HUMAN MILK.

HEALTH EFFECTS AND FIRST AID

INHALATION:
ETHYLENE DICHLORIDE (1,2-DICHLOROETHANE):
IRRITANT/NARCOTIC/HEPATOTOXIN/NEPHROTOXIN/TOXIC.
ACUTE EXPOSURE- MAY CAUSE IRRITATION OF THE MUCOUS MEMBRANES OF THE UPPER RESPIRATORY TRACT, HEADACHE, NAUSEA AND VOMITING, DIARRHEA, AND INTESTINAL CRAMPS. CENTRAL NERVOUS SYSTEM EFFECTS INCLUDING LIGHTHEADEDNESS, WEAKNESS, STUPOR, DYSEQUILIBRIUM, TREMBLING, ANXIETY, DROWSINESS, DELIRIUM, PARTIAL PARALYSIS, COLLAPSE, AND COMA MAY APPEAR WITHIN SEVERAL HOURS AFTER EXPOSURE. THERE MAY BE A QUIESCENT PERIOD AND THEN, IF THE INDIVIDUAL SURVIVES, OLIGURIA, JAUNDICE, AND ANEMIA MAY RESULT. OVER THE NEXT SEVERAL DAYS HEPATORENAL FAILURE MAY OCCUR AND MAY BE COMPLICATED BY GASTROINTESTINAL BLEEDING, HYPOGLYCEMIA, HYPERCALCEMIA, HYPOPROTHROMBINEMIA, REDUCED CLOTTING FACTORS, AND CEREBRAL SWELLING AND HEMORRHAGE. OTHER SYMPTOMS MAY INCLUDE CYANOSIS, FALL OF BLOOD PRESSURE, WEAK, RAPID PULSE, RESPIRATORY DIFFICULTIES, PULMONARY EDEMA,

BRONCHITIS, SUB-NORMAL TEMPERATURE, AND CARDIAC ARRHYTHMIAS. DEATH MAY OCCUR FROM RESPIRATORY OR CARDIAC ARREST. PATHOLOGIC FINDINGS MAY INCLUDE CONGESTON OF THE LUNGS, DEGENERATIVE CHANGES IN THE MYOCARDIUM, NECROSIS OF THE ADRENAL GLANDS, LIVER NECROSIS, KIDNEY TUBULAR NECROSIS, AND SHRUNKEN NERVE CELLS IN THE BRAIN.

CHRONIC EXPOSURE- CHRONIC EXPOSURE TO 10-37 PPM HAS CAUSED NAUSEA, VOMITING, DIZZINESS, AND ADVERSE NERVOUS SYSTEM AND LIVER EFFECTS. CHARACTERISTIC SYMPTOMS OF ACUTE EXPOSURE MAY DEVELOP FROM REPEATED EXPOSURES TO 75-125 PPM. REPEATED OR PROLONGED EXPOSURE MAY ALSO RESULT IN IRRITATION OF THE MUCOUS MEMBRANES, ACUTE BRONCHIAL INFLAMMATION, LOSS OF APPETITE, WEIGHT LOSS, ANEMIA, CONSTIPATION, INSOMNIA, EPIGASTRIC DISTRESS, NYSTAGMUS, LIVER AND KIDNEY DAMAGE, ELEVATED UROBILINOGEN, AND CARDIAC PAIN. NEUROLOGIC EFFECTS INCLUDING RESTLESSNESS, IRRITABILITY, NERVOUSNESS, DECREASED MUSCLE TONE, DIFFICULTY WALKING, TREMBLING HANDS, LOSS OF REFLEXES, POSITIVE ROMBERG SIGN, HYPERHIDEROSIS, FATIGUE, AND DEAFNESS MAY OCCUR. DEATH MAY RESULT FROM RESPIRATORY, CIRCULATORY, HEPATIC, OR RENAL FAILURE. AN INCREASE IN INFANT DEATHS AMONG THE OFFSPRING OF WORKERS EXPOSED TO HALOGENATED HYDROCARBONS HAS BEEN REPORTED. INCREASED MORTALITY, PRECEDED BY LOSS OF WEIGHT, PULMONARY CONGESTION, AND LIVER CHANGES, WERE REPORTED IN 5 SPECIES OF ANIMALS EXPOSED TO 200 PPM FOR UP TO 7 HOURS A DAY FOR SEVERAL WEEKS. REPRODUCTIVE EFFECTS HAVE BEEN REPORTED IN ANIMALS.

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

SKIN CONTACT:
ETHYLENE DICHLORIDE (1,2-DICHLOROETHANE):
IRRITANT/NARCOTIC/HEPATOTOXIN/NEPHROTOXIN.

ACUTE EXPOSURE- DIRECT CONTACT WITH THE LIQUID MAY CAUSE IRRITATION. PROLONGED CONTACT MAY RESULT IN SEVERE IRRITATION, MODERATE EDEMA, AND NECROSIS. MAY BE ABSORBED THROUGH THE SKIN AND CAUSE SYSTEMIC TOXICITY AS DETAILED IN ACUTE INHALATION.

CHRONIC EXPOSURE- REPEATED OR PROLONGED CONTACT TO THE LIQUID CAN PRODUCE A DRY, SCALY, FISSURED DERMATITIS DUE TO THE DEFATTING ACTION ON THE SKIN. SYSTEMIC EFFECTS, AS IN ACUTE EXPOSURE, MAY ENSUE.

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

EYE CONTACT:
ETHYLENE DICHLORIDE (1,2-DICHLOROETHANE):
IRRITANT.

ACUTE EXPOSURE- EXPOSURE TO HIGH VAPOR CONCENTRATIONS OR TO THE LIQUID MAY CAUSE IMMEDIATE DISCOMFORT, LACRIMATION, HYPEREMIA OF THE CONJUNCTIVA, AND CORNEAL INJURY, WHICH MAY RETURN TO NORMAL WITHIN A DAY OR TWO. EXPOSURE TO 63 MG CAUSED SEVERE IRRITATION IN RABBIT EYES. APPLICATION OF A DROP OF THE LIQUID TO RABBIT EYES WAS GRADED 3 ON A SCALE OF 10 AFTER 24 HOURS.

CHRONIC EXPOSURE- REPEATED OR PROLONGED CONTACT MAY CAUSE CONJUNCTIVITIS.

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

INGESTION:

ETHYLENE DICHLORIDE (1,2-DICHLOROETHANE):
NARCOTIC/HEPATOTOXIN/NEPHROTOXIN/CARCINOGEN/TOXIC.
ACUTE EXPOSURE- INGESTION MAY CAUSE A BURNING SENSATION IN THE MOUTH, THROAT, AND STOMACH. SYSTEMIC TOXICITY, INCLUDING CENTRAL NERVOUS SYSTEM DEPRESSION, HEPATOTOXICITY, AND NEPHROTOXICITY, MAY OCCUR AS DETAILED IN ACUTE INHALATION. THE INGESTION OF 5 ML MAY BE LETHAL TO MAN.
CHRONIC EXPOSURE- MAY CAUSE SYSTEMIC EFFECTS AS DETAILED IN CHRONIC INHALATION. IN MICE, IT PRODUCED BENIGN AND MALIGNANT TUMORS OF THE LUNG AND MALIGNANT LYMPHOMAS IN ANIMALS OF BOTH SEXES; HEPATOCELLULAR CARCINOMAS IN MALES AND MAMMARY AND UTERINE ADENOCARCINOMAS IN FEMALES. IN RATS, IT PRODUCED CARCINOMAS OF THE FORESTOMACH IN MALES, BENIGN AND MALIGNANT MAMMARY TUMORS IN FEMALES, AND HEMANGIOSARCOMAS IN ANIMALS OF BOTH SEXES. TOTAL DOSES RANGED FROM 18 TO 72 GM/KG INTERMITTENTLY FOR 78 WEEKS.

FIRST AID- TREAT SYMPTOMATICALLY AND SUPPORTIVELY. GET MEDICAL ATTENTION IMMEDIATELY. IF VOMITING OCCURS, KEEP HEAD LOWER THAN HIPS TO PREVENT ASPIRATION.

ANTIDOTE:
NO SPECIFIC ANTIDOTE. TREAT SYMPTOMATICALLY AND SUPPORTIVELY.

REACTIVITY SECTION

REACTIVITY:
STABLE UNDER NORMAL TEMPERATURES AND PRESSURES.

INCOMPATIBILITIES:
ETHYLENE DICHLORIDE: (1,2-DICHLOROETHANE):
ALUMINUM: FORMATION OF A SHOCK-SENSITIVE COMPOUND.
AMMONIA (LIQUID): POSSIBLE VIOLENT EXPLOSION.
CAUSTICS (STRONG): FIRE AND EXPLOSION HAZARD.
DIMETHYLAMINOPROPYLAMINE: POSSIBLE VIOLENT EXPLOSION.
DINITROGEN TETROXIDE: FORMATION OF A SHOCK-SENSITIVE COMPOUND.
MAGNESIUM: FIRE AND EXPLOSION HAZARD.
METALS (ACTIVE): FIRE AND EXPLOSION HAZARD.
METALS: MAY BE CORROSIVE IN THE PRESENCE OF MOISTURE.
NITRIC ACID: MIXTURES ARE EASILY DETONATED BY HEAT, IMPACT, OR FRICTION.
OXIDIZERS (STRONG): FIRE AND EXPLOSION HAZARD.
PLASTICS, RUBBER, AND COATINGS: MAY BE ATTACKED.
POTASSIUM: FORMS SHOCK-SENSITIVE COMPOUND.
SODIUM: FIRE AND EXPLOSION HAZARD.

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

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

STORAGE-DISPOSAL

OBSERVE ALL FEDERAL, STATE AND LOCAL REGULATIONS WHEN STORING OR DISPOSING

OF THIS SUBSTANCE. FOR ASSISTANCE, CONTACT THE DISTRICT DIRECTOR OF THE ENVIRONMENTAL PROTECTION AGENCY.

STORAGE

STORE IN ACCORDANCE WITH 29 CFR 1910.106.

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

PROTECT AGAINST PHYSICAL DAMAGE. OUTSIDE OR DETACHED STORAGE IS PREFERABLE. INSIDE STORAGE SHOULD BE IN A STANDARD FLAMMABLE LIQUIDS STORAGE ROOM OR CABINET. SEPARATE FROM OXIDIZING MATERIALS. (NFPA 49, HAZARDOUS MATERIALS DATA, 1975).

STORE AWAY FROM INCOMPATIBLE SUBSTANCES.

DISPOSAL

DISPOSAL MUST BE IN ACCORDANCE WITH STANDARDS APPLICABLE TO GENERATORS OF HAZARDOUS WASTE, 40 CFR 262. EPA HAZARDOUS WASTE NUMBER D001.

100 POUND CERCLA SECTION 103 REPORTABLE QUANTITY.

CONDITIONS TO AVOID

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

SPILLS AND LEAKS

SOIL-RELEASE:
DIG HOLDING AREA SUCH AS LAGOON, POND OR PIT FOR CONTAINMENT.

DIKE FLOW OF SPILLED MATERIAL USING SOIL OR SANDBAGS OR FOAMED BARRIERS SUCH AS POLYURETHANE OR CONCRETE.

USE CEMENT POWDER OR FLY ASH TO ABSORB LIQUID MASS.

IMMOBILIZE SPILL WITH UNIVERSAL GELLING AGENT.

REDUCE VAPOR AND FIRE HAZARD WITH APPROPRIATE FOAM.

AIR-RELEASE:
KNOCK DOWN VAPORS WITH WATER SPRAY. KEEP UPWIND.

COMBUSTION PRODUCTS INCLUDE CORROSIVE OR TOXIC VAPORS.

WATER-SPILL:
TRAP SPILLED MATERIAL AT BOTTOM IN DEEP WATER POCKETS, EXCAVATED HOLDING AREAS OR WITHIN SAND BAG BARRIERS.

USE ACTIVATED CARBON TO ABSORB SPILLED SUBSTANCE THAT IS DISSOLVED.

USE SUCTION HOSES TO REMOVE TRAPPED SPILL MATERIAL.

USE MECHANICAL DREDGES OR LIFTS TO EXTRACT IMMOBILIZED MASSES OF POLLUTION AND PRECIPITATES.

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

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

PROTECTIVE EQUIPMENT SECTION

VENTILATION:
PROVIDE LOCAL EXHAUST OR PROCESS ENCLOSURE VENTILATION TO MEET THE PUBLISHED EXPOSURE LIMITS. VENTILATION EQUIPMENT MUST BE EXPLOSION-PROOF.

RESPIRATOR:
THE FOLLOWING RESPIRATORS AND MAXIMUM USE CONCENTRATIONS ARE RECOMMENDATIONS BY THE U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES, NIOSH POCKET GUIDE TO CHEMICAL HAZARDS; NIOSH CRITERIA DOCUMENTS OR BY THE U.S. DEPARTMENT OF LABOR, 29 CFR 1910 SUBPART Z.
THE SPECIFIC RESPIRATOR SELECTED MUST BE BASED ON CONTAMINATION LEVELS FOUND IN THE WORK PLACE, MUST NOT EXCEED THE WORKING LIMITS OF THE RESPIRATOR AND BE JOINTLY APPROVED BY THE NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH AND THE MINE SAFETY AND HEALTH ADMINISTRATION (NIOSH-MSHA).

ETHYLENE DICHLORIDE (1,2-DICHLOROETHANE):

AT ANY DETECTABLE CONCENTRATION:

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

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

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

SELF-CONTAINED BREATHING APPARATUS WITH FULL FACEPIECE OPERATED IN

PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE MODE.

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

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

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

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

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

AUTHORIZED BY- OCCUPATIONAL HEALTH SERVICES, INC.

CREATION DATE: 05/11/89 REVISION DATE: 12/27/89

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MATERIAL SAFETY DATA SHEET OHS23670

OCCUPATIONAL HEALTH SERVICES, INC.
450 SEVENTH AVENUE, SUITE 2407
NEW YORK, NEW YORK 10123
(800) 445-MSDS (212) 967-1100

EMERGENCY CONTACT:
JOHN S. BRANSFORD, JR. (615) 292-1180

SUBSTANCE IDENTIFICATION

CAS-NUMBER 156-60-5
RTEC-NUMBER KV9400000

SUBSTANCE: TRANS-1,2-DICHLOROETHYLENE

TRADE NAMES/SYNONYMS:
TRANS-ACETYLENE DICHLORIDE: TRANS-DICHLOROETHYLENE:
TRANS-1,2-DICHLOROETHENE: RCRA U079: OHS23670

CHEMICAL FAMILY:
HALOGEN COMPOUND, ALIPHATIC

MOLECULAR FORMULA: C2-H2-CL2 MOLECULAR WEIGHT: 96.94

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

COMPONENTS AND CONTAMINANTS

COMPONENT: TRANS-1,2-DICHLOROETHYLENE PERCENT: 100

OTHER CONTAMINANTS: NONE

EXPOSURE LIMIT:
TRANS-1,2-DICHLOROETHYLENE:
200 PPM OSHA TWA
200 PPM (790 MG/M3) ACGIH TWA

1000 POUNDS CERCLA SECTION 103 REPORTABLE QUANTITY

PHYSICAL DATA

DESCRIPTION: COLORLESS LIQUID WITH A PLEASANT ODOR.

BOILING POINT: 118 F (48 C) MELTING POINT: -58 F (-50 C)

SPECIFIC GRAVITY: 1.2565 SOLUBILITY IN WATER: SLIGHTLY SOLUBLE

VAPOR DENSITY: 3.34 VAPOR PRESSURE: 400 MM HG @ 87 F

ODOR-THRESHOLD: NOT ESTABLISHED

OTHER SOLVENTS (SOLVENT - SOLUBILITY):
ETHANOL, ETHYL ETHER

FIRE AND EXPLOSION DATA

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

VAPOR-AIR MIXTURES ARE EXPLOSIVE ABOVE FLASH POINT.

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

FLASH POINT: 36 F (2 C) (CC) UPPER EXPLOSION LIMIT: 12.8%

LOWER EXPLOSION LIMIT: 9.7% AUTOIGNITION TEMP.: 860 F (460 C)

FLAMMABILITY CLASS (OSHA): IB

FIREFIGHTING MEDIA:
DRY CHEMICAL, CARBON DIOXIDE, HALON, WATER SPRAY OR STANDARD FOAM (1987 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.4).

FOR LARGER FIRES, USE WATER SPRAY, FOG OR STANDARD FOAM (1987 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.4).

FIREFIGHTING:
MOVE CONTAINER FROM FIRE AREA IF POSSIBLE. COOL FIRE-EXPOSED CONTAINERS WITH WATER FROM SIDE UNTIL WELL AFTER FIRE IS OUT. STAY AWAY FROM STORAGE TANK ENDS. FOR MASSIVE FIRE IN STORAGE AREA, USE UNMANNED HOSE HOLDER OR MONITOR NOZZLES, ELSE WITHDRAW FROM AREA AND LET FIRE BURN. WITHDRAW IMMEDIATELY IN CASE OF RISING SOUND FROM VENTING SAFETY DEVICE OR ANY DISCOLORATION OF STORAGE TANK DUE TO FIRE (1987 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.4, GUIDE PAGE 27).

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

TRANSPORTATION

DEPARTMENT OF TRANSPORTATION HAZARD CLASSIFICATION 49CFR172.101:
FLAMMABLE LIQUID

DEPARTMENT OF TRANSPORTATION LABELING REQUIREMENTS 49CFR172.101 AND SUBPART E:
FLAMMABLE LIQUID

DEPARTMENT OF TRANSPORTATION PACKAGING REQUIREMENTS: 49CFR173.119
EXCEPTIONS: 49CFR173.118

TOXICITY

TRANS-1,2-DICHLOROETHYLENE:
4800 MG/M3/10 MINUTES INHALATION-HUMAN TCLO; 43000 MG/M3/6 HOURS INHALATION-CAT LCLO; 75000 MG/M3/2 HOURS INHALATION-MOUSE LCLO; 2122 MG/KG

ORAL-MOUSE LD50; 4019 INTRAPERITONEAL-MOUSE LD50; 7536 MG/KG
INTRAPERITONEAL-RAT LD50; MUTAGENIC DATA (RTECS); CARCINOGEN STATUS: NONE.
TRANS-1,2-DICHLOROETHYLENE IS A CENTRAL NERVOUS SYSTEM DEPRESSANT AND A SKIN, EYE, AND MUCOUS MEMBRANE IRRITANT. STIMULANTS SUCH AS EPINEPHRINE AND EPHEDRINE MAY ENHANCE THE TOXICITY OF SOME HALOGENATED HYDROCARBONS. PERSONS WITH CHRONIC RESPIRATORY DISEASE MAY BE AT AN INCREASED RISK FROM EXPOSURE.

HEALTH EFFECTS AND FIRST AID

INHALATION:
1,2-DICHLOROETHYLENE (ALL ISOMERS):
IRRITANT/NARCOTIC. 4000 PPM IMMEDIATELY DANGEROUS TO LIFE OR HEALTH.

ACUTE EXPOSURE- VAPOR EXPOSURE MAY CAUSE MUCOUS MEMBRANE IRRITATION, NAUSEA, VOMITING, DIZZINESS, WEAKNESS, TREMOR, AND EPIGASTRIC CRAMPS. HIGHER LEVELS MAY CAUSE CENTRAL NERVOUS SYSTEM DEPRESSION RANGING FROM DROWSINESS TO UNCONSCIOUSNESS. THE CIS- AND TRANS- ISOMERS TOGETHER HAVE BEEN USED AS AN ANESTHETIC IN MAN. A HUMAN DEATH HAS BEEN REPORTED FROM INDUSTRIAL EXPOSURE. AN 8 HOUR EXPOSURE TO THE TRANS- ISOMER AT 200 PPM LOWERED THE LEUKOCYTE COUNT IN RATS; 1000 PPM CAUSED A FALL IN THE BLOOD SERUM ALBUMIN, UREA NITROGEN, ALKALINE PHOSPHATASE ACTIVITY, AND THE NUMBER OF ERYTHROCYTES. NARCOSIS WAS NOT PRODUCED AT THESE LEVELS. 3000 PPM PRODUCED FIBROUS SWELLING OF THE CARDIAC MUSCLE AND HYPEREMIA WHICH PERSISTED FOR 14 HOURS AFTER EXPOSURE. THE CIS- ISOMER DID NOT ANESTHETIZE RATS IN 4 HOURS AT 8000 PPM, BUT AT 16,000 PPM THEY WERE ANESTHETIZED IN 8 MINUTES AND KILLED IN 4 HOURS. REVERSIBLE SUPERFICIAL CORNEAL TURBIDITY HAS BEEN OBSERVED IN SOME ANESTHETIZED DOGS.

CHRONIC EXPOSURE- VARIATIONS IN DATA EXIST ON THE CHRONIC TOXICITY OF THE CIS- AND TRANS- ISOMERS. RATS EXPOSED TO 200 PPM OF THE TRANS- ISOMER FOR 8 HOURS/DAY, 5 DAYS/WEEK FOR 16 WEEKS SHOWED HISTOLOGICAL EVIDENCE OF SLIGHT TO SEVERE FATTY DEGENERATION OF LIVER LOBULES AND KUPFFER CELLS, MARKED PULMONARY HYPEREMIA, ALVEOLAR SEPTAL DISTENSION AND FIBROUS SWELLING OF THE CARDIAC MUSCLE. SIMILAR EXPOSURES WITH RATS, GUINEA PIGS, RABBITS AND DOGS EXPOSED TO 500 PPM OR 1000 PPM 7 HOURS/DAY, 5 DAYS/WEEK FOR 6 MONTHS TO A MIXTURE OF 60% CIS- AND 40% TRANS- ISOMERS RESULTED IN NO ADVERSE EFFECTS DETECTED. CATS AND RABBITS WERE REPEATEDLY EXPOSED TO VAPOR CONCENTRATIONS OF 0.16-0.19% IN AIR. THE CIS- ISOMER CAUSED ANOREXIA, DECREASED BODY WEIGHT AND PATHOLOGICAL CHANGES IN THE LUNGS, LIVER, AND KIDNEYS. THE TRANS- ISOMER CAUSED ANOREXIA AND SOME RESPIRATORY IRRITATION, BUT NO HISTOPATHOLOGICAL CHANGES IN ORGANS.

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

SKIN CONTACT:
1,2-DICHLOROETHYLENE (ALL ISOMERS):
IRRITANT.

ACUTE EXPOSURE- DIRECT CONTACT MAY CAUSE IRRITATION. SKIN ABSORPTION MAY OCCUR DUE TO LIPID SOLUBILITY.

CHRONIC EXPOSURE- REPEATED OR PROLONGED CONTACT MAY CAUSE DERMATITIS.

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

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

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

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

FIRST AID- REMOVE BY GASTRIC LAVAGE OR EMESIS. MAINTAIN BLOOD PRESSURE AND AIRWAY. GIVE OXYGEN IF RESPIRATION IS DEPRESSED. DO NOT PERFORM GASTRIC LAVAGE OR EMESIS IF VICTIM IS UNCONSCIOUS. GET MEDICAL ATTENTION IMMEDIATELY (DREISBACH, HANDBOOK OF POISONING, 11TH ED.). ADMINISTRATION OF GASTRIC LAVAGE OR OXYGEN SHOULD BE PERFORMED BY QUALIFIED MEDICAL PERSONNEL.

ANTIDOTE:
NO SPECIFIC ANTIDOTE. TREAT SYMPTOMATICALLY AND SUPPORTIVELY.

REACTIVITY SECTION

REACTIVITY:
MAY FORM EXPLOSIVE PEROXIDES IN AIR.
UNLESS INHIBITED, GRADUAL DECOMPOSITION BY AIR, LIGHT, ULTAVIOLET LIGHT AND MOISTURE MAY RELEASE CORROSIVE HYDROGEN CHLORIDE.

INCOMPATIBILITIES:
1,2-DICHLOROETHYLENE (ALL ISOMERS):
CAUSTIC ALKALIES (SOLID OR CONCENTRATED SOLUTIONS): MAY FORM EXPLOSIVE, SPONTANEOUSLY FLAMMABLE CHLOROACETYLENE.
COPPER OR COPPER ALLOYS: MAY FORM EXPLOSIVE, SPONTANEOUSLY FLAMMABLE CHLOROACETYLENE.
DIFLUOROMETHYLENE DIHYPOFLUORITE (WITH TRANS-ISOMER): VIOLENT EXPLOSION AT ROOM TEMPERATURE.
FREE RADICAL INITIATOR: OXIDATION FORMS CORROSIVE CHLOROACETYL CHLORIDE VIA EPOXIDE INTERMEDIATES.
METAL (HOT): GRADUAL DECOMPOSITION WITH RELEASE OF CORROSIVE HYDROGEN CHLORIDE.
NITROGEN TETROXIDE: EXPLOSIVE, ESPECIALLY WHEN SHOCKED.
OZONE: FORM EXPLOSIVE PRODUCT.

PERCHLORYL FLUORIDE: EXPLOSIVE REACTION ON HEATING.
POTASSIUM HYDROXIDE (SOLID OR CONCENTRATED SOLUTION): MAY FORM EXPLOSIVE, SPONTANEOUSLY FLAMMABLE CHLOROACETYLENE.
PLASTICS, RUBBER AND COATINGS: MAY BE ATTACKED.
SODIUM: MAY FORM EXPLOSIVE, SPONTANEOUSLY FLAMMABLE CHLOROACETYLENE.
SODIUM HYDROXIDE (SOLID OR CONCENTRATED SOLUTION): MAY FORM EXPLOSIVE, SPONTANEOUSLY FLAMMABLE CHLOROACETYLENE.
SULFURIC ACID (CONCENTRATED): OXIDATION FORMS CORROSIVE CHLOROACETYL CHLORIDE VIA EPOXIDE INTERMEDIATES.
STRONG OXIDIZERS: VIGOROUS REACTION OR POSSIBLE FIRE AND EXPLOSION HAZARD.

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

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

STORAGE-DISPOSAL

STORAGE: PROTECT AGAINST PHYSICAL DAMAGE. OUTSIDE OR DETACHED STORAGE IS PREFERABLE. INSIDE STORAGE SHOULD BE IN A STANDARD FLAMMABLE LIQUIDS STORAGE ROOM OR CABINET. SEPARATE FROM OXIDIZING MATERIALS (NFPA 49, HAZARDOUS CHEMICALS DATA, 1975).

CONDITIONS TO AVOID

AVOID CONTACT WITH HEAT, SPARKS, FLAMES OR OTHER IGNITION SOURCES. VAPORS MAY BE EXPLOSIVE. MATERIAL IS CORROSIVE; AVOID CONTACT WITH SKIN OR EYES. DO NOT ALLOW CONTAMINATION OF WATER SOURCES.

SPILLS AND LEAKS

OCCUPATIONAL-SPILL:
SHUT OFF IGNITION SOURCES. DO NOT TOUCH SPILLED MATERIAL. STOP LEAK IF YOU CAN DO IT WITHOUT RISK. USE WATER SPRAY TO REDUCE VAPORS. DO NOT GET WATER INSIDE CONTAINER. FOR SMALL SPILLS, TAKE UP WITH SAND OR OTHER ABSORBENT MATERIAL AND PLACE INTO CONTAINERS FOR LATER DISPOSAL. FOR LARGER SPILLS, DIKE FAR AHEAD OF SPILL FOR LATER DISPOSAL. NO SMOKING, FLAMES OR FLARES IN HAZARD AREA. KEEP UNNECESSARY PEOPLE AWAY; ISOLATE HAZARD AREA AND DENY ENTRY.

REPORTABLE QUANTITY (RQ): 1000 POUNDS
THE SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT (SARA) SECTION 304 REQUIRES THAT A RELEASE EQUAL TO OR GREATER THAN THE REPORTABLE QUANTITY FOR THIS SUBSTANCE BE IMMEDIATELY REPORTED TO THE LOCAL EMERGENCY PLANNING COMMITTEE AND THE STATE EMERGENCY RESPONSE COMMISSION (40 CFR 355.40). IF THE RELEASE OF THIS SUBSTANCE IS REPORTABLE UNDER CERCLA SECTION 103, THE NATIONAL RESPONSE CENTER MUST BE NOTIFIED IMMEDIATELY AT (800) 424-8802 OR (202) 426-2675 IN THE METROPOLITAN WASHINGTON, D.C. AREA (40 CFR 302.6).

PROTECTIVE EQUIPMENT SECTION

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

RESPIRATOR:
THE FOLLOWING RESPIRATORS AND MAXIMUM USE CONCENTRATIONS ARE RECOMMENDATIONS BY THE U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES, NIOSH POCKET GUIDE TO CHEMICAL HAZARDS; NIOSH CRITERIA DOCUMENTS OR BY THE U.S. DEPARTMENT OF LABOR, 29 CFR 1910 SUBPART Z.
THE SPECIFIC RESPIRATOR SELECTED MUST BE BASED ON CONTAMINATION LEVELS FOUND IN THE WORK PLACE, MUST NOT EXCEED THE WORKING LIMITS OF THE RESPIRATOR AND BE JOINTLY APPROVED BY THE NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH AND THE MINE SAFETY AND HEALTH ADMINISTRATION (NIOSH-MSHA).

1,2-DICHLOROETHYLENE (ALL ISOMERS):

1000 PPM- ANY POWERED AIR-PURIFYING RESPIRATOR WITH ORGANIC VAPOR CARTRIDGES.
ANY CHEMICAL CARTRIDGE RESPIRATOR WITH AN ORGANIC VAPOR CANISTER AND A FULL FACEPIECE.

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

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

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

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

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

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

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

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

EMERGENCY WASH FACILITIES:

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

AUTHORIZED BY- OCCUPATIONAL HEALTH SERVICES, INC.

CREATION DATE: 09/07/84 REVISION DATE: 11/02/89

****

55 352

DRAWING NUMBER 305895-E8

INSTRUMENT IDENTIFICATION

FIRST LETTER PROCESS VARIABLE OF ACTUATION		SECOND LETTER FUNCTION MODIFIER	
A	ANALYSIS	A	ALARM
F	VOLTAGE (EMF)/ELECT.	AH	ALARM HIGH
F	FLOW RATE	AL	ALARM LOW
FQ	FLOW QUANTITY	C	CONTROLLER OR CONTROL
FF	FLOW RATIO	E	ELEMENT
G	GAGING (DIMENSIONAL)	G	GLASS OR GAGE
H	HAND (MANUALLY)	I	INDICATOR
I	CURRENT/AMPS	IC	INDICATING CONTROLLER
L	LEVEL	P	POINT
P	PRESSURE/VACUUM	Q	TOTALIZE/INTEGRATE
T	TEMPERATURE	R	RECORDER
X	(UNCLASSIFIED)	S	SWITCH
Y	(UNCLASSIFIED) SECOND LETTER RELAY	SH	SWITCH HIGH
		SL	SWITCH LOW
		SLH	SWITCH LOW & HIGH (DUAL)
		SV	SAFETY VALVE
		T	TRANSMITTER
		V	VALVE
		W	WELL OR PROBE
		Y	INSTRUMENT SIGNAL RELAY

FE	FLOW ELEMENT	LV	LEVEL VALVE
FI	FLOW INDICATOR	LY	LEVEL SIGNAL RELAY (CONVERTOR)
FQ	FLOW TOTALIZER	PA	PRESSURE/VACUUM ALARM
FT	FLOW TRANSMITTER	PB	PUSH BUTTON
FY	FLOW SIGNAL RELAY (CONVERTOR)	PG	PRESSURE GAGE
HS	HAND/MANUAL SWITCH	PI	PRESSURE/VACUUM INDICATOR
II	CURRENT INDICATOR (AMMETER)	TA	TEMPERATURE ALARM
LA	LEVEL ALARM	TE	TEMPERATURE ELEMENT
LC	LEVEL CONTROL	TI	TEMPERATURE INDICATOR
LE	LEVEL ELEMENT	TT	TEMPERATURE TRANSMITTER
LI	LEVEL INDICATOR	TW	THERMOWELL

AIC	ANALYSIS INDICATING CONTROL	FIC	FLOW INDICATING CONTROL
AIT	ANALYSIS INDICATING TRANSMITTER	FIT	FLOW INDICATING TRANSMITTER
dPA	DIFFERENTIAL PRESSURE ALARM	FQI	FLOW INDICATING TOTALIZER
dPI	DIFFERENTIAL PRESSURE INDICATOR	LAY	LEVEL ALARM RELAY
dPIT	DIFFERENTIAL PRESSURE INDICATING TRANSMITTER	FQIA	FLOW INDICATING TOTALIZER ALARM
dPS	DIFFERENTIAL PRESSURE SWITCH	LIC	LEVEL INDICATING CONTROL
dPSH	DIFFERENTIAL PRESSURE SWITCH HIGH	LIT	LEVEL INDICATING TRANSMITTER
dPSL	DIFFERENTIAL PRESSURE SWITCH LOW	PCV	PRESSURE CONTROL VALVE
dTA	DIFFERENTIAL TEMPERATURE ALARM	PSE	PRESSURE SAFETY ELEMENT
dTC	DIFFERENTIAL TEMPERATURE CONTROL	PSH	PRESSURE SWITCH HIGH
		PSL	PRESSURE SWITCH LOW
		PSV	PRESSURE/VACUUM SAFETY VALVE
		TSH	TEMPERATURE SWITCH HIGH

INSTRUMENT SYMBOLS

- L — LIGHT (L-WHITE, R-RED, G-GREEN A-AMBER, B-BLUE)
- LT — LOCAL MOUNTED INSTRUMENT
- BE — INSTRUMENT MOUNTED BEHIND LOCAL CONTROL BOARD
- LI — LOCAL PANEL MOUNTED INSTRUMENT
- PI — INSTRUMENT MOUNTED BEHIND BOARD (MAIN CONTROL PANEL)
- HS — PANEL MOUNTED INSTRUMENT (MAIN CONTROL PANEL)
- I — INTERLOCK

GENERAL EQUIPMENT

- BLOWER
- CENTRIFUGAL PUMP
- SUMP PUMP
- SUBMERSIBLE WELL PUMP
- CARBON ADSORBER
- BAG FILTER
- SUMP
- LOW PROFILE AIR STRIPPER
- AIR DISTRIBUTION PLENUM

MANUALLY OPERATED VALVES

- BALL VALVE
- BUTTERFLY VALVE OR DAMPER
- CHECK VALVE
- GATE VALVE
- DIAPHRAM VALVE
- GLOBE VALVE

MISCELLANEOUS

- SPRAY NOZZLES
- EXPANSION JOINT
- ATMOSPHERIC VENT
- BLIND FLANGE
- REDUCTION IN LINE SIZE
- PSV — PRESSURE RELIEF VALVE
- PSE — RUPTURE DISC
- PG — PRESSURE GAUGE
- REDUCTION EXPANSION JOINT
- LEVEL ELEMENT PROBES
- AIR BUBBLER

LINE & PIPING SYMBOLS IDENTIFICATION

- PROCESS LINE PRIMARY
- PROCESS LINE SECONDARY
- ELECTRICAL SIGNAL
- VENDOR PACKAGE
- FLANGED CONNECTION
- THREADED CONNECTION
- SOCKET WELD CONNECTION
- BUTT WELD CONNECTION
- HEAT TRACING AND INSULATION

LINE SPECIFICATIONS

PVC – POLYVINYL CHLORIDE

PIPE LINE IDENTIFICATION

6"–005–PVC

- PIPING CODE
- LINE NUMBER
- LINE SIZE

ABBREVIATIONS

HOA	HAND OFF AUTOMATIC
HO	HAND OFF
OA	OFF AUTOMATIC
HH	HIGH HIGH
H	HIGH
L	LOW

D.O. NO.	ACTION	DATE	DESCRIPTION OF REVISION

INTERNATIONAL TECHNOLOGY CORPORATION
... Creating a Safer Tomorrow

U.S. ARMY ENGINEER DISTRICT, TULSA
CORPS OF ENGINEERS
TULSA, OKLAHOMA

DESIGNED BY D.A.K./
DRAWN BY M.D.D./10JULY93
CHECKED BY B.J.P.

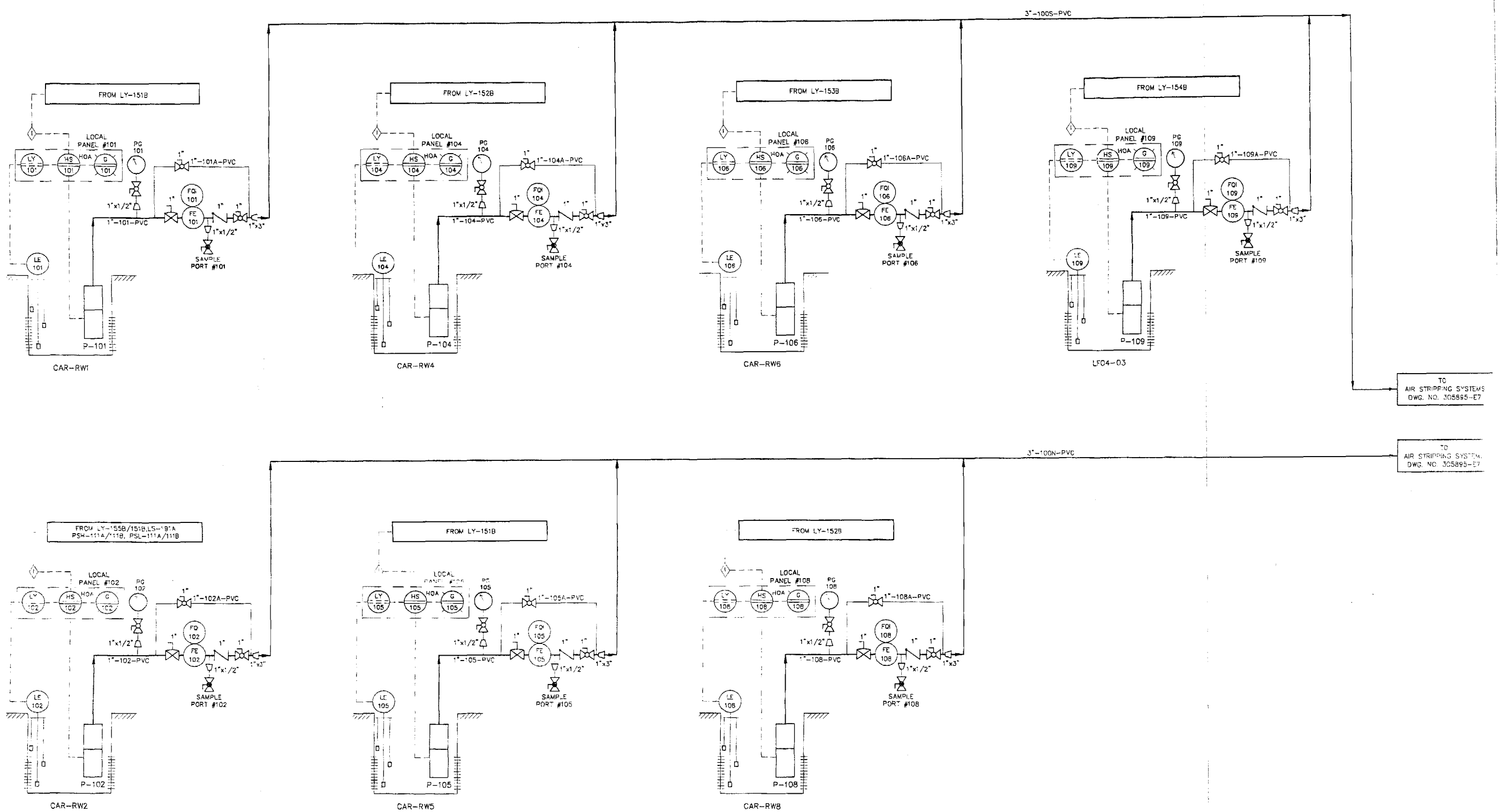
PIPING AND INSTRUMENTATION DIAGRAM
LEGEND
SHEET 1 OF 3

LANDFILL 4 & 5 — FORT WORTH, TEXAS

SUBMITTED BY B. J. PAREKH
ENGINEER

SOC NO. DACA-92-D-0008
CONTR. NO.
SEQUENCE NO.
DRAWING NO. 305895-E8
SHEET NO.

DRAWING NUMBER 305895-E6



P-101

SUBMERSIBLE PUMP
25.0 @ 220 FT. TDH
460 V. 3ø, 60 HZ.
2 HP., STAINLESS STEEL

P-102

SUBMERSIBLE PUMP
25.0 @ 220 FT. TDH
460 V. 3ø, 60 HZ.
2 HP., STAINLESS STEEL

P-104

SUBMERSIBLE PUMP
25.0 @ 220 FT. TDH
460 V. 3ø, 60 HZ.
2 HP., STAINLESS STEEL

P-105

SUBMERSIBLE PUMP
5.0 @ 240 FT. TDH
460 V. 3ø, 60 HZ.
1/2 HP., STAINLESS STEEL

P-106

SUBMERSIBLE PUMP
25.0 @ 220 FT. TDH
460 V. 3ø, 60 HZ.
2 HP., STAINLESS STEEL

P-108

SUBMERSIBLE PUMP
5.0 @ 240 FT. TDH
460 V. 3ø, 60 HZ.
1/2 HP., STAINLESS STEEL

P-109

SUBMERSIBLE PUMP
25.0 @ 220 FT. TDH
460 V. 3ø, 60 HZ.
2 HP., STAINLESS STEEL

D.O. NO.	ACTION	DATE	DESCRIPTION OF REVISION

INTERNATIONAL TECHNOLOGY CORPORATION
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U.S. ARMY ENGINEER DISTRICT, TULSA
CORPS OF ENGINEERS
TULSA, OKLAHOMA

DESIGNED BY D.A.K./
DRAWN BY R. WEBBLE/TOCTOS
CHECKED BY B.J.P.
SUBMITTED BY B. J. PAREKH

PIPING AND INSTRUMENTATION DIAGRAM
RECOVERY WELLS

SHEET 2 OF 3

LANDFILL 4 & 5 FORT WORTH, TEXAS

SOC NO. DACA-92-D-0008
CONTR. NO.
SEQUENCE NO.

132298

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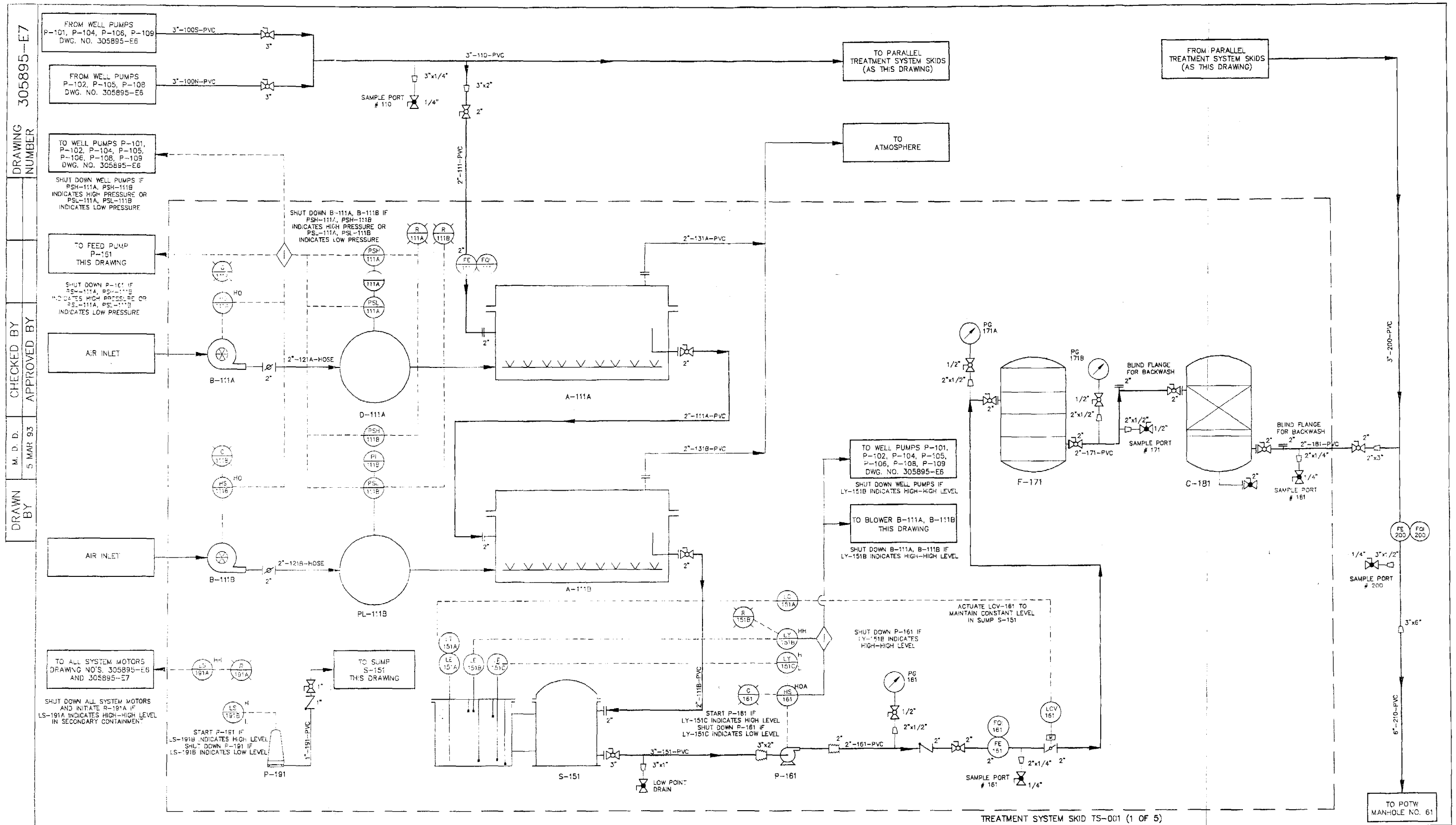
55 35



B-111A

AIR BLOWER
___ SCFM @ ___IMC
230/240 V., 3ø, 60HZ.
4.0 HP., CAST ALUMINUM

A-111A

UPPER STAGE
LOW PROFILE AIR STRIPPER
___"W. x ___"L. ___"D
HDPE

S-151

___ GAL. SUMP
___"W. x ___"L. ___"D
WITH ___" DIA. STILLING WELL
HDPE

P-161

FEED PUMP
___GPM. @ ___FT. TDH
230/240 V., 3ø, 60HZ.
___ HP., CAST IRON

P-171

BAG FILTER
12" DIA. x 36" LONG
WITH ONE 20 MIL POLYESTER BAG
STAINLESS STEEL

C-181

LIQUID PHASE CARBON VESSEL
30"DIA. x 72" SS.
1,000 LBS CARBON
CARBON STEEL WITH EPOXY INTERIOR

B-111B

AIR BLOWER
___ SCFM @ ___IMC
230/240 V., 3ø, 60HZ.
4.0 HP., CAST ALUMINUM

A-111B

LOWER STAGE
LOW PROFILE AIR STRIPPER
___"W. x ___"L. ___"D
HDPE

P-191

DEWATERING PUMP
___GPM. @ ___FT. TDH
110 V., 1ø, 60HZ.
___ HP., CAST IRON

D.O. NO.	ACTION	DATE	DESCRIPTION OF REVISION

INTERNATIONAL TECHNOLOGY CORPORATION
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U.S. ARMY ENGINEER DISTRICT, TULSA
CORPS OF ENGINEERS
TULSA, OKLAHOMA

DESIGNED BY D.A.K.
DRAWN BY W.A.D.
CHECKED BY J.U.K.

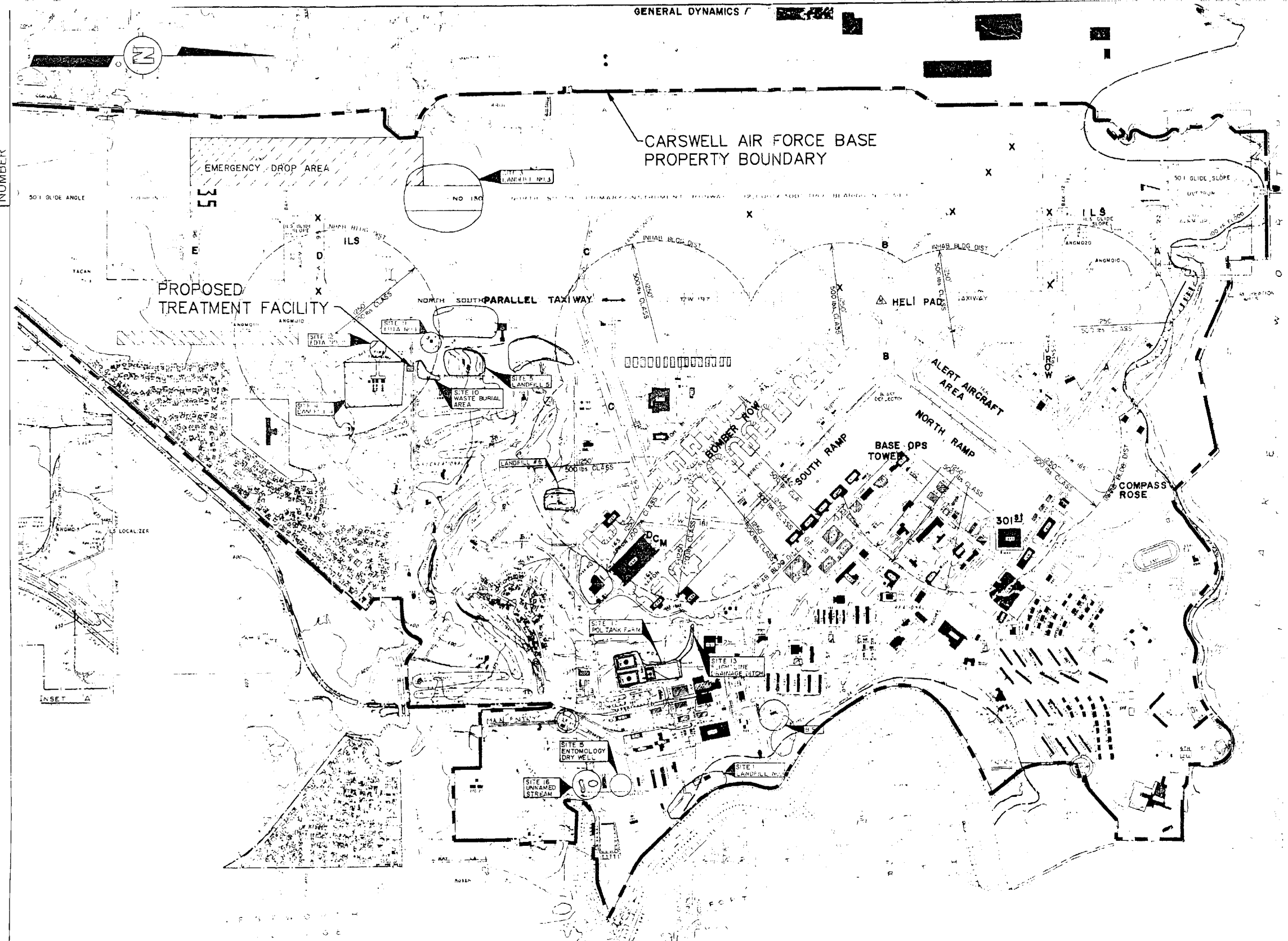
PIPING AND INSTRUMENTATION DIAGRAM
TYPICAL TREATMENT SYSTEM SKID
SHEET 3 OF 3

LANDFILL 4 & 5 — FORT WORTH, TEXAS

SUBMITTED BY
INVITATION NO.
SPECIFICATIONS DATED 7 OCT. 93
SEQUENCE NO.
ENGINEER
DRAWING NO. 305895-E7
SHEET NO.

55 359

DRAWING NUMBER 305895-E3



REFERENCE:

DEPARTMENT OF THE AIR FORCE DRAWING NO. C-1, TITLED: "MASTER PLAN IRP SITES, CARSWELL AIR FORCE BASE, FORT WORTH, TEXAS", SCALE: 1"=400', DATED: JAN 1989.

SCALE

0 600 1200 1800 FEET

D.O. NO.	ACTION	DATE	DESCRIPTION OF REVISION

INTERNATIONAL TECHNOLOGY CORPORATION
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U.S. ARMY ENGINEER DISTRICT, TULSA
CORPS OF ENGINEERS
TULSA, OKLAHOMA

DESIGNED BY
DRAWN BY R. Wolfe
CHECKED BY

SITE PLAN
AND TREATMENT FACILITY

LANDFILLS 4 AND 5 — FORT WORTH, TEXAS

SUBMITTED BY

INVITATION NO.

SPECIFICATIONS DATED

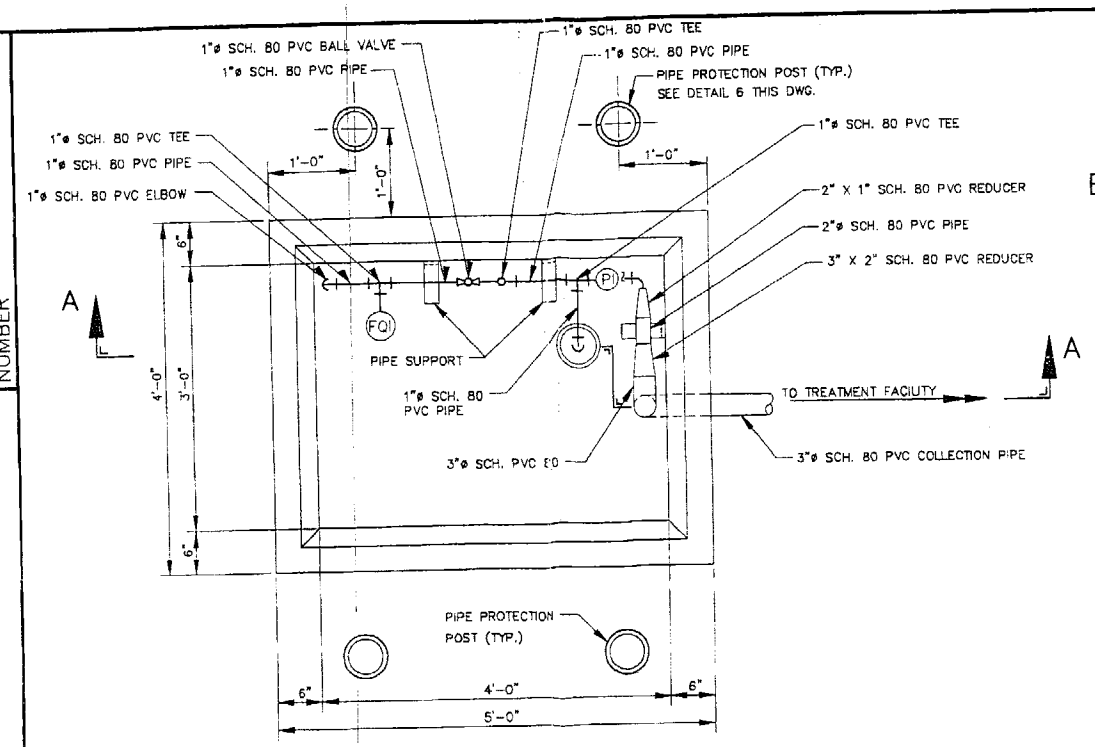
CONTRACT NO.

ENGINEER

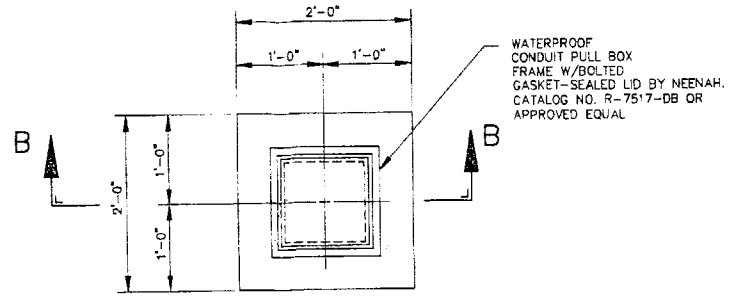
DRAWING NO. 305895-E3

SHEET NO.

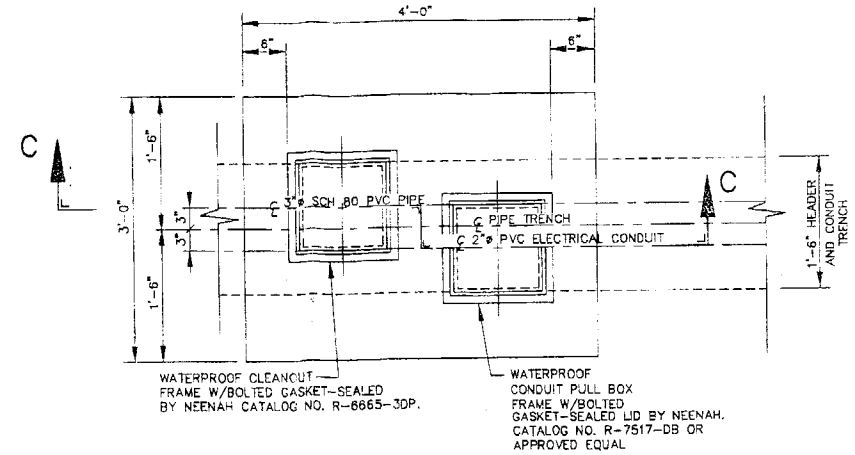
DRAWING NUMBER 305895-E2



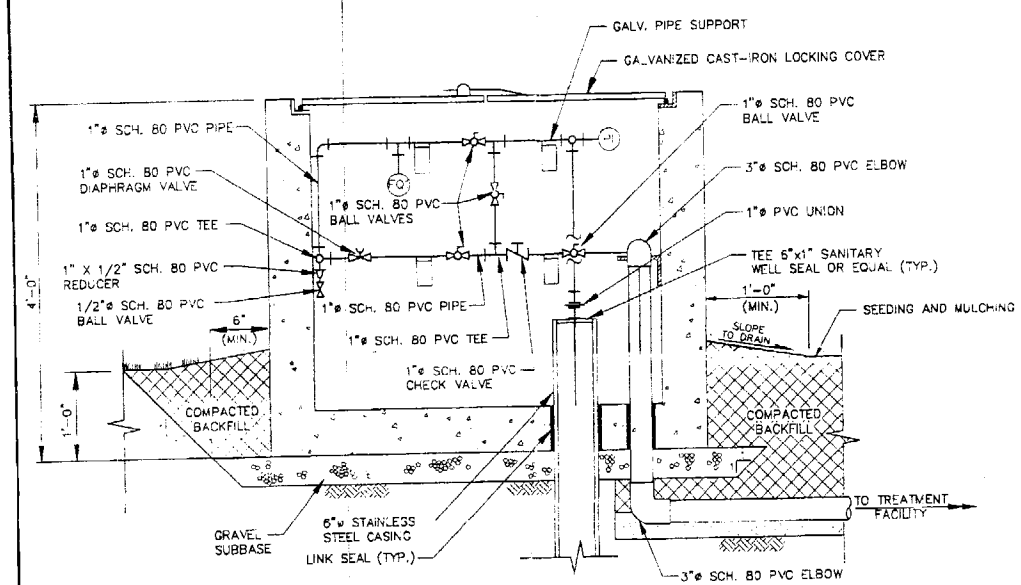
DETAIL 1
PLAN – EXTRACTION WELL VALVE PIT
SCALE: 1" = 1'-0"



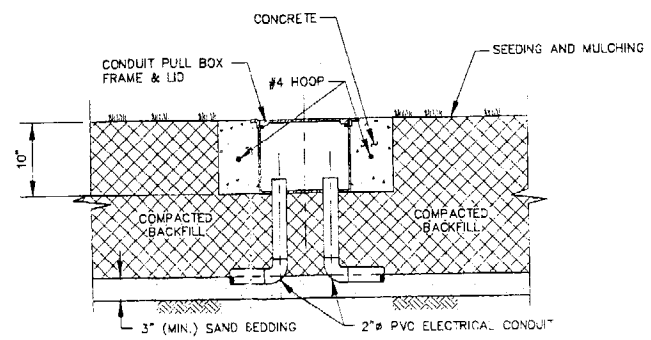
DETAIL 3
PLAN–PULL BOX PAD
SCALE: 1"=1'-0"



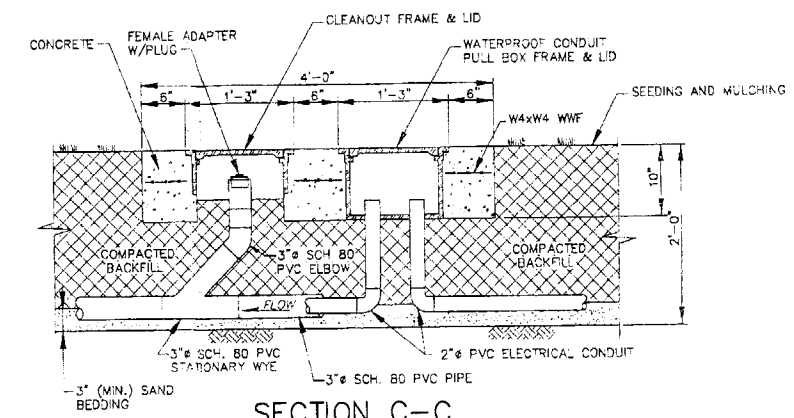
DETAIL 5
PLAN–CLEANOUT AND PULLBOX COVER
SCALE: 1"=1'-0"



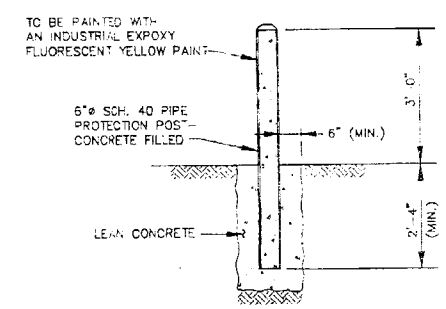
SECTION A–A
SCALE: 1"=1'-0"



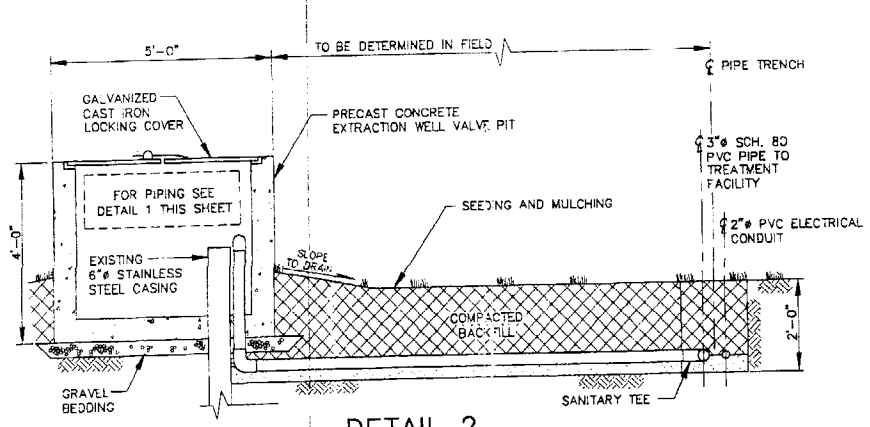
SECTION B–B
SCALE: 1"=1'-0"



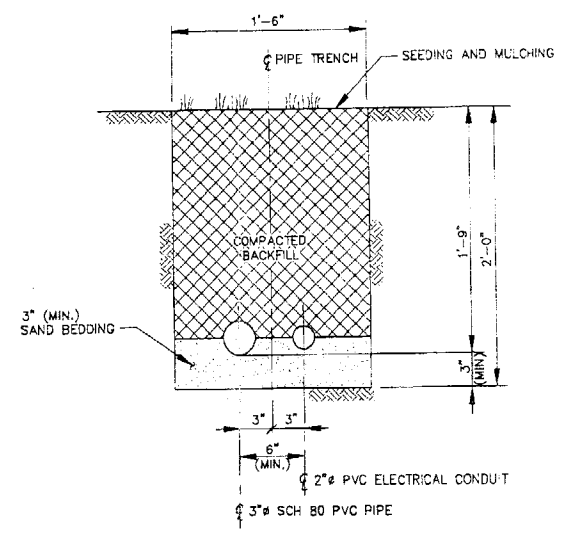
SECTION C–C
SCALE: 1"= 1'-0"



DETAIL 6
PIPE PROTECTION POST
SCALE: 1/2"=1'-0"



DETAIL 2
VALVE PIT AND HEADER CONNECTION
SCALE: 1/2"=1'-0"



DETAIL 4
TYPICAL PIPE BEDDING
SCALE: 1 1/2"= 1'-0"

NOTE:
FOR PLAN AND LOCATION OF EXTRACTION WELLS, VALVE PITS, CLEANOUTS AND PULL BOXES (SEE DWG. NO. 305895-E1.)

C.O. NO.	ACTION	DATE	DESCRIPTION OF REVISION

INTERNATIONAL TECHNOLOGY CORPORATION
... Creating a Safer Tomorrow

U.S. ARMY ENGINEER DISTRICT, TULSA
CORPS OF ENGINEERS
TULSA, OKLAHOMA

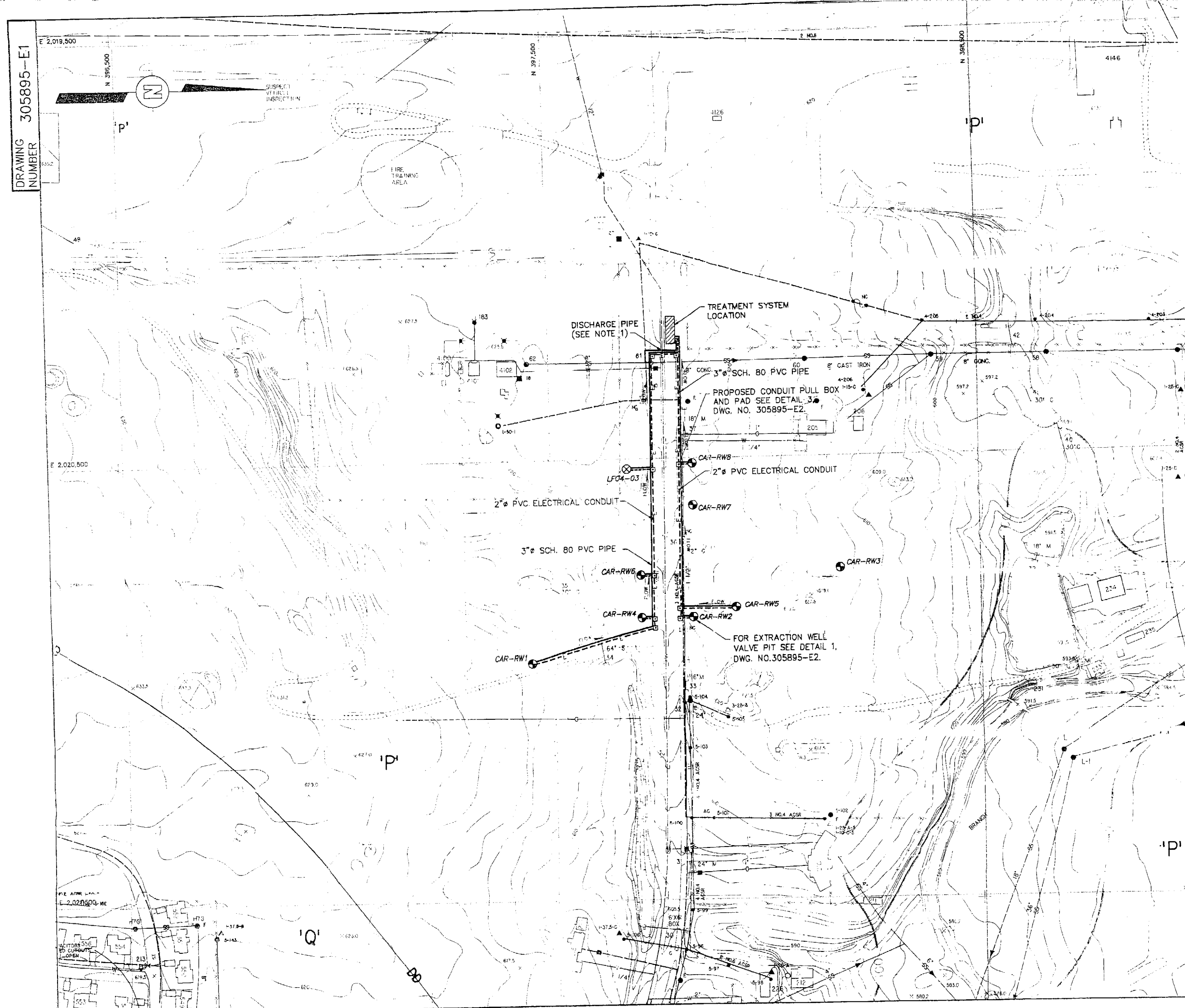
DESIGNED BY DAW/JJL
DRAWN BY D.E.S.
CHECKED BY

DETAILS
GROUNDWATER RECOVERY SYSTEM
LANDFILLS 4 AND 5 — FORT WORTH, TEXAS

SUBMITTED BY
INVITATION NO.
SPECIFICATIONS DATED
SCALE
ENGINEER
DRAWING NO. 305895-E2
SHEET NO.

55 350

DRAWING NUMBER 305895-E1



NOTES:

1. RECOVERY WELL LOCATIONS TO BE FIELD VERIFIED PRIOR TO CONSTRUCTION.
2. FIELD VERIFY EXISTING UTILITIES PRIOR TO EXCAVATION OF PIPE TRENCH FOR EXTRACTION WELLS.
3. PRIOR TO CONCRETE PLACEMENT THE CONTRACTOR SHALL DETERMINE THAT REINFORCING, PIPING, CONDUITS, AND GROUNDING CABLES ARE PROPERLY LOCATED AND INSTALLED AS PER CONTRACT DRAWINGS.
4. NO CONCRETE SHALL BE PLACED WITHOUT THE APPROVAL OF IT AND/OR IT'S REPRESENTATIVE.
5. REPORT ANY DISCREPANCIES OR CHANGES ON DRAWINGS TO IT AND/OR IT'S REPRESENTATIVE.
6. ALL CONCRETE FOR THE UTILITY BOX PADS SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 3500 PSI AT 28 DAYS.
7. ALL COLLECTION PIPE TO BE SCH. 80 UNLESS OTHERWISE NOTED OR SPECIFIED.
8. ALL ELECTRICAL CONDUIT FOR POWER AND INSTRUMENTATION SHALL BE SCH. 40 PVC.
9. PIPE PROTECTION POST TO BE FIELD LOCATED AS REQUIRED.
10. PIPING OTHER THAN 2"ø ELECTRICAL CONDUIT AND 3"ø SCH. 80 PVC PIPE IS EXISTING.
11. THE DISCHARGE PIPE SHALL BE 4"ø SCH. 80 PVC PIPE. THE PIPE SHALL BE INSTALLED AT A 2% SLOPE. THE PIPE SHALL DISCHARGE BELOW GRADE AT SANITARY SEWER MAN HOLE NO. 61.

LEGEND:

CAR-RW2	APPROXIMATE LOCATION OF EXTRACTION WELLS INSTALLED BY IT CORPORATION.
LF04-03	APPROXIMATE LOCATION OF RADIAN WELL TO BE USED AS AN EXTRACTION WELL
	CONDUIT PULL BOX AND PAD.
	2"ø PVC ELECTRICAL CONDUIT
	3"ø SCH. 80 PVC PIPE

REFERENCE:

DEPARTMENT OF THE AIR FORCE DRAWINGS: TAB NO. G11, SHEET 6 OF 22 AND 9 OF 22, TITLED: "COMPREHENSIVE PLAN COMPOSITE UTILITY SYSTEM", DATED: MAY 1960, SCALE: 1"=100'.

SCALE
0 100 200 300 FEET

D.O. NO.	ACTION	DATE	DESCRIPTION OF REVISION

INTERNATIONAL TECHNOLOGY CORPORATION
... Creating a Safer Tomorrow

U.S. ARMY ENGINEER DISTRICT, TULSA
CORPS OF ENGINEERS
TULSA, OKLAHOMA

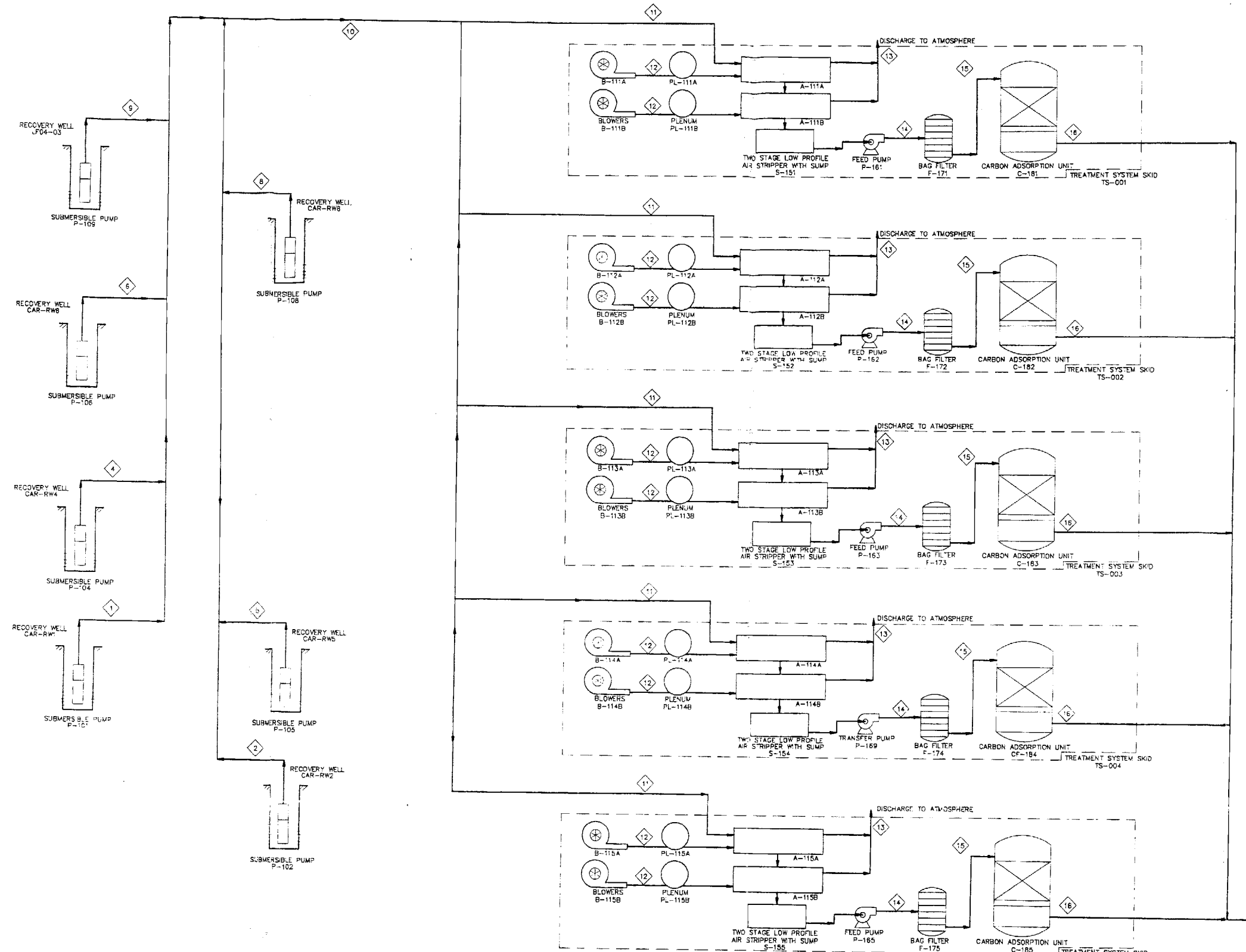
DESIGNED BY JJE
DRAWN BY R. Weibie
CHECKED BY
SUBMITTED BY
ENGINEER

PLAN
GROUNDWATER RECOVERY SYSTEM
LANDFILLS 4 AND 5 — FORT WORTH, TEXAS

INVITATION NO.
SPECIFICATIONS DATED
SEQUENCE NO.
DRAWING NO. 305895-E1
SHEET NO.

55 358

DRAWING NUMBER 305895-E4



PARAMETER	1 CAR-RW1		2 CAR-RW2		3 CAR-RW3		4 CAR-RW4		5 CAR-RW5		6 CAR-RW6		7 CAR-RW7		8 CAR-RW8	
	mg/l	ppd	mg/l	ppd	mg/l	ppd	mg/l	ppd	mg/l	ppd	mg/l	ppd	mg/l	ppd	mg/l	ppd
FLOW RATE, Q	25.0gpm	36,000gpd	25.0gpm	36,000gpd	0.0gpm	0gpd	25.0gpm	36,000gpd	5.0gpm	7,200gpd	25.0gpm	36,000gpd	0.0gpm	0gpd	5.0gpm	7,20[illegible]
TRICHLOROETHENE, TCE	0.93	0.28	3.90	1.17	1.50	0.00	2.80	0.84	1.30	0.08	1.70	0.51	5.00	0.00	3.50	[illegible]
1,2-DICHLOROETHENE, DCE	0.49	0.15	0.44	0.13	0.60	0.00	0.30	0.09	0.38	0.02	0.36	0.11	0.31	0.00	0.29	[illegible]
BARIUM, Ba	0.0589	0.02	0.111	0.03	0.138	0.00	0.085	0.03	0.085	0.01	0.085	0.03	0.085	0.00	0.085	[illegible]
SODIUM, Na	25.9	7.76	28	8.41	36.1	0.00	27.0	8.09	27.0	1.62	27.0	8.09	27.0	0.00	27.0	[illegible]
IRON, Fe	<0.03	0.00	0.0678	0.02	0.0432	0.00	0.0339	0.01	0.0339	0.00	0.0339	0.01	0.0339	0.00	0.0339	[illegible]
MANGANESE, Mn	<0.01	0.00	<0.01	0.00	0.0216	0.00	<0.01	0.00	<0.01	0.00	<0.01	0.00	<0.01	0.00	<0.01	[illegible]
ZINC, Zn	<0.02	0.00	<0.02	0.00	0.0578	0.00	<0.02	0.00	<0.02	0.00	<0.02	0.00	<0.02	0.00	<0.02	[illegible]
CALCIUM, Ca	139	41.73	139	41.73	157	0.00	139	41.73	139	8.35	139	41.73	139	0.00	139	[illegible]
pH	7.06		7.05		6.81		6.95		6.53		6.82		7.40		7.29	
TOTAL SUSPENDED SOLIDS, TSS	<4.0	0.00	<4.0	0.00	<4.0	0.00	<4.0	0.00	<4.0	0.00	<4.0	0.00	<4.0	0.00	<4.0	0.00
TOTAL DISSOLVED SOLIDS, TDS	490	147.12	510	153.12	580	0.00	500	150.12	500	30.02	500	150.12	500	0.00	500	30.02
TEMPERATURE	75.0° F		73.9° F		73.9° F		74.3° F		72.4° F		72.2° F		80.4° F		79.1° F	
BIOLOGICAL OXYGEN DEMAND, BOD	<2	0.00	<2	0.00	<2	0.00	<2	0.00	<2	0.00	<2	0.00	<2	0.00	<2	0.00

PARAMETER	9 LF04-03		10 TOTAL FLOW		11 STRIPPER FEED		12 STRIPPER INLET AIR		13 AIR DISCHARGE		14 BAG FILTER FEED		15 CARBON FEED		16 CARBON DISCHARGE		17 POTW DISCHARGE	
	mg/l	ppd	mg/l	ppd	mg/l	ppd	ppmv	ppd	ppmv	ppd	mg/l	ppd	mg/l	ppd	mg/l	ppd	mg/l	ppd
FLOW RATE, Q	25.0gpm	36,000gpd	135gpm	194,400gpd	27gpm	38,880gpd	200scfm		400scfm		27gpm	38,880gpd	27gpm	38,880gpd	27gpm	38,880gpd	135gpm	194,400gpd
TRICHLOROETHENE, TCE	2.34	0.70	2.34	3.79	2.34	0.76	0.0	0.00	3.7	0.72	0.12	0.04	0.12	0.04	<0.005	0.00	<0.005	0.00
1,2-DICHLOROETHENE, DCE	0.39	0.12	0.39	0.63	0.39	0.13	0.0	0.00	0.8	0.12	0.02	0.01	0.02	0.01	<0.005	0.00	<0.005	0.00
BARIUM, Ba	0.085	0.03	0.085	0.14	0.085	0.03	0.0	0.00	0.0	0.00	0.085	0.03	0.085	0.03	0.085	0.03	0.085	0.14
SODIUM, Na	27.0	8.09	27.0	43.69	27.0	8.74	0.0	0.00	0.0	0.00	27.0	8.74	27.0	8.74	27.0	8.74	27.0	43.69
IRON, Fe	0.0339	0.01	0.0339	0.05	0.0339	0.01	0.0	0.00	0.0	0.00	0.0339	0.01	0.0339	0.01	0.0339	0.01	0.0339	0.05
MANGANESE, Mn	<0.01	0.00	<0.01	0.00	<0.01	0.00	0.0	0.00	0.0	0.00	<0.01	0.00	<0.01	0.00	<0.01	0.00	<0.01	0.00
ZINC, Zn	<0.02	0.00	<0.02	0.00	<0.02	0.00	0.0	0.00	0.0	0.00	<0.02	0.00	<0.02	0.00	<0.02	0.00	<0.02	0.00
CALCIUM, Ca	139	41.73	139	225.36	139	45.07	0.0	0.00	0.0	0.00	139	45.07	139	45.07	139	45.07	139	225.36
pH	6.99		6.99		6.99						6.99		6.99		6.95		6.99	
TOTAL SUSPENDED SOLIDS, TSS	<4.0	0.00	<4.0	0.00	<4.0	0.00					<4.0	0.00	<4.0	0.00	<4.0	0.00	<4.0	0.00
TOTAL DISSOLVED SOLIDS, TDS	500	150.12	500	810.65	500	162.13					500	162.13	500	162.13	500	162.13	500	810.65
TEMPERATURE	75.1° F		75.1° F		75.1° F		AMBIENT		75.1° F		75.1° F		75.1° F		75.1° F		75.1° F	
BIOLOGICAL OXYGEN DEMAND, BOD	<2	0.00	<2	0.00	<2	0.00					<2	0.00	<2	0.00	<2	0.00	<2	0.00

NOTES:

1. THE LISTED PARAMETERS WERE THOSE IDENTIFIED IN THE PHASE I AND II FIELD SAMPLING, ANALYSIS, AND TESTING PROGRAM.
2. WELL LF04-03 WAS NOT SAMPLED. THE ANALYTICAL DATA SHOWN IS BASED ON AVERAGE LEVELS IN WELLS CAR-RW1 TO CAR-RW8.
3. THE INORGANIC ANALYTICAL DATA SHOWN FOR WELLS CAR-RW4 TO CAR-RW8 IS BASED ON AVERAGE LEVELS IN WELLS CAR-RW1 TO CAR-RW3.
4. THE TEMPERATURE AND PH LEVELS WERE MEASURED IN THE FIELD AS THE SAMPLES WERE COLLECTED.

LEGEND:

mg/l	MILLIGRAMS PER LITER
ppd	POUNDS PER DAY
ppmv	PARTS PER MILLION BY VOLUME
gpm	GALLONS PER MINUTE
gpd	GALLONS PER DAY
scfm	STANDARD CUBIC FEET PER MINUTE
F°	DEGREES FAHRENHEIT

D.O. NO.	ACTION	DATE	DESCRIPTION OF REVISION

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U.S. ARMY ENGINEER DISTRICT, TULSA
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TULSA, OKLAHOMA

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DRAWN BY H.A.M./12JUL93
CHECKED BY B.J.P.
SUBMITTED BY B. J. PAREKH
ENGINEER

PROCESS FLOW DIAGRAM AND MASS BALANCE

LANDFILL 4 & 5 — FORT WORTH, TEXAS

SOC NO. DACA-92-D-0008
CONTR NO.
DRAWING NO. 305895-E4
SHEET NO.
SEQUENCE NO.

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