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NCBC GULFPORT
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REVISED HEALTH AND SAFETY PLAN FOR BIOSLURPER SYSTEM SITE 6 WITH TRANSMITTAL NCBC GULFPORT MS
3/19/2003
BATTELLE

NCBC Gulfport Administrative Record
Document Index Number

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. . . Putting Technology To Work
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March 19, 2003

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Naval Facilities Engineering Command
Southern Division
2155 Eagle Drive
P.O. Box 190010
North Charleston, SC 29419-9010
Attn: Mr. Art Conrad

Dear Mr. Conrad:

Contract No. N47408-01-D-8207, Task Order 003

Enclosed is the revised Health and Safety Plan for use by employees of Battelle and Southern Petroleum Services during operation of the Site 6 bioslurper system and associated site characterization work. This Health and Safety Plan is intended to meet the requirements of the 29 Code of Federal Regulations (CFR) 1910 and 29 CFR 1926. Please contact me at (614) 424-7289 or rosansky@battelle.org, with any questions.

Sincerely,

Stephen H. Rosansky, P.E.
Principal Environmental Engineer
Environmental Restoration Department

Enclosure

cc: Mr. Dan Wadill, SOUTHDIV
Mr. Joe Della-Volle, NCBC Gulfport

HEALTH AND SAFETY PLAN

SECTION 1: GENERAL INFORMATION AND DISCLAIMER

CLIENT NAME: U.S. Navy

PROJECT NAME: Task Order 003 Gulfport Bioslurper

PROJECT MANAGER: Stephen Rosansky

PROJECT LEADER: Lydia Cumming

PREPARED BY: Stephen Rosansky

DATE: March 19, 2003

NOTE: This Site Specific Health and Safety Plan (HASP) has been prepared for use by Battelle employees and their subcontractors for work at this site. The plan is written for the specific LEVEL D site conditions, purposes, tasks, dates and personnel specified. If these conditions change, this plan must be amended and reviewed by those named in Section 18. This HASP satisfies the requirements of 29 Code of Federal Regulations (CFR) 1910.120 and 29 CPR 1926.

All site activities shall be performed in accordance with 1910.120(b)(1)(iv) and (v). Battelle will inform subcontractors of the site emergency response procedures, and any potential fire, explosion, health, safety or other hazards by making this HASP and site information obtained by others available on-site. All contractors and subcontractors are responsible for: (1) attending the health and safety briefing given by the Battelle Site Safety Officer (SSO) covering the requirements of this HASP; (2) providing their own personal protective equipment (PPE); (3) providing documentation that their employees have been health and safety trained in accordance with applicable federal, state and local laws and regulations; (4) providing evidence of medical surveillance and medical approvals for their employees; and (5) complying with the direction and guidance provided by the Battelle SSO. Subcontractors shall be solely responsible for the health and safety of their employees and shall comply with all applicable laws and regulations.

Prior to any activities being performed on site, a pre-work health and safety briefing shall be conducted by the Battelle SSO. This briefing shall discuss the chemical and physical hazards associated with working on this site.

SECTION 2: PROJECT INFORMATION

(1) SITE INFORMATION

Site Name:	Site 6	Site Project Client Contact:	Larry Flynt
Address	NCBC Gulfport	Phone Number:	(601) 765-1618
	Gulfport, MS	Site Safety & Health Contact:	Lydia Cumming
		Phone Number	(614) 424-7778

(2) SITE CLASSIFICATION (check or circle all that apply)

- ■ Hazardous (RCRA/CERCLA/State)
- ❑ Construction
- ❑ Landfill (Non-Hazardous)
- ❑ UST/LUST
- ❑ Manufacturing
- ❑ Active
- ❑ Inactive
- ❑ Other:

(3) ENTRY OBJECTIVES (check or circle all that apply)

- ■ Site Inspection (General)
- ■ Well Drilling Observation
- ■ Sampling, Air
- ■ Sampling, Water
- ■ Sampling, Soil
- ❑ Other:

DATE(S) OF FIELD VISIT(S): Unknown

(4) BATTELLE TASKS

B1.	Collect soil samples
B2.	Collect groundwater samples
B3.	Air monitoring
B4.	Well Installation
B5	Installation and operation of a bioslurper system

TASK PERFORMED BY OTHERS

01.	Soil excavation/drilling
02.	Collect water and air samples
03.	Perform O&M of bioslurper system
04.	Equipment decontamination
05.	

(5) PROJECT ORGANIZATION AND COORDINATION – The following personnel are designated to carry out the stated project job functions on site. (Note: One person may carry out more than one job function.)

PROJECT MANAGER	Stephen Rosansky
SITE SAFETY OFFICER*	Lydia Cumming
ALTERNATIVE SITE SAFETY OFFICER(S)*	Southern Petroleum Services, Larry Flynt
PUBLIC INFORMATION OFFICER	Not Applicable
SITE RECORD KEEPER	Not Applicable
SITE PERSONNEL WITH CPR/FA	Lydia Cumming
FIELD TEAM LEADER(S)	Stephen Rosansky, Lydia Cumming
OTHER FIELD TEAM MANAGERS	Employees of Southern Petroleum Services

* Site Safety Officer must have CPR, First Aid and bloodborne pathogen control training.

(6) ON SITE CONTROL

Battelle and Southern Petroleum Services will coordinate access control and security for all field operations. A fence equipped with a locked gate surrounds the site. No unauthorized person should be within this area.

SECTION 3: PHYSICAL HAZARDS

(1) IDENTIFY POTENTIAL PHYSICAL HAZARDS TO WORKERS (check or circle all that apply)

☐	Confined Space	☐	Steep/Uneven Terrain	■	Drums Handling
■	Heavy Equipment	■	Heat Stress	■	Noise
■	Moving Parts	☐	Extreme Cold	☐	Non-Ionizing Radiation
■	Heavy Lifting	☐	Ionizing Radiation	☐	Other:
■	Electrical	☐	Traffic		
■	Overhead Hazards	■	Biological Hazards		
☐	Fall (>6; Vertical)	☐	Surface Water (Immersion)		

Site hazards will be mitigated by:

(1) Briefing site personnel as to identified physical hazards.
(2) Identifying the "kill switch" on the drilling rig and all energized equipment.
(3) Where possible, avoiding high traffic work areas; where this is not possible, traffic cones and/or high-visibility barrier tape will be used to divert vehicular and pedestrian traffic.
(4) Hearing protection will be made available to site personnel.
(5) Antiseptic ointment or solution will be included in the first aid kit for insect stings.
(6) Workers will be advised to take frequent breaks and consume adequate volumes of liquids to avoid heat stress.

(2) SAFETY EQUIPMENT REQUIRED FOR BATTELLE EMPLOYEES (check or circle all that apply)

☐	Explosimeter	☐	Eye Wash	☐	Confined Space Warning Signs
☐	Fall Protection Equipment	☐	Emergency Shower	☐	Communications – On Site
☐	Barrier Tape	☐	Emergency Air Horn	☐	Communications – Off Site
☐	Traffic Cones	☐	Lights	■	Hard Hats
☐	Stretcher	☐	Lights – emergency	■	Other:
■	First Aid Kit	■	Ladder		Boots (safety-toed)
■	A-B-C Fire Extinguisher	☐	Tick Repellant		Hearing and eye protection
☐	Snake Bite Kit	☐	Flotation Device (USCG Type III)		

Emergency equipment will be located inside the equipment ground. See Sections 10 and 12 for communication procedures. The field crew will be equipped with cellular telephones for off-site communication.

SECTION 6: ENVIRONMENTAL MONITORING

(1) The following environmental monitoring instruments shall be used on site at the specified intervals for breathing zone monitoring:

	EQUIPMENT	MONITORING PERIOD		ACTION LEVEL
❑	Combustible Gas Indicator	daily/hourly/continuous/other		
❑	O_2 Meter	daily/hourly/continuous/other		
■	PID (Lamp _____ eV)	daily/hourly/continuous/other*	During drilling activities	>1 ppm
❑	FID	daily/hourly/continuous/other		
❑	Radiation Meter (Gamma)	daily/hourly/continuous/other		
❑	Respirable Dust Meter	daily/hourly/continuous/other		
❑	Other	daily/hourly/continuous/other		
		daily/hourly/continuous/other		
		daily/hourly/continuous/other		

(2) Monitoring equipment is to be calibrated according to the manufacturers' instructions. Workers will record calibration data and air concentration in the Health and Safety on-site logbook.

(3) Action Levels for work stoppage and on-site assessment. These are average values. Consideration should be given to the potential for release of highly toxic compounds from the waste or from reaction by-products. Levels are for persistence (> 10 min).

	ACTION LEVEL
Uncharacterized Airborne Vapors or Gases	>Background
Characterized Airborne Gases, Vapor, Particulates	**>50% PEL, REL, TLV**
Oxygen	< 19.5; >23.5
Flammability	> 10% LEL

(4) Military and/or civilian personnel in charge of buildings adjacent to invasive monitoring activities will be notified via a health and safety kick-off meeting of site activities. A copy of this HASP will be provided. If any action levels are reached at the work area as described above or if discernible odors are released as a result of field activities, the personnel in charge or their designated representative will be notified immediately. Hourly perimeter monitoring (Support Zone) will be conducted to assess whether organic vapors or odors are leaving the work area.

SECTION 7: HEALTH AND SAFETY TRAINING/MEDICAL MONITORING PROGRAM

The Battelle project staff is included in the Battelle Health and Safety Training and Medical Monitoring Programs in conformance with 29 CFR 1910.120(f). As deemed necessary by the Battelle SSO, training records will be kept on file for all on-site Battelle personnel.

NAME	MEDICAL (Date)	HAZWOPPER TRAINING INITIAL (Hrs/Date)	HAZWOPPER TRAINING REFRESHER (Date)	CPR/FA/BBP (Dates)

SECTION 8: PERSONAL MONITORING

■ No personal exposure monitoring or heat/cold stress monitoring will take place on site. If the need for such monitoring is anticipated, this HASP will be modified as accordingly.

SECTION 4: CHEMICAL HAZARDS INFORMATION

(1) IDENTIFIED CONTAMINANTS

Known or suspected hazardous/toxic material (attached historical information, physical description, map of contamination and tabulated date, if available).

Media	Substances Involved	Characteristics	Estimated Concentrations	PEL
GW	Petroleum Hydrocarbons	VO	UN	See Table 2
AIR	Petroleum Hydrocarbons	VO	UN	See Table 2
SL	Petroleum Hydrocarbons	VO	UN	See Table 2

Media types: GW (ground water), SW (surface water), WW (wastewater), AIR (air), SL (soil), SD (sediments), WL (waste, liquid), WS (waste, solid), WD (waste, sludge), WG (waste, gas) OT (other).

Characterizations: CA (corrosive, acid) CC, (corrosive, caustic), IG (ignitable), RA (radioactive), VO (volatile), TO (toxic), RE (reactive), BIO (infectious), UN (unknown), OT (other, describe)

Material Safety Data Sheets (MSDSs) for the contaminants of concern are attached. The data sheets include information on the chemical/toxicological properties of the site contaminants and signs and symptoms of over exposure. A copy of this HASP will be kept inside the equipment compound on site.

(2) DESCRIBE POTENTIAL FOR CONTACT WITH EACH MEDIA TYPE FOR EACH OF THE BATTELLE TASKS LISTED IN SEC 2.4:

BATTELLE TASK #	ROUTE OF EXPOSURE	POTENTIAL FOR CONTACT	METHOD OF CONTROL
B1	Inhal/Ingest/Contact/Absorb	High/Medium/Low	Latex/Nitrile gloves, APR* eye protection
B2	Inhal/Ingest/Contact/Absorb	High/Medium/Low	Latex/Nitrile gloves, eye protection
B3	Inhal/Ingest/Contact/Absorb	High/Medium/Low	Latex/Nitrile gloves, APR*
B4	Inhal/Ingest/Contact/Absorb	High/Medium/Low	APR*, eye protection, Latex/Nitrile gloves
B5	Inhal/Ingest/Contact/Absorb	High/Medium/Low	APR*, eye protection, Latex/Nitrile gloves

The BATTELLE SSO will brief the field team on interpretation of the attached MSDSs and particularly on symptoms and signs of over exposure to chemical hazards.
*An air-purifying respirator (APR) will be donned only if action levels described in Section 6 are exceeded. If organic vapors are sustained in the breathing zone for more than 10 minutes at concentrations exceeding the action level, site workers shall wear an APR with a chemical carriage for organic vapors.

SECTION 5: HAZARD COMMUNICATION PROGRAM

If chemicals are introduced to the site by Battelle (e.g., decontamination liquids, preservatives, etc.), bring a copy of the Battelle Hazardous Communication Program and associate MSDSs to the site. The Battelle SSO will review this information with all field personnel prior to the start of the field activities. The current list of chemicals for this site is:

Alconox/Liquinox	
Hydrochloric Acid	
Nitric Acid	
Diesel Fuel	

SECTION 9: CONFINED SPACE ENTRY

■ No confined space and/or trench entries will take place on site. If the possibility of such entries taking place exists, this HASP will be modified accordingly.

SECTION 10: COMMUNICATION PROCEDURES

The relatively small site area allows for field personnel to remain in visual and audio range at all times. Communication via mobile or land phone will only be necessary to contact off-site personnel. Field personnel will be equipped with mobile phones. The mobile phone number of the project manager and the SSO will be made available prior to commencement of field activities. A telephone connected to a land line is available inside the equipment pad as part of the system's auto-dialer program.

SECTION 11: DECONTAMINATION PROCEDURES

Personnel and equipment leaving an Exclusion Zone shall be thoroughly decontaminated at the decontamination facility constructed at the On-Site Staging Area. The Battelle SSO is responsible for monitoring adherence with this decontamination plan. A Modified Level D decontamination protocol shall be used with the following decontamination stations:

(1) Equipment Drop (IF NECESSARY)
(2) Boot Covers, and Glove Wash and Rinse (IF NECESSARY)
(3) Outer Boot and Glove Removal (IF NECESSARY)
(4) Outer Garment Removal (IF NECESSARY)
(5) Inner Glove Removal (IF NECESSARY)
(6) Field Hand Wash

The following decontamination equipment is required (check or circle all that apply)

■ Decon Pad (Plastic Sheet)	■ Dry Brushes	■ Detergent Soap
■ Trash Cans/Bags	❑ Wet Brushes	❑ Other Decontamination Solution
■ Buckets	■ Water	

_____

_____

SECTION 12: EMERGENCY PROCEDURES

All on-site personnel will use the following standard emergency procedures. The Battelle SSO shall be notified of all on-site emergencies and be responsible for ensuring that the procedures are followed.

Personal Injury in the Exclusion Zone DESIGNATED EMERGENCY SIGNAL: Verbal warning or crossed arms above head

Upon notification of an injury in the Exclusion Zone, the designated emergency signal shall be sounded. All site personnel shall assemble at the decontamination line or On-Site Staging Area. The Battelle SSO or alternate should evaluate the nature of the injury, and the affected person should be decontaminated to the extent possible prior to movement to the Support Zone and off site. The on-site CPR/FA personnel shall initiate the appropriate first aid, and contact should be made for an ambulance (and other emergency services as needed) and with the designated medical facility (if required). No persons shall reenter the Exclusion Zone until the cause of the injury or symptoms is determined.

Fire/Explosion DESIGNATED EMERGENCY SIGNAL: Verbal warning

Upon notification of a fire or explosion on site, the designated emergency signal shall be sounded and all site personnel assembled at the decontamination line. The fire department shall be alerted and all personnel moved to a safe distance from the involved area.

Equipment Failure

If any other equipment (i.e., air monitoring) on site fails to operate properly, the Field Team Leader and Battelle SSO shall be notified and then determine the effect of this failure on continuing operations on site. If the failure affects the safety of personnel or prevents completion of the Work Plan tasks, all personnel shall leave the Exclusion Zone until the situation is evaluated and appropriate actions taken.

Emergency escape routes are designated for use in those situations where egress from the Exclusion Zone cannot occur through the decontamination line

In all situations, when an on-site emergency results in evacuation of the Exclusion Zone, personnel shall not reenter until:

(1) The conditions resulting in the emergency have been corrected.
(2) The hazards have been reassessed by the Battelle SSO.
(3) The Site Safety Plan has been reviewed by the Battelle SSO and Corporate Health and Safety Representative.

SECTION 13: SPILL CONTROL PROCEDURES

When drilling or excavating soil, a portable self-contained decontamination pad will be used and decontamination wastewater will be pumped to a large drum for future disposal.

For all other decontamination activities, minimal quantities of liquids are expected to be generated. These materials will also be stored in drums for future disposal.

In the event of a spill, the Base spill coordinator and the Base Fire Department should be notified first [see Section 14 (1)]. Every attempt will be made to capture or contain the spill. The NCBC Gulfport site contact and the Battelle Project Manager also should be notified [see Section 14 (3)].

SECTION 14: EMERGENCY INFORMATION

(1) LOCAL RESOURCES

Ambulance (name):	Base Fire Department	Phone:	(228) 871-2333
Hospital (name):	Memorial Hospital*	Phone:	(228) 867-4000
Hospital (name):	Base Medical Clinic**	Phone:	(228) 871-2211
Fire (name):	Base Fire Department	Phone:	(228) 871-2333
Spill Response (name)	Joseph Della-Volle, Public Works Dept.	Phone:	(228) 871-2720 or (228) 323-0779
Emergency Spill Response	Base Fire Department	Phone:	(228) 871-2833
On-Site CPR/FA(s):	Base Fire Department	Phone:	(228) 871-2333

* For life-threatening emergencies or emergency trauma care.
Memorial Hospital is approximately 15 minutes from the furthest work area and the ambulance response time is approximately 5 minutes.

** For non-life threatening medical care.
The Base medical clinic is approximately 5 minutes from the furthest work area. Injured workers may be transported here for non-emergency treatment only.

(2) DIRECTIONS TO NEAREST HOSPITAL:

Memorial Hospital from Site 6: Turn right (south) on Simms Ave and turn left (east) on Marvin Shields Blvd. Continue On Marvin Shields Blvd to the southern gate and exit the Base. Continue south on Broad Ave. Turn left (east) on 13th St. The Memorial Hospital is located at 4500 13th Street, Gulfport, MS.

Base Medical Clinic from Site 6: Turn right (south) on Simms Ave and turn left (east) on Marvin Shields Blvd. The health clinic is located On Marvin Shield Blvd, next to the McDonald's restaurant.

(3) BATTELLE RESOURCES

Corporate Health and Safety*
Gary Carlin (614) 424-4929
Corporate Health and Safety Representative
(Government Business Services)

CBC Gulfport Site Contact: Joseph Della-Volle (228) 871-2720
Battelle Project Manager: Stephen Rosansky (614) 424-7289

Battelle Main Number	(614) 424-6424
Workers Compensation Administrator*	(614) 424-7554
Legal Department*	(614) 424-6585
Medical Services (Emergency)	(614) 424-4622

*WHOM TO NOTIFY IN CASE OF ACCIDENT

SECTION 15: PERSONAL PROTECTIVE EQUIPMENT (check or circle all that apply)

■ No type of respiratory protection is required on this site. If the possibility of the need for respiratory protection is anticipated, this HASP will be modified accordingly.

CLOTHING	GLOVES	BOOTS	OTHER
❑ Coveralls	■ Cotton	❑ Safety	■ Hard Hat
❑ Tyvek	■ Leather	❑ Fireman/Hip	■ Safety Glasses
❑ Saranex	■ Disposable Nitrile	❑ Neoprene	■ Goggles
❑ PE Tyvek	❑ Butyl	■ Steel Toe	❑ Face Shield
■ Other: Coverall and/or work jeans and shirt.	❑ Neoprene		■ Hearing Protection
	❑ Viton		
	❑ PVC		
	❑ PVA		
	■ Latex		

SECTION 16: SAFE WORK PRACTICES

THE FOLLOWING PRACTICES MUST BE FOLLOWED BY PERSONNEL ON SITE

1. Smoking, eating, chewing gum or tobacco, or drinking are forbidden except in clean or designated areas.
2. Ignition of flammable liquids within or through improvised heating devices (e.g., barrels) is forbidden.
3. Contact with samples, excavated materials, or other contaminated materials must be minimized.
4. Use of contact lenses is prohibited at all times unless goggles/safety glasses are worn.
5. Do not kneel on the ground when collecting samples.
6. If drilling equipment is involved, know where the kill switch is.
7. All electrical equipment used in outside locations, wet areas, or near water must be plugged into ground fault circuit interrupter (GFCI) protected outlets.
8. A "Buddy System" in which another worker is close enough to render immediate aid will be used.
9. Good housekeeping practices are to be maintained.
10. Where the eyes or body may be exposed to corrosive materials, water suitable for quick drenching or flushing shall be available for immediate use.
11. In the event of treacherous weather-related working conditions (i.e., thunderstorm, limited visibility, extreme cold or heat) the field task will be suspended until conditions improve or appropriate protection from the elements is provided.

SECTION 17: REFERENCES (POTENTIAL)

- 29 CFR 1910 and 29 CFR 1926
- U.S. EPA Standard Operating Safety Guidelines for Hazardous Waste Operations. June 1992
- United States Army Corps of Engineers Safety and Health Manual, EM 305-1-1. September 1996.
- Navy/Marine Corps Installation and Restoration manual. August 2000.
- California Code of Regulations, Title 8 Section 5192.

SECTION 18: EMPLOYEE ACKNOWLEDGMENTS

PLAN REVIEWED BY:		DATE
H&S Representative:		3-19-03
Project Manager:		3/20/03
Project Leader:		3/20/03
Site Safety Officer:		

I acknowledge that I have read the information in this HASP form and the attached MSDSs. I understand the site hazards as described and agree to comply with the contents of the plan.

EMPLOYEE (Print Name)	SIGNATURE	DATE

VISITOR (Print Name)	SIGNATURE	DATE
Organization/Agency		
Organization/Agency		

Table 1. Hazard Sources and Mitigation During Field Activities to Support Bioslurper System Operation, Site 6, CBC Gulfport, MS

Hazard	Typical Sources	Mitigation Methods
Slips, trips, and falls	General site area	Maintain good housekeeping. Limit work area with boundary marking tape and signs. Slip, trip, and fall hazards will be addressed through an ongoing proactive housekeeping program that eliminates elements in the work area that have potential for causing substantial loss of footing.
Electrical shock	General site area	All major electrical work (wiring, control panel construction, etc.) will be subcontracted to a qualified electrical contractor. Care will be taken to de-energize and ground any electrical equipment prior to any necessary repair work. Before undertaking any repair work, the energy source will be either permanently disconnected or temporarily tagged and kept locked to prevent the equipment from accidentally energizing. The key will be kept under control of the SSO.
Flying particulate	General site area	Hard hats and safety glasses will be worn by all site personnel.
Objects striking head	General site area	Hard hats will be worn in the vicinity of overhead hazards (e.g., in the drilling rig or soil excavation equipment area).
Fire	General site area	Open-flame ignition sources will be restricted from the work area (smoking, etc.). Any free-phase petroleum or gasoline will be stored in appropriate containers. Signs indicating flammable liquids will be posted where appropriate. Appropriate fire extinguishers will be available to site personnel during field activities. A fire extinguisher will be permanently located in Battelle's trailer located in Area 12.
Respiration or ingestion of organic vapors	Soil/water handling and sampling	Real-time environmental monitoring will be provided upwind, downwind, and in the breathing zone. If conditions may require upgrading to air-purifying respirations (Level C PPE), an addendum to the document will be submitted for review and approval. Remain upwind whenever possible. Wear disposable gloves and protective goggles when handling and sampling water.
Contact with detergent or solvent	Decontaminating sampling equipment	Level D PPE is typically adequate. Wear coveralls and gloves. Wear safety glasses with side shields when preparing and using decontamination solutions Maintain good housekeeping. No eating, smoking, or drinking on site.

Table 1. Hazard Sources and Mitigation During Field Activities to Support Bioslurper System Operation, Site 6, CBC Gulfport, MS (Continued)

Hazard	Typical Sources	Mitigation Methods
Contact with scorpions, snakes, spiders, or other hazardous flora or fauna	General site area and, in particular, the back of the berm	Do not place hands into areas that have not been visually inspected, e.g., reaching overhead onto ledges or into holes. Wear coveralls, safety-toed shoes, and gloves. Perform periodic self-checks for ticks and insect bites.
Weather extremes	Work in inclement weather	Use dress consistent with conditions. Stop work in extreme heat.

SSO = Site safety officer.
PPE = Personal protective equipment.

Table 2. Primary Health Hazards and Exposure Limits for Chemical Substances on Subject Site

Compound	PEL-TWA[(a)]	STEL[(b)]	TLV[(b)]	Primary Health Hazard
Gasoline, Kerosene, Diesel	—	—	100 mg/m^3	Irritates eyes and nose; causes nausea and dizziness
Benzene	1 ppm	5.0 ppm	0.5 ppm	Irritates eyes and nose; causes headache, nausea, and fatigue; carcinogenic
Toluene	200 ppm	—	50 ppm	Irritates eyes and nose; causes nausea; affects liver and central nervous system
Ethylbenzene	100 ppm	125 ppm	100 ppm	Irritates eyes and mucous membranes
Xylenes	100 ppm	—	100 ppm	Irritates eyes and nose; causes nausea; affects liver and central nervous system

a) Occupational Health Guidelines for Chemical Hazards (NIOSH, 1981).
b) TLVs and BEIs (ACGIH, 2002).
PEL-TWA = permissible exposure limit–time-weighted average.

MATERIAL SAFETY DATA SHEETS

OHS02610

SECTION 1 CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

MDL INFORMATION SYSTEMS, INC.
1281 Murfreesboro Road, Suite 300
Nashville, TN 37217-2423
1-615-366-2000

EMERGENCY TELEPHONE NUMBER:
1-800-424-9300 (NORTH AMERICA)
1-703-527-3887 (INTERNATIONAL)

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; MINERAL NAPHTHA; (6)ANNULENE; NITRATION BENZENE; RCRA U019; UN 1114; C6H6; OHS02610; RTECS CY1400000

CHEMICAL FAMILY: hydrocarbons, aromatic

CREATION DATE: Oct 11 1984
REVISION DATE: Dec 16 2002

SECTION 2 COMPOSITION, INFORMATION ON INGREDIENTS

COMPONENT: BENZENE
CAS NUMBER: 71-43-2
EC NUMBER (EINECS): 200-753-7
EC INDEX NUMBER: 601-020-00-8
PERCENTAGE: >99

OTHER CONTAMINANTS:
0.15% NON-AROMATICS; 1 PPM THIOPHENE

SECTION 3 HAZARDS IDENTIFICATION

NFPA RATINGS (SCALE 0-4): HEALTH=3 FIRE=3 REACTIVITY=0

EMERGENCY OVERVIEW:
COLOR: colorless to yellow
PHYSICAL FORM: liquid
ODOR: distinct odor
MAJOR HEALTH HAZARDS: potentially fatal on contact with the skin, respiratory tract irritation, skin irritation, eye irritation, aspiration hazard, blood

damage, central nervous system depression, cancer hazard (in humans)
PHYSICAL HAZARDS: Extremely flammable liquid and vapor. Vapor may cause flash fire. Electrostatic charges may be generated by flow, agitation, etc.

POTENTIAL HEALTH EFFECTS:
INHALATION:
SHORT TERM EXPOSURE: irritation, nausea, vomiting, chest pain, difficulty breathing, irregular heartbeat, headache, drowsiness, dizziness, disorientation, sleep disturbances, mood swings, tremors, loss of coordination, blurred vision, lung congestion, internal bleeding, blood disorders, paralysis, coma
LONG TERM EXPOSURE: changes in body temperature, changes in blood pressure, nausea, stomach pain, loss of appetite, difficulty breathing, irregular heartbeat, headache, drowsiness, dizziness, emotional disturbances, loss of coordination, hearing loss, visual disturbances, menstrual disorders, blood disorders, bone disorders, reproductive effects, brain damage, cancer
SKIN CONTACT:
SHORT TERM EXPOSURE: irritation, death
LONG TERM EXPOSURE: irritation, allergic reactions, tingling sensation
EYE CONTACT:
SHORT TERM EXPOSURE: irritation
LONG TERM EXPOSURE: irritation
INGESTION:
SHORT TERM EXPOSURE: irritation, nausea, vomiting, chest pain, difficulty breathing, irregular heartbeat, headache, drowsiness, dizziness, disorientation, emotional disturbances, mood swings, tremors, loss of coordination, visual disturbances, lung congestion, internal bleeding, paralysis, convulsions, coma, aspiration hazard
LONG TERM EXPOSURE: nausea, vomiting, diarrhea, headache, dizziness, impotence, kidney damage, cancer

CARCINOGEN STATUS:
OSHA: Yes
NTP: Yes
IARC: Yes

SECTION 4 FIRST AID MEASURES

INHALATION: If adverse effects occur, remove to uncontaminated area. Give artificial respiration if not breathing. If breathing is difficult, oxygen should be administered by qualified personnel. Get immediate medical attention.

SKIN CONTACT: Wash skin with soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention, if needed. Thoroughly clean and dry contaminated clothing and shoes before reuse.

EYE CONTACT: Flush eyes with plenty of water for at least 15 minutes. Then get

immediate medical attention.

INGESTION: Aspiration hazard. DO NOT induce vomiting. If vomiting occurs, keep head lower than hips to help prevent aspiration. Get immediate medical attention. Give artificial respiration if not breathing.

NOTE TO PHYSICIAN: For inhalation, consider oxygen. For ingestion, consider gastric lavage.

SECTION 5 FIRE FIGHTING MEASURES

FIRE AND EXPLOSION HAZARDS: Severe fire hazard. Moderate explosion hazard. Vapor/air mixtures are explosive. The vapor is heavier than air. Vapors or gases may ignite at distant ignition sources and flash back. Electrostatic discharges may be generated by flow or agitation resulting in ignition or explosion.

EXTINGUISHING MEDIA: regular dry chemical, carbon dioxide, water, regular foam

Large fires: Use regular foam or flood with fine water spray.

FIRE FIGHTING: Move container from fire area if it can be done without risk. Cool containers with water spray until well after the fire is out. Stay away from the ends of tanks. For fires in cargo or storage area: Cool containers with water from unmanned hose holder or monitor nozzles until well after fire is out. If this is impossible then take the following precautions: Keep unnecessary people away, isolate hazard area and deny entry. Let the fire burn. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tanks due to fire. For tank, rail car or tank truck: Evacuation radius: 800 meters (1/2 mile). Water may be ineffective.

FLASH POINT: 12 F (-11 C) (CC)
LOWER FLAMMABLE LIMIT: 1.2%
UPPER FLAMMABLE LIMIT: 7.8%
AUTOIGNITION: 928 F (498 C)
FLAMMABILITY CLASS (OSHA): IB

SECTION 6 ACCIDENTAL RELEASE MEASURES

AIR RELEASE:
Reduce vapors with water spray. Stay upwind and keep out of low areas.

SOIL RELEASE:
Dig holding area such as lagoon, pond or pit for containment. Dike for later disposal. Absorb with sand or other non-combustible material.

WATER RELEASE:
Cover with absorbent sheets, spill-control pads or pillows. Apply detergents, soaps, alcohols or another surface active agent. Collect with absorbent into suitable container. Absorb with activated carbon. Remove trapped material with suction hoses. Collect spilled material using mechanical equipment. Subject to California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65). Keep out of water supplies and sewers.

OCCUPATIONAL RELEASE:
Avoid heat, flames, sparks and other sources of ignition. Stop leak if possible without personal risk. Reduce vapors with water spray. Small spills: Absorb with sand or other non-combustible material. Collect spilled material in appropriate container for disposal. Large spills: Dike for later disposal. Remove sources of ignition. Keep unnecessary people away, isolate hazard area and deny entry. Notify Local Emergency Planning Committee and State Emergency Response Commission for release greater than or equal to RQ (U.S. SARA Section 304). If release occurs in the U.S. and is reportable under CERCLA Section 103, notify the National Response Center at (800)424-8802 (USA) or (202)426-2675 (USA).

SECTION 7 HANDLING AND STORAGE

STORAGE: Store and handle in accordance with all current regulations and standards. Subject to storage regulations: U.S. OSHA 29 CFR 1910.106. Grounding and bonding required. Protect from physical damage. Store outside or in a detached building. Store with flammable liquids. Keep separated from incompatible substances.

SECTION 8 EXPOSURE CONTROLS, PERSONAL PROTECTION

EXPOSURE LIMITS:
BENZENE:

1 ppm OSHA TWA
5 ppm OSHA STEL 15 minute(s)
0.5 ppm OSHA action level
0.5 ppm ACGIH TWA (skin)
2.5 ppm ACGIH STEL (skin)
0.1 ppm NIOSH recommended TWA 10 hour(s)
1 ppm NIOSH recommended STEL
~~3.2 mg/m3 (1 ml/m3) AGS TRK (skin) (others)~~
8 mg/m3 (2.5 ml/m3) AGS TRK (production) (skin)
3 ppm UK MEL TWA

MEASUREMENT METHOD: Charcoal tube; Carbon disulfide; Gas chromatography

with flame ionization detection; NIOSH IV # 1500, Hydrocarbons; ALSO # 3700, # 1501

VENTILATION: Provide local exhaust or process enclosure ventilation system. Ventilation equipment should be explosion-resistant if explosive concentrations of material are present. Ensure compliance with applicable exposure limits.

EYE PROTECTION: Wear splash resistant safety goggles. Provide an emergency eye wash fountain and quick drench shower in the immediate work area.

CLOTHING: Wear appropriate chemical resistant clothing.

GLOVES: Wear appropriate chemical resistant gloves. OSHA REGULATED SUBSTANCES: U.S. OSHA 29 CFR 1910.1028.

RESPIRATOR: The following respirators and maximum use concentrations are drawn from NIOSH and/or OSHA.

10 ppm
Any air-purifying respirator with a full facepiece and an organic vapor canister.

50 ppm
Any chemical cartridge respirator with a full facepiece and organic vapor cartridge(s).
Any air-purifying respirator with a full facepiece and a canister providing protection against this substance.

100 ppm
Any powered, air-purifying respirator with a tight-fitting facepiece and organic vapor cartridge(s).

1000 ppm
Any supplied-air respirator with a full facepiece that is operated in a pressure-demand or other positive-pressure mode.

For Unknown Concentrations or Immediately Dangerous to Life or Health -
Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode.
Any supplied-air respirator with full facepiece and operated in a pressure-demand or other positive-pressure mode in combination with a separate escape supply.

Escape -
Any air-purifying respirator with a full facepiece and an organic vapor canister.
Any self-contained breathing apparatus with a full facepiece.

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE: liquid
COLOR: colorless to yellow

ODOR: distinct odor
MOLECULAR WEIGHT: 78.11
MOLECULAR FORMULA: C6-H6
BOILING POINT: 176 F (80 C)
FREEZING POINT: 43 F (6 C)
VAPOR PRESSURE: 75 mmHg @ 20 C
VAPOR DENSITY (air=1): 2.8
SPECIFIC GRAVITY (water=1): 0.8765 @ 20 C
WATER SOLUBILITY: 0.18% @ 25 C
PH: Not available
VOLATILITY: 100%
ODOR THRESHOLD: 4.68 ppm
EVAPORATION RATE: 5.1 (butyl acetate=1)
VISCOSITY: 0.6468 cP @ 20 C
COEFFICIENT OF WATER/OIL DISTRIBUTION: Not available
SOLVENT SOLUBILITY:
Soluble: acetone, alcohol, carbon disulfide, ether, carbon tetrachloride, chloroform, acetic acid, oils, organic solvents

SECTION 10 STABILITY AND REACTIVITY

REACTIVITY: Stable at normal temperatures and pressure.

CONDITIONS TO AVOID: Avoid heat, flames, sparks and other sources of ignition. Containers may rupture or explode if exposed to heat. Keep out of water supplies and sewers.

INCOMPATIBILITIES: acids, bases, halogens, oxidizing materials, metal salts

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.

HAZARDOUS DECOMPOSITION:
Thermal decomposition products: oxides of carbon

POLYMERIZATION: Will not polymerize.

SECTION 11 TOXICOLOGICAL INFORMATION

BENZENE:
IRRITATION DATA:
15 mg/24 hour(s) open skin-rabbit mild; 20 mg/24 hour(s) skin-rabbit moderate; 88 mg eyes-rabbit moderate; 2 mg/24 hour(s) eyes-rabbit severe
TOXICITY DATA:
2 pph/5 minute(s) inhalation-human LCLo; 50 mg/kg oral-man LDLo; 150 ppm/1 year(s) intermittent inhalation-man TCLo; 100 ppm inhalation-human TCLo; 65 mg/m3/5 year(s) inhalation-human LCLo; 194 mg/kg unreported-man LDLo; 930 mg/kg oral-rat LD50; 10000 ppm/7 hour(s) inhalation-rat LC50; 1100 ug/kg intraperitoneal-rat LD50; 4700 mg/kg oral-mouse LD50; 9980 ppm inhalation-mouse LC50; 48 mg/kg skin-mouse LD50; 340 mg/kg intraperitoneal-mouse LD50; 2 gm/kg oral-dog LDLo; 146000 mg/m3 inhalation-dog LCLo; 170000 mg/m3 inhalation-cat LCLo; 45000 ppm/30 minute(s) inhalation-rabbit LCLo; >9400 ul/kg skin-rabbit LD50; 88 mg/kg intravenous-rabbit LDLo; >9400 ul/kg skin-guinea pig LD50; 527 mg/kg intraperitoneal-guinea pig LDLo; 1400 mg/kg subcutaneous-frog LDLo; 5700 mg/kg oral-mammal LD50; 20000 ppm/5 minute(s) inhalation-mammal LCLo; 1500 mg/kg intraperitoneal-mammal LDLo; 5 mg/kg subcutaneous-rat LDLo; 6600 mg/kg/27 week(s) intermittent oral-rat TDLo; 23 mg/m3/4 hour(s)-8 day(s) intermittent inhalation-rat TCLo; 300 ppm/6 hour(s)-13 week(s) intermittent inhalation-rat TCLo; 300 ppm/6 hour(s)-99 week(s) intermittent inhalation-rat TCLo; 17 gm/kg/17 week(s) intermittent oral-rat TDLo; 1000 ppm/7 hour(s)-28 week(s) intermittent inhalation-rat TCLo; 500 ppm/6

hour(s)-3 week(s) intermittent inhalation-rat TCLo; 12 gm/kg/6 week(s) intermittent subcutaneous-rat TDLo; 18 mg/kg/21 day(s) intermittent subcutaneous-rat TDLo; 2197 mg/kg/5 day(s) intermittent subcutaneous-rat TDLo; 13536 mg/kg/12 week(s) intermittent subcutaneous-rat TDLo; 5 ml/kg/10 day(s) intermittent intraperitoneal-rat TDLo; 4250 mg/kg/17 week(s) intermittent oral-mouse TDLo; 300 ppm/6 hour(s)-13 week(s) intermittent inhalation-mouse TCLo; 25 ppm/6 hour(s)-5 day(s) intermittent inhalation-mouse TCLo; 10 ppm/6 hour(s)-10 week(s) intermittent inhalation-mouse TCLo; 10 ppm/6 hour(s)-26 week(s) intermittent inhalation-mouse TCLo; 211 ppm/6 hour(s)-7 day(s) intermittent oral-mouse TCLo; 300 ppm/6 hour(s)-16 week(s) intermittent inhalation-mouse TCLo; 48 ppm/6 hour(s)-14 day(s) intermittent inhalation-mouse TCLo; 2197 mg/kg/5 day(s) intermittent subcutaneous-mouse TDLo; 100 ppm/6 hour(s)-72 week(s) intermittent inhalation-mouse TCLo; 500 mg/m3/3 hour(s)-13 week(s) intermittent inhalation-rabbit TCLo; 100 ppm/6 hour(s)-3 week(s) intermittent inhalation-pig TCLo

CARCINOGEN STATUS: OSHA: Carcinogen; NTP: Known Human Carcinogen; IARC: Human Sufficient Evidence, Animal Sufficient Evidence, Group 1; ACGIH: A1 -Confirmed Human Carcinogen; EC: Category 1; TRGS 905: K 1
Numerous case reports and series have suggested a relationship between exposure to benzene and the occurrence of various types of leukemia. Several case-control studies have also shown increased odds ratios for exposure to benzene, but mixed exposure patterns and poorly defined exposures render their interpretation difficult. Three independent cohort studies have demonstrated an increased incidence of acute nonlymphocytic leukemia in workers exposed to benzene.

LOCAL EFFECTS:
Irritant: inhalation, skin, eye

ACUTE TOXICITY LEVEL:
Highly Toxic: dermal absorption
Moderately Toxic: ingestion
Slightly Toxic: inhalation

TARGET ORGANS: immune system (blood), central nervous system

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: blood system disorders, immune system disorders or allergies

TUMORIGENIC DATA:
200 mg/m3 inhalation-man TCLo/78 week(s) intermittent; 10 ppm inhalation-human TCLo/8 hour(s)-10 year(s) intermittent; 52 gm/kg oral-rat TDLo/52 week(s) intermittent; 1200 ppm inhalation-rat TCLo/6 hour(s)-10 week(s) intermittent; 18250 mg/kg oral-mouse TDLo/2 year(s) continuous; 300 ppm inhalation-mouse TCLo/6 hour(s)-16 week(s) intermittent; 1200 gm/kg skin-mouse TDLo/49 week(s) intermittent; 1200 mg/kg intraperitoneal-mouse TDLo/8 week(s) intermittent; 600 mg/kg subcutaneous-mouse TDLo/17 week(s) intermittent; 670 mg/kg parenteral-mouse TDLo/19 week(s) intermittent; 150 ppm inhalation-human TC/15 minute(s)-8 year(s) intermittent; 52 gm/kg oral-rat TD/1 year(s) intermittent; 10 gm/kg oral-rat TD/52 week(s) intermittent; 600 mg/m3 inhalation-man TC/4 year(s) intermittent; 150 ppm inhalation-man TC/11 year(s) intermittent; 1200 ppm inhalation-mouse TC/6 hour(s)-10 week(s) intermittent; 2400 mg/kg oral-mouse TD/8 week(s)

intermittent; 8 ppb inhalation-human TC/4 week(s) intermittent; 10 mg/m3 inhalation-human TC/11 year(s) intermittent; 300 ppm inhalation-mouse TC/6 hour(s)-16 week(s) intermittent; 51500 mg/kg oral-rat TDLo/103 week(s) intermittent; 103000 mg/kg oral-rat TDLo/103 week(s) intermittent; 12875 mg/kg oral-rat TDLo/103 week(s) intermittent; 12875 mg/kg oral-mouse TDLo/103 week(s) intermittent; 51500 mg/kg oral-mouse TDLo/103 week(s) intermittent

MUTAGENIC DATA:

mutation in microorganisms - Salmonella typhimurium 10 ppm (-S9); specific locus test - Drosophila melanogaster oral 11250 umol/L; sex chromosone loss and non disjunction - Drosophila melanogaster oral 7500 ppm; sex chromosone loss and non disjunction - Drosophila melanogaster multiple 27000 ppm; mutation in microorganisms - Saccharomyes cerevisae 549 mg/L (+S9); gene conversion and miotic recombination - Saccharomyes cerevisae 275 mg/L; sex chromosone loss and non disjunction - Aspergillus nidulans 35000 ppm; other mutation test systems - grasshopper inhalation 14 pph 16 hour(s); other mutation test systems - non-mammalian species intraperitoneal 75 gm/kg; DNA inhibition - human leukocyte 2200 umol/L; DNA inhibition - human HeLa cell 2200 umol/L; other mutation test systems - human lymphocyte 5 umol/L; cytogenetic analysis - human inhalation 125 ppm 1 year(s); cytogenetic analysis - human leukocyte 1 mmol/L 72 hour(s); cytogenetic analysis - human lymphocyte 1 mg/L; cytogenetic analysis - human unreported 10 ppm 4 week(s); sister chromatid exchange - human lymphocyte 200 umol/L; mutation in mammalian somatic cells - human lymphocyte 1 gm/L; micronucleus test - rat inhalation 1 ppm 6 hour(s); unscheduled DNA synthesis - rat liver 1 mmol/L; DNA inhibition - rat inhalation 400 ppm; other mutation test systems - rat liver 1 mmol/L; other mutation test systems - rat bone marrow 1 mmol/L; other mutation test systems - rat subcutaneous 1 gm/L; other mutation test systems - rat subcutaneous 2200 mg/kg; cytogenetic analysis - rat inhalation 300 mg/m3 16 week(s)-intermittent; cytogenetic analysis - rat subcutaneous 2400 mg/kg 12 day(s)-intermittent; cytogenetic analysis - rat intraperitoneal 234 mg/kg; cytogenetic analysis - rat oral 39060 ug/kg; sister chromatid exchange - rat inhalation 3 ppm 6 hour(s); sister chromatid exchange - rat leukocyte 1 mmol/L; micronucleus test - mouse embryo 12500 nmol/L; micronucleus test - mouse subcutaneous 440 mg/kg; micronucleus test - mouse oral 40 mg/kg; micronucleus test - mouse intraperitoneal 264 mg/kg 24 hour(s); micronucleus test - mouse inhalation 10 ppm 6 hour(s); mutation in microorganisms - mouse lymphocyte 62500 ug/L (+S9); mutation in microorganisms - mouse embryo 2500 mg/L (+S9); morphological transformation - mouse embryo 1 gm/L; morphological transformation - mouse fibroblast 150 gm/L; DNA damage - mouse lymphocyte 3840 umol/L; DNA adduct - mouse intraperitoneal 2640 mg/kg 3 day(s)-continuous; other mutation test systems - mouse oral 2 gm/kg; other mutation test systems - mouse other cell types 5 mmol/L; DNA inhibition - mouse oral 20 gm/kg; other mutation test systems - mouse lymphocyte 10 mmol/L; DNA inhibition - mouse intraperitoneal 880 mg/kg; DNA inhibition - mouse inhalation 3000 ppm 4 hour(s)-continuous; DNA inhibition - mouse bone marrow 3 mmol/L; sister chromatid exchange - mouse inhalation 10 ppm 6 hour(s); sister chromatid exchange - mouse intraperitoneal 5 gm/kg; cytogenetic analysis - mouse oral 20 mg/kg;

cytogenetic analysis - mouse intraperitoneal 264 mg/kg 3 day(s)-continuous; cytogenetic analysis - mouse inhalation 3000 ppm; dominant lethal test - mouse oral 1 mg/kg; dominant lethal test - mouse intraperitoneal 5 mg/kg; mutation in mammalian somatic cells - mouse lymphocyte 12500 ug/L; mutation in mammalian somatic cells - mouse inhalation 40 ppb 6 week(s)-continuous; mutation in mammalian somatic cells - mouse oral 2 gm/kg 5 day(s)-continuous; morphological transformation - hamster embryo 100 ug/L; DNA damage - hamster ovary 17 mmol/L; cytogenetic analysis - hamster lung 550 mg/L; cytogenetic analysis - hamster ovary 600 mg/L; sister chromatid exchange - hamster ovary 750 mg/L; sex chromosone loss and non disjunction - hamster liver 62500 ug/L; sex chromosone loss and non disjunction - hamster embryo 30 umol/L; mutation in mammalian somatic cells - hamster embryo 10 umol/L; DNA damage - rabbit subcutaneous 2344 mg/kg; DNA inhibition - rabbit subcutaneous 2 gm/kg; other mutation test systems - rabbit bone marrow 1 mmol/L; other mutation test systems - cat bone marrow 1 mmol/L; cytogenetic analysis - rabbit subcutaneous 8400 mg/kg; DNA damage - mouse intraperitoneal 2000 mg/kg; DNA damage - mouse oral 2000 mg/kg; micronucleus test - mouse inhalation 15000 ppm 5 week(s); cytogenetic analysis - mouse skin 8.5 gm/kg

REPRODUCTIVE EFFECTS DATA:

670 mg/m3 inhalation-rat TCLo/24 hour(s) 15 day(s) pre pregnancy/1-22 day(s) pregnant female continuous; 56600 ug/m3 inhalation-rat TCLo/24 hour(s) 1-22 day(s) pregnant female continuous; 50 ppm inhalation-rat TCLo/24 hour(s) 7-14 day(s) pregnant female continuous; 150 ppm inhalation-rat TCLo/24 hour(s) 7-14 day(s) pregnant female continuous; 9 gm/kg oral-mouse TDLo 6-15 day(s) pregnant female continuous; 12 gm/kg oral-mouse TDLo 6-15 day(s) pregnant female continuous; 6500 mg/kg oral-mouse TDLo 8-12 day(s) pregnant female continuous; 16880 mg/kg oral-mouse TDLo 6-15 day(s) pregnant female continuous; 500 ppm inhalation-mouse TCLo/7 hour(s) 6-15 day(s) pregnant female continuous; 500 mg/m3 inhalation-mouse TCLo/12 hour(s) 6-15 day(s) pregnant female continuous; 5 ppm inhalation-mouse TCLo 6-15 day(s) pregnant female continuous; 20 ppm inhalation-mouse TCLo/6 hour(s) 6-15 day(s) pregnant female continuous; 5 mg/kg intraperitoneal-mouse TDLo 1 day(s) male; 219 mg/kg intraperitoneal-mouse TDLo 14 day(s) pregnant female continuous; 1100 mg/kg subcutaneous-mouse TDLo 12 day(s) pregnant female continuous; 7030 mg/kg subcutaneous-mouse TDLo 12-13 day(s) pregnant female continuous; 13200 ug/kg intravenous-mouse TDLo 13-16 day(s) pregnant female continuous; 4 gm/kg parenteral-mouse TDLo 12 day(s) pregnant female continuous; 1 gm/m3 inhalation-rabbit TCLo/24 hour(s) 7-20 day(s) pregnant female continuous; 1 gm/m3 inhalation-rabbit TCLo/24 hour(s) 7-20 day(s) pregnant female continuous; 500 ppm inhalation-rabbit TCLo/7 hour(s) 6-18 day(s) pregnant female continuous

ADDITIONAL DATA: May cross the placenta. Alcohol may enhance the toxic effects. Interactions with drugs may occur.

~~Use of stimulants such as epinephrine may cause cardiac arrhythmias.~~

HEALTH EFFECTS:

INHALATION:

ACUTE EXPOSURE:

BENZENE: Concentrations of 3000 ppm may cause respiratory tract irritation; more severe exposures may result in pulmonary edema. Systemic effects are mainly on the central nervous system and depend on exposure time and concentration. No effects were noted at 25 ppm for 8 hours; signs of intoxication began at 50-150 ppm within 5 hours; at 500-1500 ppm, within 1 hour; were severe at 7500 ppm, within 30-60 minutes; and 20,000 ppm was 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, confusion, ataxia, staggering, weak, rapid pulse, chest pain and tightness with breathlessness, pallor, cyanosis of the lips and fingertips, 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 hyperreflexia, sometimes preceded by convulsions. Recovery depends on the severity of exposure. Polyneuritis may occur and there may be persistent nausea, anorexia, muscular weakness, headache, drowsiness, insomnia, and agitation. Nervous irritability, breathlessness, and unsteady gait may persist for 2-3 weeks; a peculiar skin color and cardiac distress may persist for 4 weeks. Liver and kidney effects may occur, but are usually mild, temporary impairments. Chromosomal damage has been found after exposure to toxic levels. Although generally hematotoxicity is not a significant concern in acute exposure, delayed hematological effects, including anemia and thrombocytopenia, have been reported, as have petechial hemorrhages, spontaneous internal bleeding and secondary infections. In fatal exposures, death may be due to asphyxia, 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.

CHRONIC EXPOSURE:

BENZENE: 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. Sore, dry throat, weakness, lethargy, malaise, drowsiness, nervousness, and irritability have also been reported. Later there may be dyspnea, pallor, slightly increased temperature, decreased blood pressure, rapid pulse, palpitations, 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. Several case reports, one of them an acute exposure, suggest the

possibility that systemic exposure may be associated with retrobulbar or optic neuritis. Occasionally hemorrhages in retina and conjunctiva occur and rarely neuroretinal edema and papilledema have accompanied the retinal hemorrhages. Hematological 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 morphological, functional and quantitative platelet alteration with resultant bleeding from the nose and gums, easy bruising and petechiae; leukopenia with predominant lymphocytopenia or neutropenia; and anemia which may be normochromic or macrocytic and hypochromic. Extramedullary hematopoiesis, splenomegaly, circulating immature marrow cells, and an initial increase in leukocytes, erythrocytes and platelets have also been reported. The bone marrow may be hyper-, hypo- or normoplastic and does not always correlate with the peripheral blood picture. 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. Decreased erythrocyte survival, hemolysis, capillary fragility, internal hemorrhages, iron metabolism disturbances, and hyperbilirubinemia have also been reported. Exposure to high levels for longer periods may result in aplasia and fatty degeneration of the bone marrow with pancytopenia. The most serious cases of aplastic anemia may be fatal due to hemorrhage and infection; death may occur within 3 months of diagnosis. 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. Numerous case reports and series have suggested a relationship between exposure to benzene and the occurrence of various types of leukemia. Several case-control studies have also shown increased odds ratios for exposure to benzene, but mixed exposure patterns and poorly defined exposures render their interpretation difficult. Three independent cohort studies have demonstrated an increased incidence of acute nonlymphocytic leukemia in workers exposed to benzene. Several studies have also suggested a link between occupational exposure and multiple myeloma and lymphoma, both Hodgkin's and nonhodgkin's. 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 being 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. Exposed mice exhibited a tendency toward induction of lymphoid neoplasms. Rats exhibited an

increased incidence of neoplasms, mainly carcinomas, at various sites. Menstrual disturbances have been reported more frequently in exposed women. Testicular damage has been reported in rats, rabbits and guinea pigs. Some animal studies have demonstrated embryo/fetotoxicity, sometimes at levels as low as 10 ppm and the potential for teratogenic effects such as decreased body weight and skeletal variants, have also been shown. Other studies have not produced any abnormalities or embryolethality.

SKIN CONTACT:

ACUTE EXPOSURE:

BENZENE: Direct contact may cause irritation. Effects may include erythema, a burning sensation, and with prolonged contact, blistering and edema. Under normal conditions, significant signs of systemic toxicity are unlikely from skin contact alone due to the slow rate of absorption. It may however, contribute to the toxicity from inhalation. Application to guinea pigs resulted in increased dermal permeability.

CHRONIC EXPOSURE:

BENZENE: 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. Peripheral neuritis has also been reported. Secondary infections may occur. Tests on guinea pigs indicate sensitization is possible. Although animal studies have failed to establish a relationship between skin contact and a carcinogenic effect, most of the studies were inadequate; some papillomas and hematopoietic effects have been reported.

EYE CONTACT:

ACUTE EXPOSURE:

BENZENE: May cause irritation. Vapor concentrations of 3000 ppm are very irritating, even on brief exposure. Droplets cause a moderate burning sensation, but only a slight, transient corneal epithelial injury with rapid recovery.

CHRONIC EXPOSURE:

BENZENE: Repeated or prolonged exposure may cause conjunctivitis. In one study, 50% of rats exposed to 50 ppm for more than 600 hours developed cataracts.

INGESTION:

ACUTE EXPOSURE:

BENZENE: Lung damage may occur if aspirated into the lungs and may be fatal. Symptoms may include coughing, difficulty breathing, cyanosis, and pulmonary edema. May cause local irritation and burning sensation in the mouth, throat and stomach, and hemorrhagic inflammatory lesions of the mucous membranes in contact with the liquid. Signs and symptoms of systemic intoxication may include nausea, vomiting, headache, dizziness, weakness, staggering, chest pain and tightness, shallow, rapid pulse and

respiration, breathlessness, pallor followed by flushing, and a fear of impending death. There may be visual disturbances, tremors, convulsions, ventricullar irregularities, and paralysis. Excitement, euphoria or delirium may precede weariness, fatigue, sleepiness and followed by stupor and unconsciousness, coma and death from respiratory failure. Those who survive the central nervous system effects may develop bronchitis, pneumonia, pulmonary edema, and intrapulmonary 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:

BENZENE: Daily administration to humans of 2-5 grams in olive oil caused headache, vertigo, bladder irritability, impotence, gastric disturbances, and evidence of renal congestion. In female rats treated with 132 single daily doses over 187 days, no effects were observed at 1 mg/kg. There was slight leukopenia at 10 mg/kg and both leukopenia and anemia were seen at 50 and 100 mg/kg. Oral administration to rats and mice at various dose levels induced neoplasms at multiple sites in males and females. 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. There were other tumor types also reported. Reproductive effects have been reported in animals.

SECTION 12 ECOLOGICAL INFORMATION

ECOTOXICITY DATA:

FISH TOXICITY: 9200 ug/L 96 hour(s) LC50 (Mortality) Rainbow trout,donaldson trout (Oncorhynchus mykiss)

INVERTEBRATE TOXICITY: 10000 ug/L 48 hour(s) EC50 (Immobilization) Water flea (Daphnia magna)

ALGAL TOXICITY: 41000 ug/L 8 hour(s) EC50 (Growth) Green algae (Selenastrum capricornutum)

OTHER TOXICITY: 25 ug/L 24 day(s) (Residue) Wood frog (Rana sylvatica)

FATE AND TRANSPORT:

BIOCONCENTRATION: 4360 ug/L 24 day(s) BCF (Residue) Northern anchovy (Engraulis mordax) 97 ug/L

SECTION 13 DISPOSAL CONSIDERATIONS

Subject to disposal regulations: U.S. EPA 40 CFR 262. Hazardous Waste Number(s): U019. Hazardous Waste Number(s): D018. Dispose of in accordance with U.S. EPA 40 CFR 262 for concentrations at or above the Regulatory level. Regulatory level- 0.5 mg/L. Dispose in accordance with all applicable regulations.

SECTION 14 TRANSPORT INFORMATION

U.S. DOT 49 CFR 172.101:
PROPER SHIPPING NAME: Benzene
ID NUMBER: UN1114
HAZARD CLASS OR DIVISION: 3
PACKING GROUP: II

CANADIAN TRANSPORTATION OF DANGEROUS GOODS:
SHIPPING NAME: Benzene
ID NUMBER: UN1114
CLASSIFICATION: 3
PACKING GROUP: II

LAND TRANSPORT ADR/RID:
PROPER SHIPPING NAME: Benzene
UN NUMBER: UN1114
ADR/RID CLASS: 3
CLASSIFICATION CODE: F1
PACKING GROUP: II

AIR TRANSPORT IATA/ICAO:
PROPER SHIPPING NAME: Benzene
UN/ID NUMBER: UN1114
IATA/ICAO CLASS: 3
PACKING GROUP: II

MARITIME TRANSPORT IMDG:
PROPER SHIPPING NAME: Benzene
UN NUMBER: UN1114
IMDG CLASS: 3
PACKING GROUP: II

SECTION 15 REGULATORY INFORMATION

U.S. REGULATIONS:
CERCLA SECTIONS 102a/103 HAZARDOUS SUBSTANCES (40 CFR 302.4):
Benzene: 10 LBS RQ

SARA TITLE III SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355.30):
Not regulated.

SARA TITLE III SECTION 304 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355.40):
Not regulated.

SARA TITLE III SARA SECTIONS 311/312 HAZARDOUS CATEGORIES (40 CFR 370.21):
ACUTE: Yes
CHRONIC: Yes
FIRE: Yes
REACTIVE: No
SUDDEN RELEASE: No

SARA TITLE III SECTION 313 (40 CFR 372.65):
Benzene

OSHA PROCESS SAFETY (29CFR1910.119): Not regulated.

STATE REGULATIONS:
California Proposition 65:
Known to the state of California to cause the following:
Benzene
Cancer (Feb 27, 1987)
Developmental toxicity (Dec 26, 1997)
Male reproductive toxicity (Dec 26, 1997)

CANADIAN REGULATIONS:
WHMIS CLASSIFICATION: Not determined.

EUROPEAN REGULATIONS:
EC CLASSIFICATION (ASSIGNED):
F Highly Flammable
T Toxic
Carcinogen Category 1

EC Classification may be inconsistent with independently-researched data.

DANGER/HAZARD SYMBOL:
F Highly Flammable
T Toxic

EC RISK AND SAFETY PHRASES:

R 11	Highly flammable.
R 45	May cause cancer.
R 48/23/24/25	Toxic: danger of serious damage to health by prolonged exposure through inhalation, in contact with skin and if swallowed.
S 45	In case of accident or if you feel unwell, seek medical

advice immediately (show the label where possible).
S 53 Avoid exposure - obtain special instructions before use.

GERMAN REGULATIONS:
WATER HAZARD CLASS (WGK):
STATE OF CLASSIFICATION: VwVwS
CLASSIFICATION UNDER HAZARD TO WATER: 3

NATIONAL INVENTORY STATUS:
U.S. INVENTORY (TSCA): Listed on inventory.

TSCA 12(b) EXPORT NOTIFICATION: Not listed.

SECTION 16 OTHER INFORMATION

MSDS SUMMARY OF CHANGES

SECTION 3	HAZARDS IDENTIFICATION
SECTION 8	EXPOSURE CONTROLS, PERSONAL PROTECTION
SECTION 11	TOXICOLOGICAL INFORMATION

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OHS23590

SECTION 1 CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

MDL INFORMATION SYSTEMS, INC.
1281 Murfreesboro Road, Suite 300
Nashville, TN 37217-2423
1-615-366-2000

EMERGENCY TELEPHONE NUMBER:
1-800-424-9300 (NORTH AMERICA)
1-703-527-3887 (INTERNATIONAL)

SUBSTANCE: TOLUENE

TRADE NAMES/SYNONYMS:
METHYLBENZENE; 1-METHYLBENZENE; METHYLBENZOL; PHENYLMETHANE; TOLUOL; METHYL BENZENE; TOULENE; RCRA U220; UN 1294; C7H8; OHS23590; RTECS XS5250000

CHEMICAL FAMILY: hydrocarbons, aromatic

CREATION DATE: Oct 25 1984
REVISION DATE: Dec 16 2002

SECTION 2 COMPOSITION, INFORMATION ON INGREDIENTS

COMPONENT: TOLUENE
CAS NUMBER: 108-88-3
EC NUMBER (EINECS): 203-625-9
EC INDEX NUMBER: 601-021-00-3
PERCENTAGE: 100

SECTION 3 HAZARDS IDENTIFICATION

NFPA RATINGS (SCALE 0-4): HEALTH=2 FIRE=3 REACTIVITY=0

EMERGENCY OVERVIEW:
COLOR: colorless
PHYSICAL FORM: liquid
ODOR: distinct odor
MAJOR HEALTH HAZARDS: respiratory tract irritation, skin irritation, eye irritation, aspiration hazard, central nervous system depression, nerve damage
PHYSICAL HAZARDS: Flammable liquid and vapor. Vapor may cause flash fire. Electrostatic charges may be generated by flow, agitation, etc.

POTENTIAL HEALTH EFFECTS:

INHALATION:
SHORT TERM EXPOSURE: irritation, nausea, headache, drowsiness, dizziness, disorientation, sleep disturbances, loss of coordination, dilated pupils, kidney damage, liver damage
LONG TERM EXPOSURE: irritation, nosebleed, nausea, vomiting, stomach pain, loss of appetite, chest pain, irregular heartbeat, headache, drowsiness, dizziness, disorientation, difficulty speaking, sleep disturbances, hallucinations, mood swings, pain in extremities, tremors, loss of coordination, visual disturbances, dilated pupils, menstrual disorders, internal bleeding, blood disorders, kidney damage, liver damage, nerve damage, brain damage, coma
SKIN CONTACT:
SHORT TERM EXPOSURE: irritation
LONG TERM EXPOSURE: irritation
EYE CONTACT:
SHORT TERM EXPOSURE: irritation (possibly severe)
LONG TERM EXPOSURE: irritation
INGESTION:
SHORT TERM EXPOSURE: irritation, nausea, stomach pain, headache, drowsiness, dizziness, disorientation, sleep disturbances, loss of coordination, dilated pupils, kidney damage, liver damage, aspiration hazard
LONG TERM EXPOSURE: reproductive effects

CARCINOGEN STATUS:
OSHA: No
NTP: No
IARC: No

SECTION 4 FIRST AID MEASURES

INHALATION: If adverse effects occur, remove to uncontaminated area. Give artificial respiration if not breathing. Get immediate medical attention.

SKIN CONTACT: Wash skin with soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention, if needed. Thoroughly clean and dry contaminated clothing and shoes before reuse.

EYE CONTACT: Flush eyes with plenty of water for at least 15 minutes. Then get immediate medical attention.

INGESTION: Aspiration hazard. DO NOT induce vomiting. If vomiting occurs, keep head lower than hips to help prevent aspiration. Get immediate medical attention. Give artificial respiration if not breathing.

SECTION 5 FIRE FIGHTING MEASURES

FIRE AND EXPLOSION HAZARDS: Severe fire hazard. The vapor is heavier than air. Vapors or gases may ignite at distant ignition sources and flash back. Vapor/air mixtures are explosive. Electrostatic discharges may be generated by flow or agitation resulting in ignition or explosion.

EXTINGUISHING MEDIA: regular dry chemical, carbon dioxide, water, regular foam

Large fires: Use regular foam or flood with fine water spray.

FIRE FIGHTING: Move container from fire area if it can be done without risk. Cool containers with water spray until well after the fire is out. Stay away from the ends of tanks. For fires in cargo or storage area: Cool containers with water from unmanned hose holder or monitor nozzles until well after fire is out. If this is impossible then take the following precautions: Keep unnecessary people away, isolate hazard area and deny entry. Let the fire burn. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tanks due to fire. For tank, rail car or tank truck: Evacuation radius: 800 meters (1/2 mile). Water may be ineffective.

FLASH POINT: 39 F (4 C) (CC)
LOWER FLAMMABLE LIMIT: 1.2%
UPPER FLAMMABLE LIMIT: 7.1%
AUTOIGNITION: 896 F (480 C)
FLAMMABILITY CLASS (OSHA): IB

SECTION 6 ACCIDENTAL RELEASE MEASURES

AIR RELEASE:
Reduce vapors with water spray. Stay upwind and keep out of low areas.

SOIL RELEASE:
Dig holding area such as lagoon, pond or pit for containment. Dike for later disposal. Absorb with sand or other non-combustible material. Collect with absorbent into suitable container.

WATER RELEASE:
Absorb with activated carbon. Collect spilled material using mechanical equipment. Cover with absorbent sheets, spill-control pads or pillows. Apply detergents, soaps, alcohols or another surface active agent. Remove trapped material with suction hoses. Subject to California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65). Keep out of water supplies and sewers.

OCCUPATIONAL RELEASE:
Avoid heat, flames, sparks and other sources of ignition. Stop leak if possible without personal risk. Reduce vapors with water spray. Small spills: Absorb with sand or other non-combustible material. Collect spilled material

in appropriate container for disposal. Large spills: Dike for later disposal. Remove sources of ignition. Keep unnecessary people away, isolate hazard area and deny entry. Notify Local Emergency Planning Committee and State Emergency Response Commission for release greater than or equal to RQ (U.S. SARA Section 304). If release occurs in the U.S. and is reportable under CERCLA Section 103, notify the National Response Center at (800)424-8802 (USA) or (202)426-2675 (USA).

SECTION 7 HANDLING AND STORAGE

STORAGE: Store and handle in accordance with all current regulations and standards. Subject to storage regulations: U.S. OSHA 29 CFR 1910.106. Protect from physical damage. Store outside or in a detached building. Store with flammable liquids. Keep separated from incompatible substances. Grounding and bonding required. Store in a tightly closed container. Store in a cool, dry place.

SECTION 8 EXPOSURE CONTROLS, PERSONAL PROTECTION

EXPOSURE LIMITS:
TOLUENE:
200 ppm OSHA TWA
300 ppm OSHA ceiling
500 ppm OSHA peak 10 minute(s)
100 ppm (377 mg/m3) OSHA TWA (vacated by 58 FR 35338, June 30, 1993)
150 ppm (565 mg/m3) OSHA STEL (vacated by 58 FR 35338, June 30, 1993)
50 ppm ACGIH TWA (skin)
100 ppm (375 mg/m3) NIOSH recommended TWA 10 hour(s)
150 ppm (560 mg/m3) NIOSH recommended STEL
190 mg/m3 (50 ml/m3) DFG MAK (peak limitation category - II, with excursion factor of 4) (cutaneous absorption danger)
50 ppm (191 mg/m3) UK OES TWA (skin)
150 ppm (574 mg/m3) UK OES STEL (skin)

MEASUREMENT METHOD: Charcoal tube; Carbon disulfide; Gas chromatography with flame ionization detection; NIOSH IV # 1500, Hydrocarbons; ALSO # 4000, # 1501

VENTILATION: Provide local exhaust ventilation system. Ventilation equipment should be explosion-resistant if explosive concentrations of material are present. Ensure compliance with applicable exposure limits.

EYE PROTECTION: Wear splash resistant safety goggles with a faceshield. Provide an emergency eye wash fountain and quick drench shower in the immediate work area.

CLOTHING: Wear appropriate chemical resistant clothing.

GLOVES: Wear appropriate chemical resistant gloves.

RESPIRATOR: The following respirators and maximum use concentrations are drawn from NIOSH and/or OSHA.

500 ppm
- Any chemical cartridge respirator with organic vapor cartridge(s).
- Any powered, air-purifying respirator with organic vapor cartridge(s).
- Any air-purifying respirator with a full facepiece and an organic vapor canister.
- Any supplied-air respirator.
- Any self-contained breathing apparatus with a full facepiece.

Escape -
- Any air-purifying respirator with a full facepiece and an organic vapor canister.
- Any appropriate escape-type, self-contained breathing apparatus.

For Unknown Concentrations or Immediately Dangerous to Life or Health -
- Any supplied-air respirator with full facepiece and operated in a pressure-demand or other positive-pressure mode in combination with a separate escape supply.
- Any self-contained breathing apparatus with a full facepiece.

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE: liquid
APPEARANCE: clear
COLOR: colorless
ODOR: distinct odor
MOLECULAR WEIGHT: 92.14
MOLECULAR FORMULA: C6-H5-C-H3
BOILING POINT: 232 F (111 C)
FREEZING POINT: -139 F (-95 C)
VAPOR PRESSURE: 22 mmHg @ 20 C
VAPOR DENSITY (air=1): 3.14
SPECIFIC GRAVITY (water=1): 0.8669
WATER SOLUBILITY: 0.05% @ 20 C
PH: Not available
VOLATILITY: 100%
ODOR THRESHOLD: 10-15 ppm
EVAPORATION RATE: 2.24 (butyl acetate=1)
~~VISCOSITY: 0.560 mPa.s @ 25 C~~
COEFFICIENT OF WATER/OIL DISTRIBUTION: Not available
SOLVENT SOLUBILITY:
Soluble: alcohol, ether, benzene, chloroform, ligroin, acetic acid, carbon disulfide, acetone

SECTION 10 STABILITY AND REACTIVITY

REACTIVITY: Stable at normal temperatures and pressure.

CONDITIONS TO AVOID: Avoid heat, flames, sparks and other sources of ignition. Containers may rupture or explode if exposed to heat. Keep out of water supplies and sewers.

INCOMPATIBILITIES: halogens, combustible materials, acids, oxidizing materials, metal salts

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.
MINERAL ACIDS (STRONG): Incompatible.
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.

HAZARDOUS DECOMPOSITION:
Thermal decomposition products: oxides of carbon, hydrocarbons

POLYMERIZATION: Will not polymerize.

SECTION 11 TOXICOLOGICAL INFORMATION

TOLUENE:
IRRITATION DATA:
300 ppm eyes-human; 435 mg-skin-rabbit mild; 500 mg skin-rabbit moderate; 20 mg/24 hour(s) skin-rabbit moderate; 870 ug eyes-rabbit mild; 2 mg/24 hour(s) eyes-rabbit severe; 100 mg/30 second(s) rinsed eyes-rabbit mild; 250 ul/24 hour(s) skin-pig mild
TOXICITY DATA:

719 ul/kg oral-man LDLo; 50 mg/kg oral-human LDLo; 200 ppm inhalation-human TCLo; 100 ppm inhalation-man TCLo; 636 mg/kg oral-rat LD50; 49 gm/m3/4 hour(s) inhalation-rat LC50; 1332 mg/kg intraperitoneal-rat LD50; 1960 mg/kg intravenous-rat LD50; 6900 mg/kg unreported-rat LD50; 400 ppm/24 hour(s) inhalation-mouse LC50; 59 mg/kg intraperitoneal-mouse LD50; 2250 mg/kg subcutaneous-mouse LD50; 2 gm/kg unreported-mouse LD50; 55000 ppm/40 minute(s) inhalation-rabbit LCLo; 14100 ul/kg skin-rabbit LD50; 130 mg/kg intravenous-rabbit LDLo; 1600 ppm inhalation-guinea pig LCLo; 500 mg/kg intraperitoneal-guinea pig LD50; 920 mg/kg subcutaneous-frog LDLo; 4 gm/kg oral-mammal LD50; 30 gm/m3 inhalation-mammal LC50; 1750 mg/kg intraperitoneal-mammal LDLo; 1000 ppm/6 hour(s) inhalation-rat TCLo; 42380 mg/kg/49 day(s) intermittent oral-rat TDLo; 27645 mg/kg/3 week(s) intermittent oral-rat TDLo; 162 gm/kg/13 week(s) intermittent oral-rat TDLo; 1600 ppm/20 hour(s)-7 day(s) intermittent inhalation-rat TCLo; 12000 ppm/10 minute(s)-8 week(s) intermittent inhalation-rat TCLo; 300 ppm/6 hour(s)-2 year(s) intermittent inhalation-rat TCLo; 2500 ppm/6.5 hour(s)-15 week(s) intermittent inhalation-rat TCLo; 1500 ppm/6 hour(s)-26 week(s) intermittent inhalation-rat TCLo; 320 ppm/24 hour(s)-30 day(s) continuous inhalation-rat TCLo; 10500 mg/kg/7 day(s) intermittent subcutaneous-rat TDLo; 300 mg/m3/5 hour(s)-21 day(s) intermittent inhalation-rat TCLo; 2200 ppm/8 hour(s)-23 week(s) intermittent inhalation-rat TCLo; 11058 ug/kg/30 day(s) intermittent intraperitoneal-rat TDLo; 227 gm/kg/13 week(s) intermittent oral-mouse TDLo; 2940 mg/kg/4 week(s) continuous oral-mouse TDLo; 12000 ppm/10 minute(s)-8 week(s) intermittent inhalation-mouse TCLo; 1250 ppm/6 hour(s)-14 week(s) intermittent inhalation-mouse TCLo; 1000 ppm/6 hour(s)-20 day(s) intermittent inhalation-mouse TCLo; 8400 mg/kg/14 day(s) intermittent oral-mouse TDLo; 50 mg/m3/4 hour(s)-26 week(s) intermittent inhalation-rabbit TCLo; 6000 ppm/2 hour(s)-5 week(s) intermittent inhalation-rat TCLo; 500 ppm/6 hour(s)-3 day(s) continuous inhalation-rat TCLo; 217 mg/kg/2 day(s) continuous skin-rabbit TCLo

CARCINOGEN STATUS: IARC: Human Inadequate Evidence, Animal Evidence Suggesting Lack of Carcinogenicity, Group 3; ACGIH: A4 -Not Classifiable as a Human Carcinogen

LOCAL EFFECTS:

Irritant: inhalation, skin, eye

ACUTE TOXICITY LEVEL:

Moderately Toxic: ingestion

Slightly Toxic: inhalation, dermal absorption

TARGET ORGANS: nervous system

MUTAGENIC DATA:

unscheduled DNA synthesis - Escherichia coli 1 pph; unscheduled DNA synthesis - other microorganisms 1 pph 15 minute(s)-continuous; sex chromosone loss and non disjunction - Drosophila melanogaster oral 1 pph; other mutation test systems - grasshopper inhalation 20 pph 16 hour(s); DNA damage - rat liver 30 umol/L; cytogenetic analysis - rat inhalation 5400 ug/m3 16 week(s)-intermittent; cytogenetic analysis - rat subcutaneous 9600 mg/kg 12 day(s)-intermittent; micronucleus test - mouse oral 200 mg/kg; micronucleus test - mouse intraperitoneal 433 ug/kg 24 hour(s)

REPRODUCTIVE EFFECTS DATA:

7280 mg/kg oral-rat TDLo 6-19 day(s) pregnant female continuous; 9100 mg/kg oral-rat TDLo 6-19 day(s) pregnant female continuous; 16 ml/kg oral-rat TDLo 6-21 day(s) pregnant female continuous; 1500 mg/m3 inhalation-rat TCLo/24 hour(s) 1-8 day(s) pregnant female continuous; 1000 mg/m3 inhalation-rat TCLo/24 hour(s) 7-14 day(s) pregnant female continuous; 2000 ppm inhalation-rat TCLo/6 hour(s) 7-17 day(s) pregnant female continuous; 800 mg/m3 inhalation-rat TCLo/6 hour(s) 14-20 day(s) pregnant female continuous; 1200 ppm inhalation-rat TCLo/6 hour(s) 9-12 day(s) pregnant female continuous; 9 gm/kg oral-mouse TDLo 6-15 day(s) pregnant female continuous; 15 gm/kg oral-mouse TDLo 6-15 day(s) pregnant female continuous; 30 gm/kg oral-mouse TDLo 6-15 day(s) pregnant female continuous; 500 mg/m3 inhalation-mouse TCLo/24 hour(s) 6-13 day(s) pregnant female continuous; 1000 ppm inhalation-mouse TCLo/6 hour(s) 2-17 day(s) pregnant female continuous; 400 ppm inhalation-mouse TCLo/7 hour(s) 7-16 day(s) pregnant female continuous; 200 ppm inhalation-mouse TCLo/7 hour(s) 7-16 day(s) pregnant female continuous; 1 gm/m3 inhalation-rabbit TCLo/24 hour(s) 7-20 day(s) pregnant female continuous; 100 ppm inhalation-rabbit TDLo/6 hour(s) 6-18 day(s) pregnant female continuous; 800 mg/m3 inhalation-hamster TCLo/6 hour(s) 6-11 day(s) pregnant female continuous; 6000 mg/m3 inhalation-rat TCLo 4 day(s) pregnant female continuous; 6000 mg/m3 inhalation-rat TCLo 21 day(s) pregnant female continuous; 8700 mg/kg oral-mouse TDLo 6-15 day(s) pregnant female continuous

ADDITIONAL DATA: Alcohol may enhance the toxic effects. Stimulants such as epinephrine may induce ventricular fibrillation.
The metabolism of other solvents may be inhibited resulting in a potentiation of toxic effects of those chemicals. Uptake is directly proportional to the amount of body fat. Blood levels may be cumulative when exposure is extended.

HEALTH EFFECTS:

INHALATION:

ACUTE EXPOSURE:

TOLUENE: Odor detection may be insufficient for warning due to olfactory fatigue. Exposure to 100 ppm may cause irritation. 200-600 ppm for up to 8 hours caused 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. After effects 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. Death may be due to respiratory failure or ventricular fibrillation.

CHRONIC EXPOSURE:

TOLUENE: Prolonged or repeated exposure may cause mucous membrane irritation, vomiting, insomnia, nosebleeds, chest pains, euphoria, headache, vertigo, nausea, anorexia, momentary loss of memory, loss of

coordination and impairment of reaction time, tinnitus, impaired speech, vision, and/or hearing, alcohol intolerance, and petechiae and abnormal bleeding. 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. Volunteers exposed to 200 ppm for 6 hours/day for 2 days showed a significant increase in heart rate. Cardiac sensitization may occur and may result in cardiac arrest due to ventricular fibrillation. Repeated inhalation to the point of euphoria has caused irreversible encephalopathy with cerebellar ataxia, rhythmic limb movements, disequilibrium, bizarre 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. One case study indicated toluene apparently crossed the placenta and created cerebellar damage in an unborn infant. Dysmenorrhea has been reported in women occupationally exposed to toluene levels of 60-100 ppm. Reproductive effects have also been reported in animals.

SKIN CONTACT:

ACUTE EXPOSURE:

TOLUENE: Contact with the liquid may cause irritation. Vapors may cause drying. Skin absorption does occur, but it is generally too slow to produce signs of acute systemic toxicity.

CHRONIC EXPOSURE:

TOLUENE: Prolonged or repeated contact with the liquid may cause defatting of the skin with a dry fissured dermatitis. Repeated application to rabbit skin produced slight to moderate irritation and slight necrosis. Topical application of 10 gm/kg produced an increase in plasmic and lymphoid reticular cells in bone marrow of rats, while 1 gm/kg had no effect.

EYE CONTACT:

ACUTE EXPOSURE:

TOLUENE: Liquid may cause irritation and corneal burns if not promptly removed. Concentrations around 300-800 ppm may cause noticeable irritation and lacrimation. Corneal lesions and very fine vacuoles have been reported

in workers exposed to a solvent containing toluene. The lesions subsided following several days of non-exposure. Similar lesions have been produced in cats following exposure to toluene.

CHRONIC EXPOSURE:
TOLUENE: Repeated or prolonged contact with irritants may cause conjunctivitis.

INGESTION:
ACUTE EXPOSURE:
TOLUENE: Lung damage may occur if aspirated into the lungs and may be fatal. Symptoms may include coughing, difficulty breathing, cyanosis, and pulmonary edema. May cause a burning sensation in the epigastrium, abdominal spasms, and hemorrhagic pneumonitis. Systemic effects may occur as described in acute inhalation. The approximate lethal dose in humans is 15-30 ml.

CHRONIC EXPOSURE:
TOLUENE: No effects were reported in rats fed up to 590 mg/kg/day for 193 days. Administration to animals during gestation produced significant embryolethality and an increase in cleft palate in offspring.

SECTION 12 ECOLOGICAL INFORMATION

ECOTOXICITY DATA:
FISH TOXICITY: 8110 ug/L 96 hour(s) LC50 (Mortality) Coho salmon,silver salmon (Oncorhynchus kisutch)

INVERTEBRATE TOXICITY: 6000 ug/L 48 hour(s) EC50 (Immobilization) Water flea (Daphnia magna)

ALGAL TOXICITY: 9400 ug/L 8 hour(s) EC50 (Growth) Green algae (Selenastrum capricornutum)

FATE AND TRANSPORT:
BIOCONCENTRATION: 1716 ug/L 6 hour(s) BCF (Residue) Water flea (Daphnia magna) 1.5 ug/L

SECTION 13 DISPOSAL CONSIDERATIONS

Dispose in accordance with all applicable regulations. Subject to disposal regulations: U.S. EPA 40 CFR 262. Hazardous Waste Number(s): U220.

SECTION 14 TRANSPORT INFORMATION

U.S. DOT 49 CFR 172.101:
PROPER SHIPPING NAME: Toluene
ID NUMBER: UN1294
HAZARD CLASS OR DIVISION: 3
PACKING GROUP: II

CANADIAN TRANSPORTATION OF DANGEROUS GOODS:
SHIPPING NAME: Toluene
ID NUMBER: UN1294
CLASSIFICATION: 3
PACKING GROUP: II

LAND TRANSPORT ADR/RID:
PROPER SHIPPING NAME: Toluene
UN NUMBER: UN1294
ADR/RID CLASS: 3
CLASSIFICATION CODE: F1
PACKING GROUP: II

AIR TRANSPORT IATA/ICAO:
PROPER SHIPPING NAME: Toluene
UN/ID NUMBER: UN1294
IATA/ICAO CLASS: 3
PACKING GROUP: II

MARITIME TRANSPORT IMDG:
PROPER SHIPPING NAME: Toluene
UN NUMBER: UN1294
IMDG CLASS: 3
PACKING GROUP: II

SECTION 15 REGULATORY INFORMATION

U.S. REGULATIONS:
CERCLA SECTIONS 102a/103 HAZARDOUS SUBSTANCES (40 CFR 302.4):
TOLUENE: 1000 LBS RQ

SARA TITLE III SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355.30):
Not regulated.

~~SARA TITLE III SECTION 304 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355.40):~~
Not regulated.

SARA TITLE III SARA SECTIONS 311/312 HAZARDOUS CATEGORIES (40 CFR 370.21):
ACUTE: Yes

CHRONIC: Yes
FIRE: Yes
REACTIVE: No
SUDDEN RELEASE: No

SARA TITLE III SECTION 313 (40 CFR 372.65):
TOLUENE

OSHA PROCESS SAFETY (29CFR1910.119): Not regulated.

STATE REGULATIONS:
California Proposition 65:
Known to the state of California to cause the following:
TOLUENE
Developmental toxicity (Jan 01, 1991)

CANADIAN REGULATIONS:
WHMIS CLASSIFICATION: Not determined.

EUROPEAN REGULATIONS:
EC CLASSIFICATION (ASSIGNED):
F Highly Flammable
Xn Harmful

EC Classification may be inconsistent with independently-researched data.

DANGER/HAZARD SYMBOL:
F Highly Flammable
Xn Harmful

EC RISK AND SAFETY PHRASES:

R 11	Highly flammable.
R 20	Harmful by inhalation.
S 2	Keep out of reach of children.
S 16	Keep away from sources of ignition - No smoking.
S 25	Avoid contact with eyes.
S 29	Do not empty into drains.
S 33	Take precautionary measures against static discharges.

CONCENTRATION LIMITS:
C>=12.5% Xn R 20

GERMAN REGULATIONS:
WATER HAZARD CLASS (WGK):
STATE OF CLASSIFICATION: VwVwS
CLASSIFICATION UNDER HAZARD TO WATER: 2

NATIONAL INVENTORY STATUS:

U.S. INVENTORY (TSCA): Listed on inventory.

TSCA 12(b) EXPORT NOTIFICATION: Not listed.

SECTION 16 OTHER INFORMATION

MSDS SUMMARY OF CHANGES

SECTION 2	COMPOSITION, INFORMATION ON INGREDIENTS
SECTION 8	EXPOSURE CONTROLS, PERSONAL PROTECTION
SECTION 11	TOXICOLOGICAL INFORMATION

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OHS08780

SECTION 1 CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

MDL INFORMATION SYSTEMS, INC.
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1-615-366-2000

EMERGENCY TELEPHONE NUMBER:
1-800-424-9300 (NORTH AMERICA)
1-703-527-3887 (INTERNATIONAL)

SUBSTANCE: ETHYL BENZENE

TRADE NAMES/SYNONYMS:
PHENYLETHANE; ETHYLBENZENE; ETHYLBENZOL; ALPHA-METHYLTOLUENE; EB; UN 1175; C8H10; OHS08780; RTECS DA0700000

CHEMICAL FAMILY: hydrocarbons, aromatic

CREATION DATE: Feb 05 1985
REVISION DATE: Dec 16 2002

SECTION 2 COMPOSITION, INFORMATION ON INGREDIENTS

COMPONENT: ETHYL BENZENE
CAS NUMBER: 100-41-4
EC NUMBER (EINECS): 202-849-4
EC INDEX NUMBER: 601-023-00-4
PERCENTAGE: 100

SECTION 3 HAZARDS IDENTIFICATION

NFPA RATINGS (SCALE 0-4): HEALTH=3 FIRE=3 REACTIVITY=0

EMERGENCY OVERVIEW:
COLOR: colorless
PHYSICAL FORM: liquid
ODOR: distinct odor
MAJOR HEALTH HAZARDS: respiratory tract irritation, skin irritation, eye irritation, aspiration hazard, central nervous system depression, suspect cancer hazard (in animals)
PHYSICAL HAZARDS: Flammable liquid and vapor. Vapor may cause flash fire. Electrostatic charges may be generated by flow, agitation, etc.

POTENTIAL HEALTH EFFECTS:

INHALATION:
SHORT TERM EXPOSURE: irritation (possibly severe), chest pain, difficulty breathing, headache, drowsiness, dizziness, loss of coordination, coma
LONG TERM EXPOSURE: irritation, headache, drowsiness, emotional disturbances, cancer
SKIN CONTACT:
SHORT TERM EXPOSURE: irritation (possibly severe)
LONG TERM EXPOSURE: irritation
EYE CONTACT:
SHORT TERM EXPOSURE: irritation (possibly severe)
LONG TERM EXPOSURE: irritation
INGESTION:
SHORT TERM EXPOSURE: nausea, vomiting, stomach pain, aspiration hazard
LONG TERM EXPOSURE: no information on significant adverse effects

CARCINOGEN STATUS:
OSHA: No
NTP: No
IARC: Yes

SECTION 4 FIRST AID MEASURES

INHALATION: If adverse effects occur, remove to uncontaminated area. Give artificial respiration if not breathing. If breathing is difficult, oxygen should be administered by qualified personnel. Get immediate medical attention.

SKIN CONTACT: Wash skin with soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get immediate medical attention. Thoroughly clean and dry contaminated clothing and shoes before reuse. Destroy contaminated shoes.

EYE CONTACT: Flush eyes with plenty of water for at least 15 minutes. Then get immediate medical attention.

INGESTION: Aspiration hazard. DO NOT induce vomiting. If vomiting occurs, keep head lower than hips to help prevent aspiration. Get immediate medical attention. Give artificial respiration if not breathing.

NOTE TO PHYSICIAN: For inhalation, consider oxygen. For ingestion, consider gastric lavage and activated charcoal slurry.

SECTION 5 FIRE FIGHTING MEASURES

FIRE AND EXPLOSION HAZARDS: Severe fire hazard. Vapor/air mixtures are explosive. The vapor is heavier than air. Vapors or gases may ignite at

distant ignition sources and flash back. Electrostatic discharges may be generated by flow or agitation resulting in ignition or explosion.

EXTINGUISHING MEDIA: regular dry chemical, carbon dioxide, water, regular foam

Large fires: Use regular foam or flood with fine water spray.

FIRE FIGHTING: Move container from fire area if it can be done without risk. Cool containers with water spray until well after the fire is out. Stay away from the ends of tanks. For fires in cargo or storage area: Cool containers with water from unmanned hose holder or monitor nozzles until well after fire is out. If this is impossible then take the following precautions: Keep unnecessary people away, isolate hazard area and deny entry. Let the fire burn. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tanks due to fire. For tank, rail car or tank truck: Evacuation radius: 800 meters (1/2 mile). Do not attempt to extinguish fire unless flow of material can be stopped first. Flood with fine water spray. Do not scatter spilled material with high-pressure water streams. Cool containers with water spray until well after the fire is out. Apply water from a protected location or from a safe distance. Avoid inhalation of material or combustion by-products. Stay upwind and keep out of low areas. Water may be ineffective.

FLASH POINT: 59 F (15 C) (CC)
LOWER FLAMMABLE LIMIT: 0.8%
UPPER FLAMMABLE LIMIT: 6.7%
AUTOIGNITION: 810 F (432 C)
FLAMMABILITY CLASS (OSHA): IB

SECTION 6 ACCIDENTAL RELEASE MEASURES

AIR RELEASE:
Reduce vapors with water spray.

SOIL RELEASE:
Dig holding area such as lagoon, pond or pit for containment. Dike for later disposal. Absorb with sand or other non-combustible material.

WATER RELEASE:
Absorb with activated carbon. Remove trapped material with suction hoses. Collect spilled material using mechanical equipment. Collect with absorbent into suitable container. Neutralize.

OCCUPATIONAL RELEASE:
Avoid heat, flames, sparks and other sources of ignition. Stop leak if possible without personal risk. Reduce vapors with water spray. Small spills: Absorb with sand or other non-combustible material. Collect spilled material

in appropriate container for disposal. Large spills: Dike for later disposal. Remove sources of ignition. Keep unnecessary people away, isolate hazard area and deny entry. Notify Local Emergency Planning Committee and State Emergency Response Commission for release greater than or equal to RQ (U.S. SARA Section 304). If release occurs in the U.S. and is reportable under CERCLA Section 103, notify the National Response Center at (800)424-8802 (USA) or (202)426-2675 (USA).

SECTION 7 HANDLING AND STORAGE

STORAGE: Store and handle in accordance with all current regulations and standards. Protect from physical damage. Store outside or in a detached building. Store with flammable liquids. Subject to storage regulations: U.S. OSHA 29 CFR 1910.106. Grounding and bonding required. Keep separated from incompatible substances.

SECTION 8 EXPOSURE CONTROLS, PERSONAL PROTECTION

EXPOSURE LIMITS:
ETHYL BENZENE:
100 ppm (435 mg/m3) OSHA TWA
125 ppm (543 mg/m3) OSHA STEL (vacated by 58 FR 35338, June 30, 1993)
100 ppm ACGIH TWA
125 ppm ACGIH STEL
100 ppm (435 mg/m3) NIOSH recommended TWA 10 hour(s)
125 ppm (545 mg/m3) NIOSH recommended STEL
DFG MAK (skin)
442 mg/m3 (100 ppm) EC OEL TWA (skin)
884 mg/m3 (200 ppm) EC OEL STEL (skin)
100 ppm (441 mg/m3) UK OES TWA (skin)
125 ppm (552 mg/m3) UK OES STEL (skin)

MEASUREMENT METHOD: Charcoal tube; Carbon disulfide; Gas chromatography with flame ionization detection; NIOSH IV # 1501, Aromatic Hydrocarbons

VENTILATION: Ventilation equipment should be explosion-resistant if explosive concentrations of material are present. Provide local exhaust ventilation system. Ensure compliance with applicable exposure limits.

EYE PROTECTION: Wear splash resistant safety goggles with a faceshield. Provide an emergency eye wash fountain and quick drench shower in the immediate work area.

CLOTHING: Wear appropriate chemical resistant clothing.

GLOVES: Wear appropriate chemical resistant gloves.

RESPIRATOR: The following respirators and maximum use concentrations are drawn from NIOSH and/or OSHA.

800 ppm

Any chemical cartridge respirator with organic vapor cartridge(s).
Any air-purifying respirator with a full facepiece and an organic vapor canister.
Any powered, air-purifying respirator with organic vapor cartridge(s).
Any supplied-air respirator.
Any self-contained breathing apparatus with a full facepiece.

Escape -

Any air-purifying respirator with a full facepiece and an organic vapor canister.
Any appropriate escape-type, self-contained breathing apparatus.

For Unknown Concentrations or Immediately Dangerous to Life or Health -

Any supplied-air respirator with full facepiece and operated in a pressure-demand or other positive-pressure mode in combination with a separate escape supply.
Any self-contained breathing apparatus with a full facepiece.

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE: liquid
APPEARANCE: clear
COLOR: colorless
ODOR: distinct odor
MOLECULAR WEIGHT: 106.17
MOLECULAR FORMULA: C-H3-C-H2-C6-H5
BOILING POINT: 277 F (136 C)
FREEZING POINT: -139 F (-95 C)
VAPOR PRESSURE: 7.1 mmHg @ 20 C
VAPOR DENSITY (air=1): 3.7
SPECIFIC GRAVITY (water=1): 0.8670
WATER SOLUBILITY: 0.015%
PH: Not available
VOLATILITY: 100%
ODOR THRESHOLD: 140 ppm
EVAPORATION RATE: <1 (butyl acetate=1)
VISCOSITY: 0.64 cP @ 25 C
COEFFICIENT OF WATER/OIL DISTRIBUTION: Not available
SOLVENT SOLUBILITY:

Soluble: alcohol, ether, benzene, sulfur dioxide, carbon tetrachloride
Insoluble: ammonia

SECTION 10 STABILITY AND REACTIVITY

REACTIVITY: Stable at normal temperatures and pressure.

CONDITIONS TO AVOID: Avoid heat, flames, sparks and other sources of ignition. Containers may rupture or explode if exposed to heat. Keep out of water supplies and sewers.

INCOMPATIBILITIES: acids, bases, oxidizing materials, combustible materials

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.

HAZARDOUS DECOMPOSITION:
Thermal decomposition products: oxides of carbon

POLYMERIZATION: Will not polymerize.

SECTION 11 TOXICOLOGICAL INFORMATION

ETHYL BENZENE:
IRRITATION DATA:
15 mg/24 hour(s) open skin-rabbit mild; 500 mg eyes-rabbit severe
TOXICITY DATA:
100 ppm/8 hour(s) inhalation-human TCLo; 3500 mg/kg oral-rat LD50; 4000 ppm/4 hour(s) inhalation-rat LCLo; 50 gm/m3/2 hour(s) inhalation-mouse LCLo; 2624 ul/kg intraperitoneal-mouse LD50; 17800 ul/kg skin-rabbit LD50; 10000 ppm inhalation-guinea pig LCLo; 740 ppm/6 hour(s)-92 day(s) intermittent inhalation-rat TCLo; 782 ppm/6 hour(s)-4 week(s) intermittent inhalation-rat TCLo; 975 ppm/6 hour(s)-97 day(s) intermittent inhalation-mouse TCLo; 782 ppm/6 hour(s)-4 week(s) intermittent inhalation-mouse TCLo; 100 mg/m3/4 hour(s)-30 week(s) intermittent inhalation-rabbit TCLo; 1386 mg/kg/24 week(s) continuous oral-rabbit TDLo; 30 mg/m3/7 year(s) intermittent inhalation-human TCLo
CARCINOGEN STATUS: IARC: Human Inadequate Evidence, Animal Sufficient Evidence, Group 2B; ACGIH: A3 -Animal Carcinogen
Two year inhalation studies showed clear evidence of carcinogenic activity in male rats based on increased incidences of renal tubule neoplasms and testicular adenoma. There was some evidence of carcinogenic activity in female rats as indicated by renal tubule adenoma and increased incidences of alveolar/bronchiolar in male mice and hepatocellular neoplasms in female mice (NTP TR-466).
LOCAL EFFECTS:

Irritant: inhalation, skin, eye
ACUTE TOXICITY LEVEL:
Moderately Toxic: ingestion
Slightly Toxic: dermal absorption
TARGET ORGANS: central nervous system
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: kidney disorders, liver disorders, respiratory disorders, skin disorders and allergies
TUMORIGENIC DATA:
750 ppm inhalation-rat TCLo/6 hour(s)-2 year(s) intermittent; 750 ppm inhalation-mouse TCLo/6 hour(s)-2 year(s) intermittent
MUTAGENIC DATA:
sister chromatid exchange - human lymphocyte 10 mmol/L; mutation in mammalian somatic cells - mouse lymphocyte 80 mg/L; micronucleus test - hamster embryo 25 mg/L
REPRODUCTIVE EFFECTS DATA:
97 ppm inhalation-rat TCLo/7 hour(s) 15 day(s) pre pregnancy continuous; 985 ppm inhalation-rat TCLo/7 hour(s) 1-19 day(s) pregnant female continuous; 96 ppm inhalation-rat TCLo/7 hour(s) 1-19 day(s) pregnant female continuous; 600 mg/m3 inhalation-rat TCLo/24 hour(s) 7-15 day(s) pregnant female continuous; 2400 mg/m3 inhalation-rat TCLo/24 hour(s) 7-15 day(s) pregnant female continuous; 99 ppm inhalation-rabbit TCLo/7 hour(s) 1-18 day(s) pregnant female continuous; 500 mg/m3 inhalation-rabbit TCLo/24 hour(s) 7-20 day(s) pregnant female continuous; 1 gm/m3 inhalation-rabbit TCLo/24 hour(s) 7-20 day(s) pregnant female continuous
ADDITIONAL DATA: May cross 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:
INHALATION:
ACUTE EXPOSURE:
ETHYL BENZENE: 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:
ETHYL BENZENE: 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. A two year study in rats and mice produced an increase in the incidences of renal tubule neoplasms, testicular adenoma, renal tubule adenoma, alveolar/bronchiolar and hepatocellular neoplasms.

SKIN CONTACT:

ACUTE EXPOSURE:

ETHYL BENZENE: 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:

ETHYL BENZENE: 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.

EYE CONTACT:

ACUTE EXPOSURE:

ETHYL BENZENE: 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:

ETHYL BENZENE: Repeated or prolonged exposure may cause conjunctivitis. In one report workers exposed to 0.8-1.2 mg/L for more than eighteen months complained of reduced vision in dim light.

INGESTION:

ACUTE EXPOSURE:

ETHYL BENZENE: 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:
ETHYL BENZENE: Ingestion of 408-680 mg/kg/day for 182 days by rats caused slight liver and kidney weight increases with slight pathological signs.

SECTION 12 ECOLOGICAL INFORMATION

ECOTOXICITY DATA:
FISH TOXICITY: 9090 ug/L 96 hour(s) LC50 (Mortality) Fathead minnow (Pimephales promelas)

INVERTEBRATE TOXICITY: 87600 ug/L 96 hour(s) LC50 (Mortality) Opossum shrimp (Mysidopsis bahia)

ALGAL TOXICITY: >438000 ug/L 96 hour(s) EC50 (Photosynthesis) Diatom (Skeletonema costatum)

FATE AND TRANSPORT:
KOW: 154881.66 (log = 5.190) (estimated from water solubility)

KOC: 43651.58 (log = 4.640) (estimated from water solubility)

HENRY'S LAW CONSTANT: 6.6 E -3 atm-m3/mol

BIOCONCENTRATION: 36.39 (estimated from water solubility)

AQUATIC PROCESSES: 2.6723816 hours (River Model: 1 m deep, 1 m/s flow, 3 m/s wind)

ENVIRONMENTAL SUMMARY: Toxic to aquatic life. Relatively non-persistent in the environment. Not expected to leach through the soil or the sediment. Accumulates very little in the bodies of living organisms. Highly volatile from water.

SECTION 13 DISPOSAL CONSIDERATIONS

Dispose in accordance with all applicable regulations. Subject to disposal regulations: U.S. EPA 40 CFR 262. Hazardous Waste Number(s): D001.

SECTION 14 TRANSPORT INFORMATION

U.S. DOT 49 CFR 172.101:
PROPER SHIPPING NAME: Ethylbenzene

ID NUMBER: UN1175
HAZARD CLASS OR DIVISION: 3
PACKING GROUP: II

CANADIAN TRANSPORTATION OF DANGEROUS GOODS:
SHIPPING NAME: Ethylbenzene
ID NUMBER: UN1175
CLASSIFICATION: 3
PACKING GROUP: II

LAND TRANSPORT ADR/RID:
PROPER SHIPPING NAME: Ethylbenzene
UN NUMBER: UN1175
ADR/RID CLASS: 3
CLASSIFICATION CODE: F1
PACKING GROUP: II

AIR TRANSPORT IATA/ICAO:
PROPER SHIPPING NAME: Ethylbenzene
UN/ID NUMBER: UN1175
IATA/ICAO CLASS: 3
PACKING GROUP: II

MARITIME TRANSPORT IMDG:
PROPER SHIPPING NAME: Ethylbenzene
UN NUMBER: UN1175
IMDG CLASS: 3
PACKING GROUP: II

SECTION 15 REGULATORY INFORMATION

U.S. REGULATIONS:
CERCLA SECTIONS 102a/103 HAZARDOUS SUBSTANCES (40 CFR 302.4):
ETHYL BENZENE: 1000 LBS RQ

SARA TITLE III SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355.30):
Not regulated.

SARA TITLE III SECTION 304 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355.40):
Not regulated.

SARA TITLE III SARA SECTIONS 311/312 HAZARDOUS CATEGORIES (40 CFR 370.21):
ACUTE: Yes
CHRONIC: Yes
FIRE: Yes
REACTIVE: No
SUDDEN RELEASE: No

SARA TITLE III SECTION 313 (40 CFR 372.65):
ETHYL BENZENE

OSHA PROCESS SAFETY (29CFR1910.119): Not regulated.

STATE REGULATIONS:
California Proposition 65: Not regulated.

CANADIAN REGULATIONS:
WHMIS CLASSIFICATION: Not determined.

EUROPEAN REGULATIONS:
EC CLASSIFICATION (ASSIGNED):
F Highly Flammable
Xn Harmful

EC Classification may be inconsistent with independently-researched data.

DANGER/HAZARD SYMBOL:
F Highly Flammable
Xn Harmful

EC RISK AND SAFETY PHRASES:

R 11	Highly flammable.
R 20	Harmful by inhalation.
S 2	Keep out of reach of children.
S 16	Keep away from sources of ignition - No smoking.
S 24/25	Avoid contact with skin and eyes.
S 29	Do not empty into drains.

CONCENTRATION LIMITS:
C>=25% Xn R 20

GERMAN REGULATIONS:
WATER HAZARD CLASS (WGK):
STATE OF CLASSIFICATION: VwVwS
CLASSIFICATION UNDER HAZARD TO WATER: 1

NATIONAL INVENTORY STATUS:
U.S. INVENTORY (TSCA): Listed on inventory.

TSCA 12(b) EXPORT NOTIFICATION: Not listed.

SECTION 16 OTHER INFORMATION

MSDS SUMMARY OF CHANGES
SECTION 3 HAZARDS IDENTIFICATION
SECTION 11 TOXICOLOGICAL INFORMATIÓN

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OHS25150

SECTION 1 CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

MDL INFORMATION SYSTEMS, INC.
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1-615-366-2000

EMERGENCY TELEPHONE NUMBER:
1-800-424-9300 (NORTH AMERICA)
1-703-527-3887 (INTERNATIONAL)

SUBSTANCE: XYLENE

TRADE NAMES/SYNONYMS:
DIMETHYLBENZENE; DIMETHYL BENZENE; METHYLTOLUENE; METHYL TOLUENE; TOTAL XYLENES; XYLENE (MIXED ISOMERS); XYLENE (MIXED); XYLENES; XYLOL; RCRA U239; UN 1307; C8H10; OHS25150; RTECS ZE2100000

CHEMICAL FAMILY: hydrocarbons, aromatic

CREATION DATE: Nov 14 1984
REVISION DATE: Dec 16 2002

SECTION 2 COMPOSITION, INFORMATION ON INGREDIENTS

COMPONENT: XYLENE
CAS NUMBER: 1330-20-7
EC NUMBER (EINECS): 215-535-7
EC INDEX NUMBER: 601-022-00-9
PERCENTAGE: 100

SECTION 3 HAZARDS IDENTIFICATION

NFPA RATINGS (SCALE 0-4): HEALTH=2 FIRE=3 REACTIVITY=0

EMERGENCY OVERVIEW:
COLOR: colorless or pale
PHYSICAL FORM: liquid
ODOR: distinct odor
MAJOR HEALTH HAZARDS: respiratory tract irritation, skin irritation, eye irritation, aspiration hazard, central nervous system depression
PHYSICAL HAZARDS: Flammable liquid and vapor. Vapor may cause flash fire. Electrostatic charges may be generated by flow, agitation, etc.

POTENTIAL HEALTH EFFECTS:

INHALATION:
SHORT TERM EXPOSURE: irritation, changes in body temperature, nausea, vomiting, stomach pain, chest pain, difficulty breathing, headache, drowsiness, dizziness, disorientation, difficulty speaking, mood swings, tremors, loss of coordination, visual disturbances, lung congestion, kidney damage, liver damage, unconsciousness, coma
LONG TERM EXPOSURE: nosebleed, changes in body temperature, nausea, vomiting, stomach pain, loss of appetite, chest pain, difficulty breathing, irregular heartbeat, headache, drowsiness, fatigue, dizziness, disorientation, sleep disturbances, emotional disturbances, mood swings, tremors, loss of coordination, visual disturbances, menstrual disorders, sterility, lung congestion, internal bleeding, blood disorders, heart damage, kidney damage, liver damage, reproductive effects, unconsciousness
SKIN CONTACT:
SHORT TERM EXPOSURE: irritation
LONG TERM EXPOSURE: irritation
EYE CONTACT:
SHORT TERM EXPOSURE: irritation (possibly severe), sensitivity to light
LONG TERM EXPOSURE: irritation, blurred vision, eye damage
INGESTION:
SHORT TERM EXPOSURE: irritation, changes in body temperature, nausea, vomiting, stomach pain, chest pain, difficulty breathing, headache, drowsiness, dizziness, disorientation, difficulty speaking, mood swings, tremors, loss of coordination, visual disturbances, lung congestion, kidney damage, liver damage, unconsciousness, coma, aspiration hazard
LONG TERM EXPOSURE: no information on significant adverse effects

CARCINOGEN STATUS:
OSHA: No
NTP: No
IARC: No

SECTION 4 FIRST AID MEASURES

INHALATION: If adverse effects occur, remove to uncontaminated area. Give artificial respiration if not breathing. Get immediate medical attention.

SKIN CONTACT: Wash skin with soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention, if needed. Thoroughly clean and dry contaminated clothing and shoes before reuse.

EYE CONTACT: Flush eyes with plenty of water for at least 15 minutes. Then get immediate medical attention.

INGESTION: Aspiration hazard. DO NOT induce vomiting. If vomiting occurs, keep head lower than hips to help prevent aspiration. Get immediate medical attention. Give artificial respiration if not breathing.

SECTION 5 FIRE FIGHTING MEASURES

FIRE AND EXPLOSION HAZARDS: Severe fire hazard. Electrostatic discharges may be generated by flow or agitation resulting in ignition or explosion. The vapor is heavier than air. Vapors or gases may ignite at distant ignition sources and flash back. Vapor/air mixtures are explosive.

EXTINGUISHING MEDIA: regular dry chemical, carbon dioxide, water, regular foam

Large fires: Use regular foam or flood with fine water spray.

FIRE FIGHTING: Move container from fire area if it can be done without risk. Cool containers with water spray until well after the fire is out. Stay away from the ends of tanks. For fires in cargo or storage area: Cool containers with water from unmanned hose holder or monitor nozzles until well after fire is out. If this is impossible then take the following precautions: Keep unnecessary people away, isolate hazard area and deny entry. Let the fire burn. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tanks due to fire. For tank, rail car or tank truck: Evacuation radius: 800 meters (1/2 mile). Water may be ineffective.

FLASH POINT: >=77 F (>=25 C) (CC)
LOWER FLAMMABLE LIMIT: 1.0%
UPPER FLAMMABLE LIMIT: 7.0%
AUTOIGNITION: 867-984 F (464-529 C)
FLAMMABILITY CLASS (OSHA): IC

HAZARDOUS COMBUSTION PRODUCTS:
Thermal decomposition products or combustion: oxides of carbon

SECTION 6 ACCIDENTAL RELEASE MEASURES

AIR RELEASE:
Reduce vapors with water spray. Stay upwind and keep out of low areas.

SOIL RELEASE:
Trap spilled material at bottom in deep water pockets, excavated holding areas or within sand bag barriers. Dike for later disposal. Absorb with sand or other non-combustible material. Collect with absorbent into suitable container.

WATER RELEASE:
Cover with absorbent sheets, spill-control pads or pillows. Neutralize. Collect with absorbent into suitable container. Absorb with activated carbon. Remove trapped material with suction hoses. Collect spilled material using

mechanical equipment.

OCCUPATIONAL RELEASE:
Avoid heat, flames, sparks and other sources of ignition. Stop leak if possible without personal risk. Reduce vapors with water spray. Small spills: Absorb with sand or other non-combustible material. Collect spilled material in appropriate container for disposal. Large spills: Dike for later disposal. Remove sources of ignition. Keep unnecessary people away, isolate hazard area and deny entry. Notify Local Emergency Planning Committee and State Emergency Response Commission for release greater than or equal to RQ (U.S. SARA Section 304). If release occurs in the U.S. and is reportable under CERCLA Section 103, notify the National Response Center at (800)424-8802 (USA) or (202)426-2675 (USA).

SECTION 7 HANDLING AND STORAGE

STORAGE: Store and handle in accordance with all current regulations and standards. Protect from physical damage. Keep container tightly closed. Store outside or in a detached building. Store with flammable liquids. Store in a cool, dry place. Subject to storage regulations: U.S. OSHA 29 CFR 1910.106. Grounding and bonding required. Keep separated from incompatible substances.

SECTION 8 EXPOSURE CONTROLS, PERSONAL PROTECTION

EXPOSURE LIMITS:
XYLENE:
100 ppm (435 mg/m3) OSHA TWA
150 ppm (651 mg/m3) OSHA STEL (vacated by 58 FR 35338, June 30, 1993)
100 ppm ACGIH TWA
150 ppm ACGIH STEL
100 ppm (435 mg/m3) NIOSH recommended TWA 10 hour(s)
150 ppm (655 mg/m3) NIOSH recommended STEL
440 mg/m3 (100 ml/m3) DFG MAK (peak limitation category - II, with excursion factor of 2) (cutaneous absorption danger)
221 mg/m3 (50 ppm) EC OEL TWA (skin)
442 mg/m3 (100 ppm) EC OEL STEL (skin)
50 ppm (220 mg/m3) UK OES TWA (skin) (mixed isomers)
100 ppm (441 mg/m3) UK OES STEL (skin) (mixed isomers)

MEASUREMENT METHOD: Charcoal tube; Carbon disulfide; Gas chromatography with flame ionization detection; NIOSH IV # 1501, Aromatic Hydrocarbons

VENTILATION: Ventilation equipment should be explosion-resistant if explosive concentrations of material are present. Provide local exhaust ventilation system. Ensure compliance with applicable exposure limits.

EYE PROTECTION: Wear splash resistant safety goggles with a faceshield. Provide an emergency eye wash fountain and quick drench shower in the immediate work area.

CLOTHING: Wear appropriate chemical resistant clothing.

GLOVES: Wear appropriate chemical resistant gloves.

PROTECTIVE MATERIAL TYPES: polyvinyl alcohol (PVA)

RESPIRATOR: The following respirators and maximum use concentrations are drawn from NIOSH and/or OSHA.

900 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 with a full facepiece.

Escape -
- Any air-purifying respirator with a full facepiece and an organic vapor canister.
- Any appropriate escape-type, self-contained breathing apparatus.

For Unknown Concentrations or Immediately Dangerous to Life or Health -
- Any supplied-air respirator with full facepiece and operated in a pressure-demand or other positive-pressure mode in combination with a separate escape supply.
- Any self-contained breathing apparatus with a full facepiece.

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE: liquid
COLOR: colorless or pale
TEXTURE: free-flowing
ODOR: distinct odor
MOLECULAR WEIGHT: 106.16
MOLECULAR FORMULA: C6-H4-(C-H3)2
BOILING POINT: 280-291 F (138-144 C)
FREEZING POINT: -54 to 55 F (-48 to 13 C)
VAPOR PRESSURE: 6-16 mmHg @ 20 C
VAPOR DENSITY (air=1): 3.7
SPECIFIC GRAVITY (water=1): 0.8600-0.9000
WATER SOLUBILITY: 0.00003%
PH: Not available
VOLATILITY: 100%
ODOR THRESHOLD: 0.3 ppm
EVAPORATION RATE: 0.6 (butyl acetate=1)
COEFFICIENT OF WATER/OIL DISTRIBUTION: Not available

SOLVENT SOLUBILITY:
Soluble: alcohol, ether, acetone, petroleum ether, benzene, carbon tetrachloride, organic solvents

SECTION 10 STABILITY AND REACTIVITY

REACTIVITY: Stable at normal temperatures and pressure.

CONDITIONS TO AVOID: Avoid heat, flames, sparks and other sources of ignition. Containers may rupture or explode if exposed to heat. Keep out of water supplies and sewers.

INCOMPATIBILITIES: oxidizing materials, combustible materials, acids, amines, bases

XYLENE:
ACIDS (STRONG): Incompatible
AMINES: Incompatible.
BASES (STRONG): Incompatible.
NITRIC ACID: Exothermic reaction.
OXIDIZERS (STRONG): Fire and explosion hazard.
PLASTICS, RUBBER, COATINGS: May be attacked.
SULFURIC ACID: Exothermic reaction.

HAZARDOUS DECOMPOSITION:
Thermal decomposition products or combustion: oxides of carbon

POLYMERIZATION: Will not polymerize.

SECTION 11 TOXICOLOGICAL INFORMATION

XYLENE:
IRRITATION DATA:
200 ppm eyes-human; 100 percent skin-rabbit moderate; 500 mg/24 hour(s) skin-rabbit moderate; 87 mg eyes-rabbit mild; 5 mg/24 hour(s) eyes-rabbit severe
TOXICITY DATA:
50 mg/kg oral-human LDLo; 10000 ppm/6 hour(s) inhalation-man LCLo; 200 ppm inhalation-human TCLo; 4300 mg/kg oral-rat LD50; 5000 ppm/4 hour(s) inhalation-rat LC50; 2459 mg/kg intraperitoneal-rat LD50; 1700 mg/kg subcutaneous-rat LD50; 2119 mg/kg oral-mouse LD50; 1548 mg/kg intraperitoneal-mouse LD50; >1700 mg/kg skin-rabbit LD50; 129 mg/kg intravenous-rabbit LDLo; 450 ppm inhalation-guinea pig LCLo; 2 gm/kg intraperitoneal-guinea pig LDLo; 4300 mg/kg oral-mammal LD50; 30 gm/m3 inhalation-mammal LC50; 2 gm/kg intraperitoneal-mammal LDLo; 28 gm/kg/14

day(s) continuous oral-rat TDLo; 63 gm/kg/90 day(s) intermittent oral-rat TDLo; 1600 ppm/20 hour(s)-7 day(s) intermittent inhalation-rat TCLo; 15 mg/m3/24 hour(s)-85 day(s) continuous inhalation-rat TCLo; 800 ppm/14 hour(s)-6 week(s) intermittent inhalation-rat TCLo; 300 ppm/6 hour(s)-18 week(s) intermittent inhalation-rat TCLo; 12740 ug/kg/30 day(s) intermittent intraperitoneal-rat TDLo; 4128 mg/kg/3 day(s) intermittent intraperitoneal-rat TDLo; 28 gm/kg/14 day(s) continuous oral-mouse TDLo; 1250 mg/m3/2 hour(s)-60 day(s) intermittent inhalation-mouse TCLo; 100 mg/m3/90 day(s) intermittent inhalation-monkey TCLo

CARCINOGEN STATUS: IARC: Human Inadequate Evidence, Animal Inadequate Evidence, Group 3; ACGIH: A4 -Not Classifiable as a Human Carcinogen

LOCAL EFFECTS:

Irritant: inhalation, skin, eye

ACUTE TOXICITY LEVEL:

Moderately Toxic: inhalation, ingestion

TARGET ORGANS: central nervous system

REPRODUCTIVE EFFECTS DATA:

250 mg/m3 inhalation-rat TCLo/24 hour(s) 7-15 day(s) pregnant female continuous; 50 mg/m3 inhalation-rat TCLo/6 hour(s) 1-21 day(s) pregnant female continuous; 50 mg/m3 inhalation-rat TCLo/6 hour(s) 1-21 day(s) pregnant female continuous; 200 ppm inhalation-rat TDLo/6 hour(s) 4-20 day(s) pregnant female continuous; 20600 ug/kg oral-mouse TDLo 6-15 day(s) pregnant female continuous; 31 mg/kg oral-mouse TDLo 6-15 day(s) pregnant female continuous; 4000 ppm inhalation-mouse TCLo/6 hour(s) 6-12 day(s) pregnant female continuous; 2000 ppm inhalation-mouse TCLo/6 hour(s) 6-12 day(s) pregnant female continuous; 1 gm/m3 inhalation-mouse TCLo/12 hour(s) 6-15 day(s) pregnant female continuous; 500 mg/m3 inhalation-rabbit TCLo/24 hour(s) 7-20 day(s) pregnant female continuous; 1 gm/m3 inhalation-rabbit TCLo/24 hour(s) 7-20 day(s) pregnant female continuous

ADDITIONAL DATA: Alcohol may enhance the toxic effects. Stimulants such as epinephrine may induce ventricular fibrillation.

HEALTH EFFECTS:

INHALATION:

ACUTE EXPOSURE:

XYLENE: 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 unconscious 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:

XYLENE: 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.

SKIN CONTACT:

ACUTE EXPOSURE:

XYLENE: 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:

XYLENE: 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.

EYE CONTACT:

ACUTE EXPOSURE:
XYLENE: 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:
XYLENE: 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.

INGESTION:
ACUTE EXPOSURE:
XYLENE: Lung damage may occur if aspirated into the lungs and may be fatal. Symptoms may include coughing, difficulty breathing, cyanosis, and pulmonary edema. 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.

CHRONIC EXPOSURE:
XYLENE: 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, reduced litter size, craniofacial and musculoskeletal system abnormalities, and post-implantation mortality.

SECTION 12 ECOLOGICAL INFORMATION

ECOTOXICITY DATA:
FISH TOXICITY: 8200 ug/L 96 hour(s) LC50 (Mortality) Rainbow trout,donaldson trout (Oncorhynchus mykiss)

INVERTEBRATE TOXICITY: 190000 ug/L 96 hour(s) LC50 (Mortality) Marine bivalve (Katelysia opima)

ALGAL TOXICITY: 240 ug/L 17 year(s) (Abundance) Dinoflagellate (Ceratium sp)

FATE AND TRANSPORT:
KOW: 14454397.71 (log = 7.160) (estimated from water solubility)

KOC: 1342764.96 (log = 6.128) (estimated from water solubility)

HENRY'S LAW CONSTANT: 2.8 atm-m3/mol

BIOCONCENTRATION: 9.2 ug/L 24 hour(s) BCF (Residue) Rainbow trout,donaldson trout (Oncorhynchus mykiss) 360 ug/L

AQUATIC PROCESSES: 2.6723425 hours (River Model: 1 m deep, 1 m/s flow, 3 m/s wind)

ENVIRONMENTAL SUMMARY: Relatively non-persistent in the environment. Not expected to leach through the soil or the sediment. Accumulates greatly in the bodies of living organisms. Highly volatile from water.

SECTION 13 DISPOSAL CONSIDERATIONS

Dispose in accordance with all applicable regulations. Subject to disposal regulations: U.S. EPA 40 CFR 262. Hazardous Waste Number(s): U239.

SECTION 14 TRANSPORT INFORMATION

U.S. DOT 49 CFR 172.101:
PROPER SHIPPING NAME: Xylenes
ID NUMBER: UN1307
HAZARD CLASS OR DIVISION: 3
PACKING GROUP: II

CANADIAN TRANSPORTATION OF DANGEROUS GOODS:
SHIPPING NAME: Xylenes
ID NUMBER: UN1307
CLASSIFICATION: 3
PACKING GROUP: II

LAND TRANSPORT ADR/RID:
PROPER SHIPPING NAME: Xylenes
UN NUMBER: UN1307
ADR/RID CLASS: 3
CLASSIFICATION CODE: F1
PACKING GROUP: III

AIR TRANSPORT IATA/ICAO:
PROPER SHIPPING NAME: Xylenes
UN/ID NUMBER: UN1307
IATA/ICAO CLASS: 3
PACKING GROUP: II

MARITIME TRANSPORT IMDG:
PROPER SHIPPING NAME: Xylenes
UN NUMBER: UN1307
IMDG CLASS: 3
PACKING GROUP: II

SECTION 15 REGULATORY INFORMATION

U.S. REGULATIONS:
CERCLA SECTIONS 102a/103 HAZARDOUS SUBSTANCES (40 CFR 302.4):
XYLENE: 100 LBS RQ

SARA TITLE III SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355.30):
Not regulated.

SARA TITLE III SECTION 304 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355.40):
Not regulated.

SARA TITLE III SARA SECTIONS 311/312 HAZARDOUS CATEGORIES (40 CFR 370.21):
ACUTE: Yes
CHRONIC: No
FIRE: Yes
REACTIVE: No
SUDDEN RELEASE: No

SARA TITLE III SECTION 313 (40 CFR 372.65):
XYLENE

OSHA PROCESS SAFETY (29CFR1910.119): Not regulated.

STATE REGULATIONS:
California Proposition 65: Not regulated.

CANADIAN REGULATIONS:
WHMIS CLASSIFICATION: Not determined.

EUROPEAN REGULATIONS:
EC CLASSIFICATION (ASSIGNED):
Flammable
Xn Harmful
Xi Irritant

EC Classification may be inconsistent with independently-researched data.

DANGER/HAZARD SYMBOL:
Xn Harmful

EC RISK AND SAFETY PHRASES:

R 10	Flammable.
R 20/21	Harmful by inhalation and in contact with skin.
R 38	Irritating to skin.
S 2	Keep out of reach of children.
S 25	Avoid contact with eyes.

CONCENTRATION LIMITS:

C>=20%	Xn	R 20/21-38
12.5%<=C<20%	Xn	R 20/21

GERMAN REGULATIONS:

WATER HAZARD CLASS (WGK):

STATE OF CLASSIFICATION: VwVwS

CLASSIFICATION UNDER HAZARD TO WATER: 2

NATIONAL INVENTORY STATUS:

U.S. INVENTORY (TSCA): Listed on inventory.

TSCA 12(b) EXPORT NOTIFICATION: Not listed.

SECTION 16 OTHER INFORMATION

MSDS SUMMARY OF CHANGES

SECTION 8 EXPOSURE CONTROLS, PERSONAL PROTECTION

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OHS07100

SECTION 1 CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

MDL INFORMATION SYSTEMS, INC.
1281 Murfreesboro Road, Suite 300
Nashville, TN 37217-2423
1-615-366-2000

EMERGENCY TELEPHONE NUMBER:
1-800-424-9300 (NORTH AMERICA)
1-703-527-3887 (INTERNATIONAL)

SUBSTANCE: DIESEL FUEL NO. 2

TRADE NAMES/SYNONYMS:
DIESEL OIL; DIESEL FUEL; DIESEL OIL, MEDIUM; FUELS, DIESEL, NO. 2; DIESEL OIL NO. 2-D; DIESEL FUEL OIL NO. 2-D; DIESEL FUEL NO. 2-D; NO. 2 DIESEL FUEL; WINTER DIESEL; CHEVRON DIESEL FUEL NO. 2; ARCO DIESEL (ARCO PRODUCTS COMPANY); DIESEL FUEL #2; REGULAR DIESEL; FUEL OIL #2; CALCO SPECIAL LS DIESEL 2-EL SEGUNDO; OHS07100

CHEMICAL FAMILY: petroleums, hydrocarbons

CREATION DATE: Mar 14 1985
REVISION DATE: Dec 16 2002

SECTION 2 COMPOSITION, INFORMATION ON INGREDIENTS

COMPONENT: DIESEL FUEL NO. 2
CAS NUMBER: 68476-34-6
EC NUMBER (EINECS): 270-676-1
EC INDEX NUMBER: 649-227-00-2
PERCENTAGE: >99

OTHER CONTAMINANTS:
May contain trace amounts of sulfur, aniline and 2-ethylhexanol.

SECTION 3 HAZARDS IDENTIFICATION

NFPA RATINGS (SCALE 0-4): HEALTH=2 FIRE=2 REACTIVITY=0

EMERGENCY OVERVIEW:
COLOR: colorless to brown
PHYSICAL FORM: liquid
ODOR: petroleum odor
MAJOR HEALTH HAZARDS: respiratory tract irritation, skin irritation, central

nervous system depression
PHYSICAL HAZARDS: Flash back hazard. Combustible liquid and vapor.

POTENTIAL HEALTH EFFECTS:
INHALATION:
SHORT TERM EXPOSURE: irritation, nausea, vomiting, headache, symptoms of drunkenness, disorientation, bluish skin color, coma
LONG TERM EXPOSURE: no information on significant adverse effects
SKIN CONTACT:
SHORT TERM EXPOSURE: irritation, blisters
LONG TERM EXPOSURE: kidney damage
EYE CONTACT:
SHORT TERM EXPOSURE: mild irritation
LONG TERM EXPOSURE: no information on significant adverse effects
INGESTION:
SHORT TERM EXPOSURE: nausea, vomiting, diarrhea, difficulty breathing, symptoms of drunkenness, lung congestion
LONG TERM EXPOSURE: no information is available

CARCINOGEN STATUS:
OSHA: No
NTP: No
IARC: No

SECTION 4 FIRST AID MEASURES

INHALATION: If adverse effects occur, remove to uncontaminated area. Give artificial respiration if not breathing. Get immediate medical attention.

SKIN CONTACT: Wash skin with soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention, if needed. Thoroughly clean and dry contaminated clothing and shoes before reuse.

EYE CONTACT: Flush eyes with plenty of water for at least 15 minutes. Then get immediate medical attention.

INGESTION: Contact local poison control center or physician immediately. Never make an unconscious person vomit or drink fluids. When vomiting occurs, keep head lower than hips to help prevent aspiration. If person is unconscious, turn head to side. Get medical attention immediately.

SECTION 5 FIRE FIGHTING MEASURES

FIRE AND EXPLOSION HAZARDS: Moderate fire hazard. The vapor is heavier than air. Vapors or gases may ignite at distant ignition sources and flash back. Vapor/air mixtures are explosive above flash point.

EXTINGUISHING MEDIA: regular dry chemical, carbon dioxide, water, regular foam

Large fires: Use regular foam or flood with fine water spray.

FIRE FIGHTING: Move container from fire area if it can be done without risk. Cool containers with water spray until well after the fire is out. Stay away from the ends of tanks. For fires in cargo or storage area: Cool containers with water from unmanned hose holder or monitor nozzles until well after fire is out. If this is impossible then take the following precautions: Keep unnecessary people away, isolate hazard area and deny entry. Let the fire burn. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tanks due to fire. For tank, rail car or tank truck: Evacuation radius: 800 meters (1/2 mile). Do not attempt to extinguish fire unless flow of material can be stopped first. Flood with fine water spray. Do not scatter spilled material with high-pressure water streams. Cool containers with water spray until well after the fire is out. Apply water from a protected location or from a safe distance. Avoid inhalation of material or combustion by-products. Stay upwind and keep out of low areas.

FLASH POINT: >126 F (>52 C)
LOWER FLAMMABLE LIMIT: >0.6%
UPPER FLAMMABLE LIMIT: >6.0%
AUTOIGNITION: >475 F (>246 C)
FLAMMABILITY CLASS (OSHA): II

SECTION 6 ACCIDENTAL RELEASE MEASURES

WATER RELEASE:
Subject to California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65). Keep out of water supplies and sewers.

OCCUPATIONAL RELEASE:
Avoid heat, flames, sparks and other sources of ignition. Stop leak if possible without personal risk. Reduce vapors with water spray. Small spills: Absorb with sand or other non-combustible material. Collect spilled material in appropriate container for disposal. Large spills: Dike for later disposal. Remove sources of ignition. Keep unnecessary people away, isolate hazard area and deny entry. Notify Local Emergency Planning Committee and State Emergency Response Commission for release greater than or equal to RQ (U.S. SARA Section 304). If release occurs in the U.S. and is reportable under CERCLA Section 103, notify the National Response Center at (800)424-8802 (USA) or (202)426-2675 (USA).

SECTION 7 HANDLING AND STORAGE

STORAGE: Store and handle in accordance with all current regulations and standards. Subject to storage regulations: U.S. OSHA 29 CFR 1910.106. Grounding and bonding required. Keep separated from incompatible substances.

SECTION 8 EXPOSURE CONTROLS, PERSONAL PROTECTION

EXPOSURE LIMITS:
DIESEL FUEL NO. 2:

DIESEL FUEL:
100 mg/m3 ACGIH TWA (vapor and aerosol) (skin)

KEROSENE:
100 mg/m3 NIOSH recommended TWA 10 hour(s)

MEASUREMENT METHOD: Charcoal tube; Carbon disulfide; Gas chromatography with flame ionization detection; NIOSH IV # 1550, Naphthas

MINERAL OIL MIST:
5 mg/m3 OSHA TWA
5 mg/m3 ACGIH TWA
10 mg/m3 ACGIH STEL
5 mg/m3 NIOSH recommended TWA 10 hour(s)
10 mg/m3 NIOSH recommended STEL
5 mg/m3 UK OES TWA
10 mg/m3 UK OES STEL

MEASUREMENT METHOD: Particulate filter; Carbon tetrachloride; Infrared spectrometry; NIOSH IV # 5026

HYDROGEN SULFIDE:
20 ppm OSHA ceiling
50 ppm OSHA peak 10 minute(s) (once if no other measurable exposure occurs)
10 ppm (14 mg/m3) OSHA TWA (vacated by 58 FR 35338, June 30, 1993)
15 ppm (21 mg/m3) OSHA STEL (vacated by 58 FR 35338, June 30, 1993)
10 ppm ACGIH TWA
15 ppm ACGIH STEL
10 ppm (15 mg/m3) NIOSH recommended ceiling 10 minute(s)
14 mg/m3 (10 ml/m3) DFG MAK (peak limitation category - II, with excursion factor of 2)
5 ppm (7 mg/m3) UK OES TWA
10 ppm (14 mg/m3) UK OES STEL

MEASUREMENT METHOD: Charcoal tube; Ammonium hydroxide/Hydrogen peroxide; Ion chromatography; NIOSH IV # 6013

VENTILATION: Provide local exhaust ventilation system. Ventilation equipment should be explosion-resistant if explosive concentrations of material are present. Ensure compliance with applicable exposure limits.

EYE PROTECTION: Wear splash resistant safety goggles. Provide an emergency eye wash fountain and quick drench shower in the immediate work area.

CLOTHING: Wear appropriate chemical resistant clothing. Remove any chemical soaked clothing immediately.

GLOVES: Wear appropriate chemical resistant gloves.

RESPIRATOR: Under conditions of frequent use or heavy exposure, respiratory protection may be needed. Respiratory protection is ranked in order from minimum to maximum. Consider warning properties before use.
Any supplied-air respirator with a full facepiece that is operated in a pressure-demand or other positive-pressure mode.
Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode.
For Unknown Concentrations or Immediately Dangerous to Life or Health -
Any supplied-air respirator with full facepiece and operated in a pressure-demand or other positive-pressure mode in combination with a separate escape supply.
Any self-contained breathing apparatus with a full facepiece.

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE: liquid
COLOR: colorless to brown
ODOR: petroleum odor
BOILING POINT: 340-680 F (171-360 C)
FREEZING POINT: 0 F (-18 C)
VAPOR PRESSURE: 1 mmHg @ 20 C
VAPOR DENSITY (air=1): >1
SPECIFIC GRAVITY (water=1): 0.87-0.90
WATER SOLUBILITY: insoluble
PH: Not available
VOLATILITY: Not available
ODOR THRESHOLD: Not available
EVAPORATION RATE: Not available
VISCOSITY: 32.6-40.1 SUS @ 38 C
COEFFICIENT OF WATER/OIL DISTRIBUTION: Not available

SECTION 10 STABILITY AND REACTIVITY

REACTIVITY: Stable at normal temperatures and pressure.

CONDITIONS TO AVOID: Avoid heat, flames, sparks and other sources of ignition. Containers may rupture or explode if exposed to heat. Keep out of water supplies and sewers. Dangerous gases may accumulate in confined spaces.

INCOMPATIBILITIES: oxidizing materials

DIESEL FUEL:
OXIDIZERS (STRONG): Fire and explosion hazard.

HAZARDOUS DECOMPOSITION:
Thermal decomposition products: oxides of sulfur, carbon

POLYMERIZATION: Will not polymerize.

SECTION 11 TOXICOLOGICAL INFORMATION

DIESEL FUEL NO. 2:
TOXICITY DATA:
>5 ml/kg skin-rabbit LD50 (marketplace sample AETODY); 7.5 gm/kg oral-rat LD50 (marketplace sample AETODY)
CARCINOGEN STATUS: IARC: Human Inadequate Evidence, Group 3 (Light distillate diesel fuels); ACGIH: A3 -Animal Carcinogen
LOCAL EFFECTS:
Irritant: inhalation, skin
ACUTE TOXICITY LEVEL:
Slightly Toxic: ingestion
TARGET ORGANS: central nervous system
ADDITIONAL DATA: Animal studies have confirmed an association between the induction of cancer, primarily of the lung, and inhalation exposure to whole diesel exhaust. Limited epidemiologic evidence also suggests an association between occupational exposure to diesel engine emissions and lung cancer (NIOSH, 1988).

HEALTH EFFECTS:
INHALATION:
ACUTE EXPOSURE:
DIESEL FUEL: Vapors or mist may cause respiratory tract irritation. A human exposure has resulted in immediate cough, dypsnea, cyanosis and unconsciousness for one hour. A productive cough with sputum smelling of diesel fuel persisted for 37 days. Chest X-rays showed diffuse shadowing, most prominent at the lung bases, which resolved slowly with treatment but was still present at day 37. High levels may also cause central nervous system excitation followed by depression with symptoms possibly including restlessness, confusion, ataxia, headache, dizziness, anorexia, nausea,

vomiting, weakness, incoordination, stupor, delirium and coma.

CHRONIC EXPOSURE:
DIESEL FUEL: Prolonged or repeated exposure may cause irritation. One individual exposed to diesel vapors in a truck cab developed nephrotoxic effects.

SKIN CONTACT:
ACUTE EXPOSURE:
DIESEL FUEL: May cause smarting, redness and irritation. A sample of diesel fuel applied to rabbits under a patch for 24 hours caused extreme irritation with severe erythema and edema with blistering and open sores.

CHRONIC EXPOSURE:
DIESEL FUEL: Repeated or prolonged contact may cause defatting and drying of the skin resulting in irritation and dermatitis. Cutaneous hyperkeratosis has been described in engine drivers with occupational exposure to diesel fuel. Two individuals with topical exposure from washing hair or hands with diesel fuel developed acute renal failure; one also had gastrointestinal symptoms. Repeated applications to rabbit skin produced 67% mortality at 8 mL/kg. The primary causes of death were depression and anorexia which were induced by dermal irritation with infection, rather than systemic intoxication. Autopsy revealed effects on the liver and kidneys.

EYE CONTACT:
ACUTE EXPOSURE:
DIESEL FUEL: Liquid or vapor may cause slight irritation, although tests with one sample of diesel fuel in rabbit eyes was non-irritating.

CHRONIC EXPOSURE:
DIESEL FUEL: Repeated or prolonged exposure may cause irritation.

INGESTION:
ACUTE EXPOSURE:
DIESEL FUEL: May cause nausea, vomiting, cramping, diarrhea, and possibly symptoms of central nervous system depression. Aspiration of even small amounts during ingestion or vomiting may result in severe pulmonary irritation with coughing, gagging, dyspnea, substernal distress, and pneumonitis, pulmonary edema and hemorrhage, and death. The probable lethal dose in humans is 0.5-5 gm/kg for a 150 pound person. This amount is 1-16 ounces. Death is due to pneumonitis or respiratory failure.

CHRONIC EXPOSURE:
DIESEL FUEL: No data available.

SECTION 12 ECOLOGICAL INFORMATION

Not available

SECTION 13 DISPOSAL CONSIDERATIONS

Subject to disposal regulations: U.S. EPA 40 CFR 262. Hazardous Waste Number(s): D001. Dispose in accordance with all applicable regulations.

SECTION 14 TRANSPORT INFORMATION

U.S. DOT 49 CFR 172.101:
PROPER SHIPPING NAME: Diesel fuel
ID NUMBER: NA1993
HAZARD CLASS OR DIVISION: 3
PACKING GROUP: III

INTERNATIONAL U.S. DOT 49 CFR 172.101:
PROPER SHIPPING NAME: Diesel fuel
ID NUMBER: UN1202
HAZARD CLASS OR DIVISION: 3
PACKING GROUP: III

CANADIAN TRANSPORTATION OF DANGEROUS GOODS:
SHIPPING NAME: Diesel fuel
ID NUMBER: UN1202
CLASSIFICATION: 3
PACKING GROUP: III

LAND TRANSPORT ADR/RID:
PROPER SHIPPING NAME: Gas oil or Diesel fuel or Heating oil, light (flashpoint not more than 61C)/GAS OIL or DIESEL FUEL or HEATING OIL, LIGHT (flashpoint not more than 61C)
UN NUMBER: UN1202
ADR/RID CLASS: 3
CLASSIFICATION CODE: F1
PACKING GROUP: III

AIR TRANSPORT IATA/ICAO:
PROPER SHIPPING NAME: Diesel fuel
UN/ID NUMBER: UN1202
IATA/ICAO CLASS: 3
PACKING GROUP: III

MARITIME TRANSPORT IMDG:
PROPER SHIPPING NAME: Diesel fuel

UN NUMBER: UN1202
IMDG CLASS: 3
PACKING GROUP: III

SECTION 15 REGULATORY INFORMATION

U.S. REGULATIONS:

CERCLA SECTIONS 102a/103 HAZARDOUS SUBSTANCES (40 CFR 302.4):
HYDROGEN SULFIDE: 100 LBS RQ

SARA TITLE III SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355.30):
HYDROGEN SULFIDE: 500 LBS TPQ

SARA TITLE III SECTION 304 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355.40):
HYDROGEN SULFIDE: 100 LBS RQ

SARA TITLE III SARA SECTIONS 311/312 HAZARDOUS CATEGORIES (40 CFR 370.21):
ACUTE: Yes
CHRONIC: Yes
FIRE: Yes
REACTIVE: No
SUDDEN RELEASE: No

SARA TITLE III SECTION 313 (40 CFR 372.65):
HYDROGEN SULFIDE

OSHA PROCESS SAFETY (29CFR1910.119):
HYDROGEN SULFIDE: 1500 LBS TQ

STATE REGULATIONS:
California Proposition 65: Not regulated.

CANADIAN REGULATIONS:
WHMIS CLASSIFICATION: Not determined.

EUROPEAN REGULATIONS:
EC CLASSIFICATION (ASSIGNED):
Carcinogen Category 3

EC Classification may be inconsistent with independently-researched data.

DANGER/HAZARD SYMBOL:
Xn Harmful

EC RISK AND SAFETY PHRASES:
R 40 Limited evidence of a carcinogenic effect.

S 2	Keep out of reach of children.
S 36/37	Wear suitable protective clothing and gloves.

NATIONAL INVENTORY STATUS:
U.S. INVENTORY (TSCA): Listed on inventory.

TSCA 12(b) EXPORT NOTIFICATION: Not listed.

SECTION 16 OTHER INFORMATION

MSDS SUMMARY OF CHANGES

SECTION 8	EXPOSURE CONTROLS, PERSONAL PROTECTION
SECTION 10	STABILITY AND REACTIVITY

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OHS10340

SECTION 1 CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

MDL INFORMATION SYSTEMS, INC.
1281 Murfreesboro Road, Suite 300
Nashville, TN 37217-2423
1-615-366-2000

EMERGENCY TELEPHONE NUMBER:
1-800-424-9300 (NORTH AMERICA)
1-703-527-3887 (INTERNATIONAL)

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); 420003415; 600000024; UN 1203; STCC 4908178; OHS10340; RTECS LX3373000

CHEMICAL FAMILY: petroleums, hydrocarbons

CREATION DATE: Apr 23 1985
REVISION DATE: Dec 16 2002

SECTION 2 COMPOSITION, INFORMATION ON INGREDIENTS

COMPONENT: GASOLINE, AUTOMOTIVE, UNLEADED
CAS NUMBER: 8006-61-9
EC NUMBER (EINECS): 232-349-1
PERCENTAGE: 100.0

COMPONENT: BENZENE
CAS NUMBER: 71-43-2
EC NUMBER (EINECS): 200-753-7
PERCENTAGE: <1

SECTION 3 HAZARDS IDENTIFICATION

NFPA RATINGS (SCALE 0-4): HEALTH=3 FIRE=3 REACTIVITY=0

EMERGENCY OVERVIEW:
COLOR: colorless to amber
PHYSICAL FORM: volatile liquid
ODOR: distinct odor
MAJOR HEALTH HAZARDS: respiratory tract irritation, skin irritation, eye irritation, central nervous system depression, cancer hazard (in humans)

PHYSICAL HAZARDS: Extremely flammable liquid and vapor. Vapor may cause flash fire.

POTENTIAL HEALTH EFFECTS:
INHALATION:
SHORT TERM EXPOSURE: irritation, ringing in the ears, nausea, vomiting, chest pain, difficulty breathing, irregular heartbeat, headache, drowsiness, symptoms of drunkenness, disorientation, visual disturbances, lung congestion, blood disorders, paralysis, convulsions, coma
LONG TERM EXPOSURE: hearing loss, kidney damage, nerve damage, reproductive effects, brain damage, cancer
SKIN CONTACT:
SHORT TERM EXPOSURE: irritation, blisters
LONG TERM EXPOSURE: skin disorders, tingling sensation, kidney damage
EYE CONTACT:
SHORT TERM EXPOSURE: irritation
LONG TERM EXPOSURE: no information on significant adverse effects
INGESTION:
SHORT TERM EXPOSURE: nausea, vomiting, diarrhea, chest pain, difficulty breathing, irregular heartbeat, headache, drowsiness, symptoms of drunkenness, disorientation, visual disturbances, bluish skin color, lung congestion, lung damage, paralysis, convulsions, coma
LONG TERM EXPOSURE: impotence, liver damage, cancer

CARCINOGEN STATUS:
OSHA: Yes
NTP: Yes
IARC: Yes

SECTION 4 FIRST AID MEASURES

INHALATION: If adverse effects occur, remove to uncontaminated area. Give artificial respiration if not breathing. If breathing is difficult, oxygen should be administered by qualified personnel. Get immediate medical attention.

SKIN CONTACT: Wash skin with soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention, if needed. Thoroughly clean and dry contaminated clothing and shoes before reuse.

EYE CONTACT: Flush eyes with plenty of water for at least 15 minutes. Then get immediate medical attention.

INGESTION: Contact local poison control center or physician immediately. Never make an unconscious person vomit or drink fluids. When vomiting occurs, keep head lower than hips to help prevent aspiration. If person is unconscious, turn head to side. Get medical attention immediately.

NOTE TO PHYSICIAN: For inhalation, consider oxygen. For ingestion, consider gastric lavage.

SECTION 5 FIRE FIGHTING MEASURES

FIRE AND EXPLOSION HAZARDS: Severe fire hazard. The vapor is heavier than air. Vapors or gases may ignite at distant ignition sources and flash back. Vapor/air mixtures are explosive.

EXTINGUISHING MEDIA: regular dry chemical, carbon dioxide, water, regular foam

Large fires: Use regular foam or flood with fine water spray.

FIRE FIGHTING: Move container from fire area if it can be done without risk. Cool containers with water spray until well after the fire is out. Stay away from the ends of tanks. For fires in cargo or storage area: Cool containers with water from unmanned hose holder or monitor nozzles until well after fire is out. If this is impossible then take the following precautions: Keep unnecessary people away, isolate hazard area and deny entry. Let the fire burn. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tanks due to fire. For tank, rail car or tank truck: Evacuation radius: 800 meters (1/2 mile). Water may be ineffective.

FLASH POINT: -45 F (-43 C) (CC)
LOWER FLAMMABLE LIMIT: 1.2%
UPPER FLAMMABLE LIMIT: 7.6%
AUTOIGNITION: 536-853 F (280-456 C)
FLAMMABILITY CLASS (OSHA): IB

SECTION 6 ACCIDENTAL RELEASE MEASURES

WATER RELEASE:
Subject to California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65). Keep out of water supplies and sewers.

OCCUPATIONAL RELEASE:
Avoid heat, flames, sparks and other sources of ignition. Stop leak if possible without personal risk. Reduce vapors with water spray. Small spills: Absorb with sand or other non-combustible material. Collect spilled material in appropriate container for disposal. Large spills: Dike for later disposal. Remove sources of ignition. Keep unnecessary people away, isolate hazard area and deny entry. Notify Local Emergency Planning Committee and State Emergency Response Commission for release greater than or equal to RQ (U.S. SARA Section 304). If release occurs in the U.S. and is reportable under CERCLA Section 103, notify the National Response Center at (800)424-8802 (USA) or

(202)426-2675 (USA).

SECTION 7 HANDLING AND STORAGE

STORAGE: Store and handle in accordance with all current regulations and standards. Subject to storage regulations: U.S. OSHA 29 CFR 1910.106. Keep separated from incompatible substances.

SECTION 8 EXPOSURE CONTROLS, PERSONAL PROTECTION

EXPOSURE LIMITS:
GASOLINE, AUTOMOTIVE, UNLEADED:
GASOLINE (BULK HANDLING):
300 ppm (900 mg/m3) OSHA TWA (vacated by 58 FR 35338, June 30, 1993)
500 ppm (1500 mg/m3) OSHA STEL (vacated by 58 FR 35338, June 30, 1993)
300 ppm ACGIH TWA
500 ppm ACGIH STEL

BENZENE:
1 ppm OSHA TWA
5 ppm OSHA STEL 15 minute(s)
0.5 ppm OSHA action level
0.5 ppm ACGIH TWA (skin)
2.5 ppm ACGIH STEL (skin)
0.1 ppm NIOSH recommended TWA 10 hour(s)
1 ppm NIOSH recommended STEL
3.2 mg/m3 (1 ml/m3) AGS TRK (skin) (others)
8 mg/m3 (2.5 ml/m3) AGS TRK (production) (skin)
3 ppm UK MEL TWA

MEASUREMENT METHOD: Charcoal tube; Carbon disulfide; Gas chromatography with flame ionization detection; NIOSH IV # 1500, Hydrocarbons; ALSO # 3700, # 1501

BENZENE:
1 ppm OSHA TWA
5 ppm OSHA STEL 15 minute(s)
0.5 ppm OSHA action level
0.5 ppm ACGIH TWA (skin)
2.5 ppm ACGIH STEL (skin)
0.1 ppm NIOSH recommended TWA 10 hour(s)
1 ppm NIOSH recommended STEL
3.2 mg/m3 (1 ml/m3) AGS TRK (skin) (others)
8 mg/m3 (2.5 ml/m3) AGS TRK (production) (skin)
3 ppm UK MEL TWA

MEASUREMENT METHOD: Charcoal tube; Carbon disulfide; Gas chromatography with flame ionization detection; NIOSH IV # 1500, Hydrocarbons; ALSO # 3700, # 1501

VENTILATION: Provide local exhaust ventilation system. Ventilation equipment should be explosion-resistant if explosive concentrations of material are present. Ensure compliance with applicable exposure limits.

EYE PROTECTION: Wear splash resistant safety goggles. Provide an emergency eye wash fountain and quick drench shower in the immediate work area.

CLOTHING: Wear appropriate chemical resistant clothing. Remove any chemical soaked clothing immediately.

GLOVES: Wear appropriate chemical resistant gloves.

RESPIRATOR: The following respirators and maximum use concentrations are drawn from NIOSH and/or OSHA.

At any detectable concentration -

- Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode.
- Any supplied-air respirator with full facepiece and operated in a pressure-demand or other positive-pressure mode in combination with a separate escape supply.

Escape -

- Any air-purifying respirator with a full facepiece and an organic vapor canister.
- Any appropriate escape-type, self-contained breathing apparatus.

For Unknown Concentrations or Immediately Dangerous to Life or Health -

- Any supplied-air respirator with full facepiece and operated in a pressure-demand or other positive-pressure mode in combination with a separate escape supply.
- Any self-contained breathing apparatus with a full facepiece.

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE: liquid
APPEARANCE: clear
COLOR: colorless to amber
PHYSICAL FORM: volatile liquid
ODOR: distinct odor
BOILING POINT: 100-399 F (38-204 C)
FREEZING POINT: Not available
VAPOR PRESSURE: Not available
VAPOR DENSITY (air=1): 3.0-4.0
SPECIFIC GRAVITY (water=1): 0.7-0.8

WATER SOLUBILITY: insoluble
PH: Not available
VOLATILITY: Not available
ODOR THRESHOLD: 0.25 ppm
EVAPORATION RATE: Not available
COEFFICIENT OF WATER/OIL DISTRIBUTION: Not available
SOLVENT SOLUBILITY:
Soluble: absolute alcohol, ether, chloroform, benzene

SECTION 10 STABILITY AND REACTIVITY

REACTIVITY: Stable at normal temperatures and pressure.

CONDITIONS TO AVOID: Avoid heat, flames, sparks and other sources of ignition. Containers may rupture or explode if exposed to heat. Keep out of water supplies and sewers.

INCOMPATIBILITIES: oxidizing materials

GASOLINE, AUTOMOTIVE, UNLEADED:
OXIDIZERS (STRONG): Fire and explosion hazard.

HAZARDOUS DECOMPOSITION:
Thermal decomposition products: oxides of carbon

POLYMERIZATION: Will not polymerize.

SECTION 11 TOXICOLOGICAL INFORMATION

GASOLINE, AUTOMOTIVE, UNLEADED:
IRRITATION DATA:
500 ul/24 hour(s) skin-rabbit mild
TOXICITY DATA:
13.6 gm/kg oral-rat LD50; 13600 mg/kg oral-rat LD50; >5 ml/kg skin-rabbit LD; 5 ml/kg/2 week(s) intermittent oral-rat TDLo; 10 gm/kg/4 week(s) intermittent oral-rat TDLo; 4 mg/m3/8 hour(s)-60 day(s) intermittent inhalation-rat TCLo; 2000 mg/m3/8 week(s) intermittent inhalation-rat TCLo
CARCINOGEN STATUS: IARC: Human Inadequate Evidence, Animal Limited Evidence, Group 2B; ACGIH: A3 -Animal Carcinogen
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:
Slightly Toxic: ingestion
TARGET ORGANS: central nervous system
TUMORIGENIC DATA:
1501 ppm inhalation-rat TCLo/78 week(s) continuous; 2056 ppm inhalation-mouse TCLo/6 hour(s)-78 week(s) intermittent; 2056 ppm inhalation-rat TC/6 hour(s)-78 week(s) intermittent
ADDITIONAL DATA: Alcohol may enhance the toxic effects. Stimulants such as epinephrine may induce ventricular fibrillation.
Toxicity and irritation data derived from unspecified and unleaded gasoline.

BENZENE:
IRRITATION DATA:
15 mg/24 hour(s) open skin-rabbit mild; 20 mg/24 hour(s) skin-rabbit moderate; 88 mg eyes-rabbit moderate; 2 mg/24 hour(s) eyes-rabbit severe
TOXICITY DATA:
2 pph/5 minute(s) inhalation-human LCLo; 50 mg/kg oral-man LDLo; 150 ppm/1 year(s) intermittent inhalation-man TCLo; 100 ppm inhalation-human TCLo; 65 mg/m3/5 year(s) inhalation-human LCLo; 194 mg/kg unreported-man LDLo; 930 mg/kg oral-rat LD50; 10000 ppm/7 hour(s) inhalation-rat LC50; 1100 ug/kg intraperitoneal-rat LD50; 4700 mg/kg oral-mouse LD50; 9980 ppm inhalation-mouse LC50; 48 mg/kg skin-mouse LD50; 340 mg/kg intraperitoneal-mouse LD50; 2 gm/kg oral-dog LDLo; 146000 mg/m3 inhalation-dog LCLo; 170000 mg/m3 inhalation-cat LCLo; 45000 ppm/30 minute(s) inhalation-rabbit LCLo; >9400 ul/kg skin-rabbit LD50; 88 mg/kg intravenous-rabbit LDLo; >9400 ul/kg skin-guinea pig LD50; 527 mg/kg intraperitoneal-guinea pig LDLo; 1400 mg/kg subcutaneous-frog LDLo; 5700 mg/kg oral-mammal LD50; 20000 ppm/5 minute(s) inhalation-mammal LCLo; 1500 mg/kg intraperitoneal-mammal LDLo; 5 mg/kg subcutaneous-rat LDLo; 6600 mg/kg/27 week(s) intermittent oral-rat TDLo; 23 mg/m3/4 hour(s)-8 day(s) intermittent inhalation-rat TCLo; 300 ppm/6 hour(s)-13 week(s) intermittent inhalation-rat TCLo; 300 ppm/6 hour(s)-99 week(s) intermittent inhalation-rat TCLo; 17 gm/kg/17 week(s) intermittent oral-rat TDLo; 1000 ppm/7 hour(s)-28 week(s) intermittent inhalation-rat TCLo; 500 ppm/6 hour(s)-3 week(s) intermittent inhalation-rat TCLo; 12 gm/kg/6 week(s) intermittent subcutaneous-rat TDLo; 18 mg/kg/21 day(s) intermittent subcutaneous-rat TDLo; 2197 mg/kg/5 day(s) intermittent subcutaneous-rat TDLo; 13536 mg/kg/12 week(s) intermittent subcutaneous-rat TDLo; 5 ml/kg/10 day(s) intermittent intraperitoneal-rat TDLo; 4250 mg/kg/17 week(s) intermittent oral-mouse TDLo; 300 ppm/6 hour(s)-13 week(s) intermittent inhalation-mouse TCLo; 25 ppm/6 hour(s)-5 day(s) intermittent inhalation-mouse TCLo; 10 ppm/6 hour(s)-10 week(s) intermittent inhalation-mouse TCLo; 10 ppm/6 hour(s)-26 week(s) intermittent inhalation-mouse TCLo; 211 ppm/6 hour(s)-7 day(s) intermittent oral-mouse TCLo; 300 ppm/6 hour(s)-16 week(s) intermittent inhalation-mouse TCLo; 48 ppm/6 hour(s)-14 day(s) intermittent inhalation-mouse TCLo; 2197 mg/kg/5 day(s) intermittent subcutaneous-mouse TDLo; 100 ppm/6 hour(s)-72 week(s) intermittent inhalation-mouse TCLo; 500 mg/m3/3 hour(s)-13 week(s) intermittent inhalation-rabbit TCLo; 100 ppm/6 hour(s)-3 week(s)

intermittent inhalation-pig TCLo

CARCINOGEN STATUS: OSHA: Carcinogen; NTP: Known Human Carcinogen; IARC: Human Sufficient Evidence, Animal Sufficient Evidence, Group 1; ACGIH: A1 -Confirmed Human Carcinogen; EC: Category 1; TRGS 905: K 1
Numerous case reports and series have suggested a relationship between exposure to benzene and the occurrence of various types of leukemia. Several case-control studies have also shown increased odds ratios for exposure to benzene, but mixed exposure patterns and poorly defined exposures render their interpretation difficult. Three independent cohort studies have demonstrated an increased incidence of acute nonlymphocytic leukemia in workers exposed to benzene.

LOCAL EFFECTS:
Irritant: inhalation, skin, eye

ACUTE TOXICITY LEVEL:
Highly Toxic: dermal absorption
Moderately Toxic: ingestion
Slightly Toxic: inhalation

TARGET ORGANS: immune system (blood), central nervous system

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: blood system disorders, immune system disorders or allergies

TUMORIGENIC DATA:
200 mg/m3 inhalation-man TCLo/78 week(s) intermittent; 10 ppm inhalation-human TCLo/8 hour(s)-10 year(s) intermittent; 52 gm/kg oral-rat TDLo/52 week(s) intermittent; 1200 ppm inhalation-rat TCLo/6 hour(s)-10 week(s) intermittent; 18250 mg/kg oral-mouse TDLo/2 year(s) continuous; 300 ppm inhalation-mouse TCLo/6 hour(s)-16 week(s) intermittent; 1200 gm/kg skin-mouse TDLo/49 week(s) intermittent; 1200 mg/kg intraperitoneal-mouse TDLo/8 week(s) intermittent; 600 mg/kg subcutaneous-mouse TDLo/17 week(s) intermittent; 670 mg/kg parenteral-mouse TDLo/19 week(s) intermittent; 150 ppm inhalation-human TC/15 minute(s)-8 year(s) intermittent; 52 gm/kg oral-rat TD/1 year(s) intermittent; 10 gm/kg oral-rat TD/52 week(s) intermittent; 600 mg/m3 inhalation-man TC/4 year(s) intermittent; 150 ppm inhalation-man TC/11 year(s) intermittent; 1200 ppm inhalation-mouse TC/6 hour(s)-10 week(s) intermittent; 2400 mg/kg oral-mouse TD/8 week(s) intermittent; 8 ppb inhalation-human TC/4 week(s) intermittent; 10 mg/m3 inhalation-human TC/11 year(s) intermittent; 300 ppm inhalation-mouse TC/6 hour(s)-16 week(s) intermittent; 51500 mg/kg oral-rat TDLo/103 week(s) intermittent; 103000 mg/kg oral-rat TDLo/103 week(s) intermittent; 12875 mg/kg oral-rat TDLo/103 week(s) intermittent; 12875 mg/kg oral-mouse TDLo/103 week(s) intermittent; 51500 mg/kg oral-mouse TDLo/103 week(s) intermittent

MUTAGENIC DATA:
mutation in microorganisms - Salmonella typhimurium 10 ppm (-S9); specific locus test - Drosophila melanogaster oral 11250 umol/L; sex chromosone loss and non disjunction - Drosophila melanogaster oral 7500 ppm; sex chromosone loss and non disjunction - Drosophila melanogaster multiple 27000 ppm; mutation in microorganisms - Saccharomyes cerevisae 549 mg/L (+S9); gene conversion and miotic recombination - Saccharomyes cerevisae 275 mg/L; sex chromosone loss and non disjunction - Aspergillus nidulans 35000 ppm; other

mutation test systems - grasshopper inhalation 14 pph 16 hour(s); other mutation test systems - non-mammalian species intraperitoneal 75 gm/kg; DNA inhibition - human leukocyte 2200 umol/L; DNA inhibition - human HeLa cell 2200 umol/L; other mutation test systems - human lymphocyte 5 umol/L; cytogenetic analysis - human inhalation 125 ppm 1 year(s); cytogenetic analysis - human leukocyte 1 mmol/L 72 hour(s); cytogenetic analysis - human lymphocyte 1 mg/L; cytogenetic analysis - human unreported 10 ppm 4 week(s); sister chromatid exchange - human lymphocyte 200 umol/L; mutation in mammalian somatic cells - human lymphocyte 1 gm/L; micronucleus test - rat inhalation 1 ppm 6 hour(s); unscheduled DNA synthesis - rat liver 1 mmol/L; DNA inhibition - rat inhalation 400 ppm; other mutation test systems - rat liver 1 mmol/L; other mutation test systems - rat bone marrow 1 mmol/L; other mutation test systems - rat subcutaneous 1 gm/L; other mutation test systems - rat subcutaneous 2200 mg/kg; cytogenetic analysis - rat inhalation 300 mg/m3 16 week(s)-intermittent; cytogenetic analysis - rat subcutaneous 2400 mg/kg 12 day(s)-intermittent; cytogenetic analysis - rat intraperitoneal 234 mg/kg; cytogenetic analysis - rat oral 39060 ug/kg; sister chromatid exchange - rat inhalation 3 ppm 6 hour(s); sister chromatid exchange - rat leukocyte 1 mmol/L; micronucleus test - mouse embryo 12500 nmol/L; micronucleus test - mouse subcutaneous 440 mg/kg; micronucleus test - mouse oral 40 mg/kg; micronucleus test - mouse intraperitoneal 264 mg/kg 24 hour(s); micronucleus test - mouse inhalation 10 ppm 6 hour(s); mutation in microorganisms - mouse lymphocyte 62500 ug/L (+S9); mutation in microorganisms - mouse embryo 2500 mg/L (+S9); morphological transformation - mouse embryo 1 gm/L; morphological transformation - mouse fibroblast 150 gm/L; DNA damage - mouse lymphocyte 3840 umol/L; DNA adduct - mouse intraperitoneal 2640 mg/kg 3 day(s)-continuous; other mutation test systems - mouse oral 2 gm/kg; other mutation test systems - mouse other cell types 5 mmol/L; DNA inhibition - mouse oral 20 gm/kg; other mutation test systems - mouse lymphocyte 10 mmol/L; DNA inhibition - mouse intraperitoneal 880 mg/kg; DNA inhibition - mouse inhalation 3000 ppm 4 hour(s)-continuous; DNA inhibition - mouse bone marrow 3 mmol/L; sister chromatid exchange - mouse inhalation 10 ppm 6 hour(s); sister chromatid exchange - mouse intraperitoneal 5 gm/kg; cytogenetic analysis - mouse oral 20 mg/kg; cytogenetic analysis - mouse intraperitoneal 264 mg/kg 3 day(s)-continuous; cytogenetic analysis - mouse inhalation 3000 ppm; dominant lethal test - mouse oral 1 mg/kg; dominant lethal test - mouse intraperitoneal 5 mg/kg; mutation in mammalian somatic cells - mouse lymphocyte 12500 ug/L; mutation in mammalian somatic cells - mouse inhalation 40 ppb 6 week(s)-continuous; mutation in mammalian somatic cells - mouse oral 2 gm/kg 5 day(s)-continuous; morphological transformation - hamster embryo 100 ug/L; DNA damage - hamster ovary 17 mmol/L; cytogenetic analysis - hamster lung 550 mg/L; cytogenetic analysis - hamster ovary 600 mg/L; sister chromatid exchange - hamster ovary 750 mg/L; sex chromosone loss and non disjunction - hamster liver 62500 ug/L; sex chromosone loss and non disjunction - hamster embryo 30 umol/L; mutation in mammalian somatic cells - hamster embryo 10 umol/L; DNA damage - rabbit subcutaneous 2344 mg/kg; DNA inhibition - rabbit subcutaneous 2 gm/kg; other mutation test systems - rabbit bone marrow 1 mmol/L; other mutation test systems - cat bone marrow 1 mmol/L; cytogenetic

analysis - rabbit subcutaneous 8400 mg/kg; DNA damage - mouse intraperitoneal 2000 mg/kg; DNA damage - mouse oral 2000 mg/kg; micronucleus test - mouse inhalation 15000 ppm 5 week(s); cytogenetic analysis - mouse skin 8.5 gm/kg

REPRODUCTIVE EFFECTS DATA:
670 mg/m3 inhalation-rat TCLo/24 hour(s) 15 day(s) pre pregnancy/1-22 day(s) pregnant female continuous; 56600 ug/m3 inhalation-rat TCLo/24 hour(s) 1-22 day(s) pregnant female continuous; 50 ppm inhalation-rat TCLo/24 hour(s) 7-14 day(s) pregnant female continuous; 150 ppm inhalation-rat TCLo/24 hour(s) 7-14 day(s) pregnant female continuous; 9 gm/kg oral-mouse TDLo 6-15 day(s) pregnant female continuous; 12 gm/kg oral-mouse TDLo 6-15 day(s) pregnant female continuous; 6500 mg/kg oral-mouse TDLo 8-12 day(s) pregnant female continuous; 16880 mg/kg oral-mouse TDLo 6-15 day(s) pregnant female continuous; 500 ppm inhalation-mouse TCLo/7 hour(s) 6-15 day(s) pregnant female continuous; 500 mg/m3 inhalation-mouse TCLo/12 hour(s) 6-15 day(s) pregnant female continuous; 5 ppm inhalation-mouse TCLo 6-15 day(s) pregnant female continuous; 20 ppm inhalation-mouse TCLo/6 hour(s) 6-15 day(s) pregnant female continuous; 5 mg/kg intraperitoneal-mouse TDLo 1 day(s) male; 219 mg/kg intraperitoneal-mouse TDLo 14 day(s) pregnant female continuous; 1100 mg/kg subcutaneous-mouse TDLo 12 day(s) pregnant female continuous; 7030 mg/kg subcutaneous-mouse TDLo 12-13 day(s) pregnant female continuous; 13200 ug/kg intravenous-mouse TDLo 13-16 day(s) pregnant female continuous; 4 gm/kg parenteral-mouse TDLo 12 day(s) pregnant female continuous; 1 gm/m3 inhalation-rabbit TCLo/24 hour(s) 7-20 day(s) pregnant female continuous; 1 gm/m3 inhalation-rabbit TCLo/24 hour(s) 7-20 day(s) pregnant female continuous; 500 ppm inhalation-rabbit TCLo/7 hour(s) 6-18 day(s) pregnant female continuous

ADDITIONAL DATA: May cross the placenta. Alcohol may enhance the toxic effects. Interactions with drugs may occur.
Use of stimulants such as epinephrine may cause cardiac arrhythmias.

HEALTH EFFECTS:
INHALATION:
ACUTE EXPOSURE:
GASOLINE, AUTOMOTIVE, UNLEADED: 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.

BENZENE: Concentrations of 3000 ppm may cause respiratory tract irritation; more severe exposures may result in pulmonary edema. Systemic effects are mainly on the central nervous system and depend on exposure time and concentration. No effects were noted at 25 ppm for 8 hours; signs of intoxication began at 50-150 ppm within 5 hours; at 500-1500 ppm, within 1 hour; were severe at 7500 ppm, within 30-60 minutes; and 20,000 ppm was 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, confusion, ataxia, staggering, weak, rapid pulse, chest pain and tightness with breathlessness, pallor, cyanosis of the lips and fingertips, 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 hyperreflexia, sometimes preceded by convulsions. Recovery depends on the severity of exposure. Polyneuritis may occur and there may be persistent nausea, anorexia, muscular weakness, headache, drowsiness, insomnia, and agitation. Nervous irritability, breathlessness, and unsteady gait may persist for 2-3 weeks; a peculiar skin color and cardiac distress may persist for 4 weeks. Liver and kidney effects may occur, but are usually mild, temporary impairments. Chromosomal damage has been found after exposure to toxic levels. Although generally hematotoxicity is not a significant concern in acute exposure, delayed hematological effects, including anemia and thrombocytopenia, have been reported, as have petechial hemorrhages, spontaneous internal bleeding and secondary infections. In fatal exposures, death may be due to asphyxia, 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.

CHRONIC EXPOSURE:

GASOLINE, AUTOMOTIVE, UNLEADED: 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: 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. Sore, dry throat, weakness, lethargy, malaise, drowsiness, nervousness, and irritability have also been reported. Later there may be dyspnea, pallor, slightly increased temperature, decreased blood pressure, rapid pulse, palpitations, 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. Several case reports, one of them an acute exposure, suggest the possibility that systemic exposure may be associated with retrobulbar or optic neuritis. Occasionally hemorrhages in retina and conjunctiva occur and rarely neuroretinal edema and papilledema have accompanied the retinal hemorrhages. Hematological 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 morphological, functional and quantitative platelet alteration with resultant bleeding from the nose and gums, easy bruising and petechiae; leukopenia with predominant lymphocytopenia or neutropenia; and anemia which may be normochromic or macrocytic and hypochromic. Extramedullary hematopoiesis, splenomegaly, circulating immature marrow cells, and an initial increase in leukocytes, erythrocytes and platelets have also been reported. The bone marrow may be hyper-, hypo- or normoplastic and does not always correlate with the peripheral blood picture. 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. Decreased erythrocyte survival, hemolysis, capillary fragility, internal hemorrhages, iron metabolism disturbances, and hyperbilirubinemia have also been reported. Exposure to high levels for longer periods may result in aplasia and fatty degeneration of the bone marrow with pancytopenia. The most serious cases of aplastic anemia may be fatal due to hemorrhage and infection; death may occur within 3 months of diagnosis. 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. Numerous case reports and series have suggested a relationship between exposure to benzene and the occurrence of various types of leukemia. Several case-control studies have also shown increased odds ratios for exposure to benzene, but mixed exposure patterns and poorly defined exposures render their interpretation difficult. Three independent cohort studies have demonstrated an increased incidence of acute nonlymphocytic leukemia in workers exposed to benzene. Several studies have also suggested a link between occupational exposure and multiple myeloma and lymphoma, both Hodgkin's and nonhodgkin's.

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 being 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. Exposed mice exhibited a tendency toward induction of lymphoid neoplasms. Rats exhibited an increased incidence of neoplasms, mainly carcinomas, at various sites. Menstrual disturbances have been reported more frequently in exposed women. Testicular damage has been reported in rats, rabbits and guinea pigs. Some animal studies have demonstrated embryo/fetotoxicity, sometimes at levels as low as 10 ppm and the potential for teratogenic effects such as decreased body weight and skeletal variants, have also been shown. Other studies have not produced any abnormalities or embryolethality.

SKIN CONTACT:

ACUTE EXPOSURE:

GASOLINE, AUTOMOTIVE, UNLEADED: 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.

BENZENE: Direct contact may cause irritation. Effects may include erythema, a burning sensation, and with prolonged contact, blistering and edema. Under normal conditions, significant signs of systemic toxicity are unlikely from skin contact alone due to the slow rate of absorption. It may however, contribute to the toxicity from inhalation. Application to guinea pigs resulted in increased dermal permeability.

CHRONIC EXPOSURE:

GASOLINE, AUTOMOTIVE, UNLEADED: 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: 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. Peripheral neuritis has also been reported. Secondary infections may occur. Tests on guinea pigs indicate sensitization is possible. Although animal studies have failed to establish a relationship between skin contact and a carcinogenic effect, most of the studies were inadequate; some papillomas and hematopoietic effects have been reported.

EYE CONTACT:

ACUTE EXPOSURE:

GASOLINE, AUTOMOTIVE, UNLEADED: 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.

BENZENE: May cause irritation. Vapor concentrations of 3000 ppm are very irritating, even on brief exposure. Droplets cause a moderate burning sensation, but only a slight, transient corneal epithelial injury with rapid recovery.

CHRONIC EXPOSURE:

GASOLINE, AUTOMOTIVE, UNLEADED: Repeated or prolonged exposure may cause conjunctivitis and possible gradual, irreversible loss of corneal and conjunctival sensitivity.

BENZENE: Repeated or prolonged exposure may cause conjunctivitis. In one study, 50% of rats exposed to 50 ppm for more than 600 hours developed cataracts.

INGESTION:

ACUTE EXPOSURE:

GASOLINE, AUTOMOTIVE, UNLEADED: Lung damage may occur if aspirated into the lungs and may be fatal. Symptoms may include coughing, difficulty breathing, cyanosis, and pulmonary edema. 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. 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.

BENZENE: Lung damage may occur if aspirated into the lungs and may be

fatal. Symptoms may include coughing, difficulty breathing, cyanosis, and pulmonary edema. May cause local irritation and burning sensation in the mouth, throat and stomach, and hemorrhagic inflammatory lesions of the mucous membranes in contact with the liquid. Signs and symptoms of systemic intoxication may include nausea, vomiting, headache, dizziness, weakness, staggering, chest pain and tightness, shallow, rapid pulse and respiration, breathlessness, pallor followed by flushing, and a fear of impending death. There may be visual disturbances, tremors, convulsions, ventricullar irregularities, and paralysis. Excitement, euphoria or delirium may precede weariness, fatigue, sleepiness and followed by stupor and unconsciousness, coma and death from respiratory failure. Those who survive the central nervous system effects may develop bronchitis, pneumonia, pulmonary edema, and intrapulmonary 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:

GASOLINE, AUTOMOTIVE, UNLEADED: No data available.

BENZENE: Daily administration to humans of 2-5 grams in olive oil caused headache, vertigo, bladder irritability, impotence, gastric disturbances, and evidence of renal congestion. In female rats treated with 132 single daily doses over 187 days, no effects were observed at 1 mg/kg. There was slight leukopenia at 10 mg/kg and both leukopenia and anemia were seen at 50 and 100 mg/kg. Oral administration to rats and mice at various dose levels induced neoplasms at multiple sites in males and females. 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. There were other tumor types also reported. Reproductive effects have been reported in animals.

SECTION 12 ECOLOGICAL INFORMATION

Not available

SECTION 13 DISPOSAL CONSIDERATIONS

Subject to disposal regulations: U.S. EPA 40 CFR 262. Hazardous Waste Number(s): D001. Hazardous Waste Number(s): D018. Dispose of in accordance with U.S. EPA 40 CFR 262 for concentrations at or above the Regulatory level. Regulatory level- 0.5 mg/L. Dispose in accordance with all applicable regulations.

SECTION 14 TRANSPORT INFORMATION

U.S. DOT 49 CFR 172.101:
PROPER SHIPPING NAME: Gasoline
ID NUMBER: UN1203
HAZARD CLASS OR DIVISION: 3
PACKING GROUP: II

CANADIAN TRANSPORTATION OF DANGEROUS GOODS:
SHIPPING NAME: Gasoline
ID NUMBER: UN1203
CLASSIFICATION: 3
PACKING GROUP: II

LAND TRANSPORT ADR/RID:
PROPER SHIPPING NAME: Motor spirit or gasoline or petrol/Gasoline
UN NUMBER: UN1203
ADR/RID CLASS: 3
CLASSIFICATION CODE: F1
PACKING GROUP: III/II

AIR TRANSPORT IATA/ICAO:
PROPER SHIPPING NAME: Gasoline
UN/ID NUMBER: UN1203
IATA/ICAO CLASS: 3
PACKING GROUP: II

MARITIME TRANSPORT IMDG:
PROPER SHIPPING NAME: Gasoline
UN NUMBER: UN1203
IMDG CLASS: 3
PACKING GROUP: II

SECTION 15 REGULATORY INFORMATION

U.S. REGULATIONS:
CERCLA SECTIONS 102a/103 HAZARDOUS SUBSTANCES (40 CFR 302.4):
Benzene: 10 LBS RQ

SARA TITLE III SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355.30):
Not regulated.

SARA TITLE III SECTION 304 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355.40):
Not regulated.

SARA TITLE III SARA SECTIONS 311/312 HAZARDOUS CATEGORIES (40 CFR 370.21):
ACUTE: Yes
CHRONIC: Yes
FIRE: Yes
REACTIVE: No
SUDDEN RELEASE: No

SARA TITLE III SECTION 313 (40 CFR 372.65):
Benzene

OSHA PROCESS SAFETY (29CFR1910.119): Not regulated.

STATE REGULATIONS:
California Proposition 65:
Known to the state of California to cause the following:
Benzene
Cancer (Feb 27, 1987)
Developmental toxicity (Dec 26, 1997)
Male reproductive toxicity (Dec 26, 1997)

CANADIAN REGULATIONS:
WHMIS CLASSIFICATION: Not determined.

EUROPEAN REGULATIONS:
EC CLASSIFICATION (ASSIGNED):
Xn Harmful
Carcinogen Category 2

EC Classification may be inconsistent with independently-researched data.

DANGER/HAZARD SYMBOL:
T Toxic

EC RISK AND SAFETY PHRASES:

R 45	May cause cancer.
R 65	Harmful: may cause lung damage if swallowed.
S 45	In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).
S 53	Avoid exposure - obtain special instructions before use.

CONCENTRATION LIMITS:

C>=10%	T	R 45-65
0.1%<=C<10%	T	R 45

NATIONAL INVENTORY STATUS:
U.S. INVENTORY (TSCA): Listed on inventory.

TSCA 12(b) EXPORT NOTIFICATION: Not listed.

SECTION 16 OTHER INFORMATION

MSDS SUMMARY OF CHANGES
SECTION 8 EXPOSURE CONTROLS, PERSONAL PROTECTION
SECTION 11 TOXICOLOGICAL INFORMATION

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Liqui-Nox ®

MATERIAL SAFETY DATA SHEET

Alconox, Inc.
30 Glenn Street

White Plains, NY 10603

24 Hour Emergency Number – Chem-Tel (800) 255-3924

I. IDENTIFICATION

Product Name (as appears on label)	LIQUI-NOX
CAS Registry Number:	Not Applicable
January 1, 2001	
Chemical Family:	Anionic Liquid Detergent
Manufacturer Catalog Numbers for sizes	1232, 1201, 1215 and 1255

II. HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

There are no hazardous ingredients in LIQUI-NOX" as defined by the OS

III. PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point (F):	214°F
Vapor Pressure (mm Hg):	No Data
No Data	
Specific Gravity (Water=1):	1.075
Melting Point:	Not Applicable
Evaporation Rate (Butyl Acetate=1):	Slower
Solubility in Water:	Completely soluble in all proportions.
Appearance:	Yellow liquid, nearly odorless

IV. FIRE AND EXPLOSION DATA

None (Cleveland Open Cup)

LEL: No Data

UEL: No Data

Extinguishing Media:

Special Fire fighting Procedures:

Unusual Fire and Explosion Hazards:

Conditions To Avoid:

Incompatibility (Materials To Avoid):

Hazardous Decomposition or Byproducts:

Health Hazards (Acute and Chronic):

Carcinogenicity:

Signs and Symptoms of Exposure:

Medical Conditions Generally Aggravated by Exposure:

Emergency and First Aid Procedures:

Waste Disposal Method:	
Precautions to be Taken in Storing and Handling:	No special requirements other than the good industrial hygiene and safety practices employed with any industrial chemical.

VIII. CONTROL MEASURES

Respiratory Protection (Specify Type):	Not Required
Ventilation:	Special-Not Required
	Mechanical-Not Required
	Other-Not Required
Protective Gloves:	Impervious gloves are recommended.
Eye Protection:	Goggles and/or splash shields are recommended.
Other Protective Clothing or	Not required

Equipment:

Work/Hygienic Practices: No special practices required

THE INFORMATION HEREIN IS GIVEN IN GOC

Material Safety Data Sheet

Section 1. Product and Company Identification

Product Name Methanol

Product Code VW4300

Effective Date 7/12/2001

A Division of EM Industries
P.O. Box 70
480 Democrat Road
Gibbstown, N.J. 08027

For More Information Call
856-423-6300 Technical Service
Monday-Friday: 8:00 AM - 5:00 PM

In Case of Emergency Call
800-424-9300 CHEMTREC (USA)
613-996-6666 CANUTEC (Canada)
24 Hours/Day: 7 Days/Week

Material Uses Analytical reagent.

Chemical Family Alcohol. (Solvent.)

Section 2. Composition and Information on Ingredients

Component	CAS #	% by Weight
METHANOL	67-56-1	100

Section 3. Hazards Identification

and Appearance

Emergency DANGER!

FLAMMABLE LIQUID AND VAPOR.
VAPOR MAY CAUSE FLASH FIRE.
MAY BE FATAL IF SWALLOWED.
MAY CAUSE BLINDNESS IF SWALLOWED.
CANNOT BE MADE NON-POISONOUS
HARMFUL IF INHALED OR ABSORBED THROUGH SKIN.
CAUSES RESPIRATORY TRACT, EYE AND SKIN IRRITATION.
CONTAINS MATERIAL WHICH CAUSES DAMAGE TO THE FOLLOWING ORGANS: GASTROINTESTINAL TRACT, RESPIRATORY TRACT, SKIN, EYES, CENTRAL NERVOUS SYSTEM, EYE, LENS OR CORNEA

Routes of Entry Absorbed through skin. Dermal contact. Eye contact. Inhalation. Ingestion.

Effects

Eyes Hazardous in case of eye contact (irritant). Inflammation of the eye is characterized by redness, watering, and

Skin Hazardous in case of skin contact (permeator, irritant). Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Inhalation Hazardous in case of inhalation (lung irritant).

Ingestion Extremely hazardous in case of ingestion. May be fatal or cause blindness if swallowed.

Effects

Carcinogenic This material is not known to cause cancer in animals or Additional information See Toxicological Information

Medical Conditions Aggravated by Repeated exposure to a highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

Section 4. First Aid Measures

Eye Contact	Check for and remove any contact lenses. Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. Cold water may be used. Get medical attention immediately.
Skin Contact	In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Cold water may be used.Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.
Inhalation	If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately. If swallowed, do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.

Section 5. Fire Fighting Measures

the Product	
Auto-ignition Temperature	464.05°C (867.3°F)
Flash Points	OPEN CUP: 15.9°C (60.6°F).
Flammable Limits	LOWER: 6% UPPER: 36.5%
Products of	These products are carbon oxides (CO, CO2).
Fire Hazards in Presence of Substances	Highly flammable in presence of open flames, sparks and static discharge, of shocks, of heat, of oxidizing
Explosion	Risks of explosion of the product in presence of static
Presence of Various	Highly flammable in presence of open flames, sparks and static discharge.
Substances	Highly explosive in presence of open flames, sparks and static discharge.
	Risks of explosion of the product in presence of mechanical Highly flammable in presence of shocks. Highly explosive in presence of shocks.
Fire Fighting Media and Instructions	Flammable liquid, soluble or dispersed in water. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use alcohol foam, water spray or fog. Cool containing vessels with water jet in order to prevent pressure build-up, autoignition or explosion.
Protective	Be sure to use an approved/certified respirator or
Special Remarks on Fire Hazards	Dangerous fire and explosion risk. Container explosion may occur under fire conditions or when heated. Vapor may travel considerable distance to source of ignition and flash
Special Remarks on Explosion	Not available.

Section 6. Accidental Release Measures

Small Spill and Leak	Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal

Large Spill and Leak	Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Do not touch spilled material. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.
Spill Kit Information	The following EM SCIENCE SpillSolv (TM) absorbent is recommended for this product: SX1330 Solvent

Section 7. Handling and Storage

Handling	Keep away from heat, sparks and flame. Keep container closed. Do not ingest. Do not get in eyes, on skin, or on clothing. Avoid breathing vapors or spray mists.
Storage	Keep container in a cool, well-ventilated area.

Section 8. Exposure Controls/Personal Protection

Engineering Controls	Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station
Personal	
Eyes	Splash goggles.
Body	Lab coat.
Respiratory	Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate.
Feet	Not applicable.
Personal Protection in Case of a Large Spill	Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self-contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Product Name	Exposure Limits
METHANOL	ACGIH (United States, 1994). Skin TWA: 262 mg/m3 STEL: 328 mg/m3 OSHA (United States, 1989). Skin TWA: 260 mg/m3 STEL: 325 mg/m3 ACGIH (United States, 1994). Skin STEL: 328 mg/m3 STEL: 250 ppm TWA: 262 mg/m3 TWA: 200 ppm NIOSH REL (United States, 1994). Skin STEL: 325 mg/m3 STEL: 250 ppm TWA: 260 mg/m3 Period: 10 hour(s). TWA: 200 ppm Period: 10 hour(s). OSHA Final Rule (United States, 1989). Skin STEL: 325 mg/m3 STEL: 250 ppm

TWA: 260 mg/m3
TWA: 200 ppm

Section 9. Physical and Chemical Properties

Odor	Characteristic. Alcohol like.
Physical State and Appearance	Liquid. (Colorless.)
Molecular Weight	32.05 g/mole
Formula	
Boiling/Condensation Point	64.55°C (148.2°F)
Melting/Freezing Point	-97.72°C (-143.9°F)
Specific Gravity	0.792 (Water = 1)
Vapor Pressure	12.9 kPa (97 mmHg) (@ 20°C)
Volatility	99.9% (v/v).
Odor Threshold	100 ppm
Evaporation Rate	5.91 compared to (n-BUTYL ACETATE=1)
LogKow	Not available.
Dispersion Properties	See solubility in water.
Solubility	Soluble in water.
Stability and Reactivity	The product is stable.
Conditions of	Not available.
Incompatibility with Various	Highly reactive with oxidizing agents. Reactive with metals, acids.
Rem/Incompatibility	Not available.
Decomposition	
Hazardous Polymerization	Will not occur.

Section 11. Toxicological Information

RTECS Number:	Methanol PC1400000
Toxicity	Acute oral toxicity (LD50): 5628 mg/kg [Rat]. Acute dermal toxicity (LD50): 15800 mg/kg [Rabbit]. Acute toxicity of the vapor (LC50): 64000 ppm 4 hour(s)
Chronic Effects on Humans	Not available.
Acute Effects on Humans	Hazardous in case of eye contact (irritant). Inflammation of the eye is characterized by redness, watering, and itching. Hazardous in case of skin contact (permeator, irritant). Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering. Hazardous in case of inhalation (lung irritant). Extremely hazardous in case of ingestion. May be fatal if swallowed.
Products (Toxico Irritancy	Draize Test (Rabbit): Skin: 20 mg/24h. Reaction: Moderate. Draize Test (Rabbit) Eye: 100 mg/24h moderate

Carcinogenic	This material is not known to cause cancer in animals or
Toxicity to Reproductive	Tests on laboratory animals for reproductive effects are cited in Registry of Toxic Effects on Chemical Substances
Teratogenic Effects	Not available.
Mutagenic Effects	Tests on laboratory animals for mutagenic effects are cited in Registry of Toxic Effects of Chemical Substances (RTECS).

Section 12. Ecological Information

BOD5 and COD	Not available.
Toxicity of the Biodegradation	The products of degradation are less toxic than the product

Section 13. Disposal Considerations

Treatment	Incineration, fuels blending or recycle. Contact your local permitted waste disposal site (TSD) for permissible treatment sites. Always contact a permitted waste disposal (TSD) to assure compliance with all current local, state, and Federal Regulations.
DOT Classification	Not available.
TDG	Not available.
IMO/IMDG Classification	Not available.
ICAO/IATA	Not available.

Section 15. Regulatory Information

U.S. Federal Regulations	TSCA 8(b) inventory: METHANOL SARA 302/304/311/312 extremely hazardous substances: No products were found. SARA 302/304 emergency planning and notification: No products were found. SARA 302/304/311/312 hazardous chemicals: METHANOL SARA 311/312 MSDS distribution - chemical inventory - hazard identification: METHANOL: Fire Hazard, Immediate (Acute) Health Hazard, Delayed (Chronic) Health Hazard SARA 313 toxic chemical notification and release reporting: Clean Water Act (CWA) 307: No products were found. Clean Water Act (CWA) 311: No products were found. Clean air act (CAA) 112 accidental release prevention: No products were found. Clean air act (CAA) 112 regulated flammable substances: No products were found. Clean air act (CAA) 112 regulated toxic substances: No products were found.
WHMIS (Canada)	CLASS B-2: Flammable liquid with a flash point lower than 37.8°C (100°F).

Class D-1A: Material causing immediate and serious toxic effects (VERY TOXIC).

Class D-2B: Material causing other toxic effects (TOXIC).
CEPA DSL: METHANOL

Regulations

EINECS	METHANOL 200-659-6
DSCL (EEC)	R11- Highly flammable. R23/24/25- Toxic by inhalation, in contact with skin and if R39/23/24/25- Toxic: danger of very serious irreversible effects through inhalation, in contact with skin and if
International Lists	Australia (NICNAS): METHANOL Japan (MITI): METHANOL Korea (TCCL): METHANOL Philippines (RA6969): METHANOL China: No products were found.
State Regulations	Pennsylvania RTK: METHANOL: (environmental hazard, generic environmental hazard) Massachusetts RTK: METHANOL California prop. 65: No products were found.

National Fire Protection Association (U.S.A.)

	3	Fire Hazard
Health	1	0 Reactivity
		Specific Hazard

Last Revision

The statements contained herein are based upon technical data that EM Industries believes to be reliable, are offered for information purposes only and as a guide to the appropriate precautionary and emergency handling of the material by a properly trained person having the necessary technical skills. Users should consider these data only as a supplement to other information gathered by them and must make independent determinations of suitability and completeness of information from all sources to assure proper use, storage and disposal of these materials and the safety and health of employees and customers and the protection of the environment. EM INDUSTRIES MAKES NO REPRESENTATION OR WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING MERCHANTABILITY OR FITNESS FOR A PARTICULAR USE, WITH RESPECT TO THE INFORMATION HEREIN OR THE PRODUCT TO WHICH THE INFORMATION REFERS.

OHS40068

SECTION 1 CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

MDL INFORMATION SYSTEMS, INC.
1281 Murfreesboro Road, Suite 300
Nashville, TN 37217-2423
1-615-366-2000

EMERGENCY TELEPHONE NUMBER:
1-800-424-9300 (NORTH AMERICA)
1-703-527-3887 (INTERNATIONAL)

SUBSTANCE: HYDROCHLORIC ACID SOLUTIONS, CONCENTRATED

TRADE NAMES/SYNONYMS:
HYDROCHLORIC ACID 5 N; HYDROCHLORIC ACID 10 N; UN 1789; OHS40068; RTECS MW4025000

CHEMICAL FAMILY: aqueous

CREATION DATE: Jul 09 1985
REVISION DATE: Sep 16 2002

SECTION 2 COMPOSITION, INFORMATION ON INGREDIENTS

COMPONENT: HYDROCHLORIC ACID
CAS NUMBER: 7647-01-0
EC NUMBER (EINECS): 231-595-7
PERCENTAGE: 18.2-36.5

COMPONENT: WATER
CAS NUMBER: 7732-18-5
EC NUMBER (EINECS): 231-791-2
PERCENTAGE: 64.5-81.8

SECTION 3 HAZARDS IDENTIFICATION

NFPA RATINGS (SCALE 0-4): HEALTH=3 FIRE=0 REACTIVITY=0

EMERGENCY OVERVIEW:
COLOR: colorless
PHYSICAL FORM: liquid
MAJOR HEALTH HAZARDS: respiratory tract burns, skin burns, eye burns, mucous membrane burns
PHYSICAL HAZARDS: May react on contact with water. Releases toxic, corrosive, flammable or explosive gases.

POTENTIAL HEALTH EFFECTS:
INHALATION:
SHORT TERM EXPOSURE: burns
LONG TERM EXPOSURE: burns
SKIN CONTACT:
SHORT TERM EXPOSURE: burns
LONG TERM EXPOSURE: burns
EYE CONTACT:
SHORT TERM EXPOSURE: burns
LONG TERM EXPOSURE: burns
INGESTION:
SHORT TERM EXPOSURE: burns
LONG TERM EXPOSURE: burns

CARCINOGEN STATUS:
OSHA: No
NTP: No
IARC: No

SECTION 4 FIRST AID MEASURES

INHALATION: If adverse effects occur, remove to uncontaminated area. Give artificial respiration if not breathing. If breathing is difficult, oxygen should be administered by qualified personnel. Get immediate medical attention.

SKIN CONTACT: Wash skin with soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get immediate medical attention. Thoroughly clean and dry contaminated clothing and shoes before reuse. Destroy contaminated shoes.

EYE CONTACT: Immediately flush eyes with plenty of water for at least 15 minutes. Then get immediate medical attention.

INGESTION: Contact local poison control center or physician immediately. Never make an unconscious person vomit or drink fluids. Give large amounts of water or milk. Allow vomiting to occur. When vomiting occurs, keep head lower than hips to help prevent aspiration. If person is unconscious, turn head to side. Get medical attention immediately.

NOTE TO PHYSICIAN: For inhalation, consider oxygen. Avoid gastric lavage or emesis.

SECTION 5 FIRE FIGHTING MEASURES

FIRE AND EXPLOSION HAZARDS: Negligible fire hazard.

EXTINGUISHING MEDIA: regular dry chemical, carbon dioxide, water, regular foam

Large fires: Use regular foam or flood with fine water spray.

FIRE FIGHTING: Move container from fire area if it can be done without risk. Cool containers with water spray until well after the fire is out. Stay away from the ends of tanks. Use extinguishing agents appropriate for surrounding fire. Do not get water directly on material. Large fires: Flood with fine water spray. Reduce vapors with water spray. Cool containers with water spray until well after the fire is out. Apply water from a protected location or from a safe distance. Avoid inhalation of material or combustion by-products. Stay upwind and keep out of low areas.

FLASH POINT: No data available.

SECTION 6 ACCIDENTAL RELEASE MEASURES

OCCUPATIONAL RELEASE:
Notify Local Emergency Planning Committee and State Emergency Response Commission for release greater than or equal to RQ (U.S. SARA Section 304). If release occurs in the U.S. and is reportable under CERCLA Section 103, notify the National Response Center at (800)424-8802 (USA) or (202)426-2675 (USA).

SECTION 7 HANDLING AND STORAGE

STORAGE: Store and handle in accordance with all current regulations and standards. Notify State Emergency Response Commission for storage or use at amounts greater than or equal to the TPQ (U.S. EPA SARA Section 302). SARA Section 303 requires facilities storing a material with a TPQ to participate in local emergency response planning (U.S. EPA 40 CFR 355.30). Protect from physical damage. Store in a cool, dry place. Store in a well-ventilated area.

SECTION 8 EXPOSURE CONTROLS, PERSONAL PROTECTION

EXPOSURE LIMITS:
HYDROCHLORIC ACID:
HYDROGEN CHLORIDE (HYDROCHLORIC ACID):
5 ppm (7 mg/m3) OSHA ceiling
5 ppm ACGIH ceiling
5 ppm (7 mg/m3) NIOSH recommended ceiling
7.6 mg/m3 (5 ml/m3) DFG MAK (peak limitation category - I, with excursion

factor of 1)
10 ppm (15 mg/m3) EC OEL STEL
5 ppm (8 mg/m3) EC OEL TWA
5 ppm (8 mg/m3) UK OES STEL (gas) (mist)
1 ppm (2 mg/m3) UK OES TWA (gas) (mist)

MEASUREMENT METHOD: Silica gel tube; Sodium bicarbonate/Sodium carbonate; Ion chromatography; NIOSH IV # 7903, Inorganic Acids

VENTILATION: Provide local exhaust or process enclosure ventilation system. Ensure compliance with applicable exposure limits.

EYE PROTECTION: Wear splash resistant safety goggles with a faceshield. Provide an emergency eye wash fountain and quick drench shower in the immediate work area.

CLOTHING: Wear appropriate chemical resistant clothing.

GLOVES: Wear appropriate chemical resistant gloves.

RESPIRATOR: The following respirators and maximum use concentrations are drawn from NIOSH and/or OSHA.
50 ppm
Any chemical cartridge respirator with cartridge(s) providing protection against this substance.
Any air-purifying respirator with a full facepiece and a canister providing protection against this substance.
Any powered, air-purifying respirator with cartridge(s) providing protection against this substance.
Any supplied-air respirator.
Any self-contained breathing apparatus with a full facepiece.
Escape -
Any air-purifying respirator with a full facepiece and an acid gas canister.
Any appropriate escape-type, self-contained breathing apparatus.
For Unknown Concentrations or Immediately Dangerous to Life or Health -
Any supplied-air respirator with full facepiece and operated in a pressure-demand or other positive-pressure mode in combination with a separate escape supply.
Any self-contained breathing apparatus with a full facepiece.

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE: liquid
COLOR: colorless
ODOR: Not available
MOLECULAR FORMULA: H-CL
BOILING POINT: decomposes

FREEZING POINT: 5 to -13 F (-15 to -25 C)
VAPOR PRESSURE: 4.0 atm @ 17.8 C
VAPOR DENSITY (air=1): 1.268
SPECIFIC GRAVITY (water=1): 1.1-1.2
WATER SOLUBILITY: soluble
PH: <1
VOLATILITY: Not available
ODOR THRESHOLD: Not available
EVAPORATION RATE: >1 (ether=1)
COEFFICIENT OF WATER/OIL DISTRIBUTION: Not available

SECTION 10 STABILITY AND REACTIVITY

REACTIVITY: May react with evolution of heat on contact with water. Stable at normal temperatures and pressure. Releases toxic, corrosive, flammable or explosive gases.

CONDITIONS TO AVOID: Avoid heat, flames, sparks and other sources of ignition. Dangerous gases may accumulate in confined spaces. May ignite or explode on contact with combustible materials.

INCOMPATIBILITIES: cyanides, metals, amines, bases, metal carbide, oxidizing materials, acids, halo carbons, combustible materials, halogens, metal salts

HYDROGEN CHLORIDE (HYDROCHLORIC ACID):
ACETIC ANHYDRIDE: Violent reaction.
ALCOHOLIC HYDROGEN CYANIDE: Explosive reaction.
ALUMINUM: Explosion.
ALUMINUM-TITANIUM ALLOYS: Ignites or incandesces when heated.
2-AMINOETHANOL: Violent reaction.
AMMONIUM HYDROXIDE: Violent reaction.
BASES: Violent reaction.
BRASS: Corrodes.
BRONZE: Corrodes.
CALCIUM CARBIDE: Reacts with incandescence.
CALCIUM HYPOCHLORITE: Ignition.
CESIUM ACETYLIDE: Ignites on contact.
CHLORINE + DINITROANILINES: Vigorous reaction with release of flammable hydrogen gas fumes.
CHLOROSULFONIC ACID: Violent reaction.
1,1-DIFLUOROETHYLENE: Extremely exothermic decomposition reaction.
DOWICIL 100: Decomposes.
ETHYLENE DIAMINE: Violent reaction.
ETHYLENE IMINE: Violent reaction.
FLUORINE: Ignites on contact.
HEXALITHIUM DISILICIDE: Incandescesent.
IRON: Corrodes with evolution of flammable hydrogen gas.

MAGNESIUM BORIDE: Produces a spontaneously flammable gas.
MERCURIC SULFATE: Violent reaction at 125 C.
METAL ACETYLIDES: Violent reaction.
METALS: Severe corrosion with evolution of flammable hydrogen gas.
OLEUM: Violent reaction.
OXIDIZERS (STRONG): Violent reaction.
OXYGEN + PLATINUM: Ignites on contact.
PERCHLORIC ACID: Violent reaction.
PLASTICS, RUBBER, COATINGS: Attacks.
POTASSIUM PERMANGANATE: Explosion hazard.
BETA-PROPIOLACTONE: Violent reaction.
PROPYLENE OXIDE: Violent reaction.
RUBIDIUM ACETYLIDE: Ignites on contact.
SILICA (GEL): Incompatible.
SODIUM: Vigorous or explosive reaction.
SULFURIC ACID: Explosive reaction with release of toxic hydrogen chloride gas.
TETRASELENIUM TETRANITRIDE: Explodes on contact.
VINYL ACETATE: Violent reaction.

HAZARDOUS DECOMPOSITION:
Thermal decomposition products: acid halides

POLYMERIZATION: Will not polymerize.

SECTION 11 TOXICOLOGICAL INFORMATION

HYDROCHLORIC ACID SOLUTIONS, CONCENTRATED:
IRRITATION DATA:
5 mg/30 second(s) rinsed eyes-rabbit mild; 4 percent/24 hour(s) skin-human mild
TOXICITY DATA:
2857 ug/kg oral-man LDLo; 420 ul/kg oral-woman LDLo; 1300 ppm/30 minute(s) inhalation-human LCLo; 3000 ppm/5 minute(s) inhalation-human LCLo; 81 mg/kg unreported-man LDLo; 3124 ppm/1 hour(s) inhalation-rat LC50; 1108 ppm/1 hour(s) inhalation-mouse LC50; 40142 ug/kg intraperitoneal-mouse LD50; 900 mg/kg oral-rabbit LD50; 4413 ppm/30 minute(s) inhalation-rabbit LCLo; 4413 ppm/30 minute(s) inhalation-guinea pig LCLo; 685 ug/m3/24 hour(s)-84 day(s) continuous inhalation-rat TCLo
ACUTE TOXICITY LEVEL:
Moderately Toxic: inhalation, ingestion
MUTAGENIC DATA:
~~DNA repair - Escherichia coli 25 ug/well; sex chromosone loss and non disjunction - Drosophila melanogaster inhalation 100 ppm 24 hour(s); sex~~ chromosone loss and non disjunction - Drosophila melanogaster oral 100 ppm; cytogenetic analysis - grasshopper parenteral 20 mg; cytogenetic analysis - hamster lung 30 mmol/L; cytogenetic analysis - hamster ovary 8 mmol/L

REPRODUCTIVE EFFECTS DATA:
450 mg/m3 inhalation-rat TCLo/1 hour(s) 1 day(s) pre pregnancy continuous

HYDROCHLORIC ACID:
IRRITATION DATA:
5 mg/30 second(s) rinsed eyes-rabbit mild; 4 percent/24 hour(s) skin-human mild
TOXICITY DATA:
2857 ug/kg oral-man LDLo; 420 ul/kg oral-woman LDLo; 1300 ppm/30 minute(s) inhalation-human LCLo; 3000 ppm/5 minute(s) inhalation-human LCLo; 81 mg/kg unreported-man LDLo; 3124 ppm/1 hour(s) inhalation-rat LC50; 1108 ppm/1 hour(s) inhalation-mouse LC50; 40142 ug/kg intraperitoneal-mouse LD50; 900 mg/kg oral-rabbit LD50; 4413 ppm/30 minute(s) inhalation-rabbit LCLo; 4413 ppm/30 minute(s) inhalation-guinea pig LCLo; 685 ug/m3/24 hour(s)-84 day(s) continuous inhalation-rat TCLo
CARCINOGEN STATUS: IARC: Human Inadequate Evidence, Animal Inadequate Evidence, Group 3
LOCAL EFFECTS:
Corrosive: inhalation, skin, eye, ingestion
ACUTE TOXICITY LEVEL:
Moderately Toxic: inhalation, ingestion
MUTAGENIC DATA:
DNA repair - Escherichia coli 25 ug/well; sex chromosone loss and non disjunction - Drosophila melanogaster inhalation 100 ppm 24 hour(s); sex chromosone loss and non disjunction - Drosophila melanogaster oral 100 ppm; cytogenetic analysis - grasshopper parenteral 20 mg; cytogenetic analysis - hamster lung 30 mmol/L; cytogenetic analysis - hamster ovary 8 mmol/L
REPRODUCTIVE EFFECTS DATA:
450 mg/m3 inhalation-rat TCLo/1 hour(s) 1 day(s) pre pregnancy continuous

HEALTH EFFECTS:
INHALATION:
ACUTE EXPOSURE:
HYDROGEN CHLORIDE (HYDROCHLORIC ACID): Inhalation of gas or fumes at levels of 5-35 ppm may cause irritation and burning of the throat, with coughing and choking. Concentrations of 50-100 ppm may be barely tolerable for 1 hour. High levels may cause inflammation, and occasionally ulceration of the nose, throat or larynx, bronchitis, pneumonia, palpitations, and headache. Higher concentrations may cause necrosis of the tracheal and bronchial epithelium, nasoseptal perforation, atelectasis, emphysema, damage to pulmonary blood vessels, and lesions of the liver and other organs. Death may be due to laryngeal spasm, bronchopneumonia or pulmonary edema. Concentrations of 1300-2000 ppm may be dangerous, even on brief exposures. An environmental exposure to hydrochloric acid has resulted in chronic neurobehavioral dysfunction. Reproductive effects have been reported in animals.

CHRONIC EXPOSURE:
HYDROGEN CHLORIDE (HYDROCHLORIC ACID): Repeated or prolonged exposure may

cause erosion and discoloration of exposed teeth, chronic bronchitis, and gastritis.

SKIN CONTACT:

ACUTE EXPOSURE:

HYDROGEN CHLORIDE (HYDROCHLORIC ACID): Contact may cause severe irritation, inflammation, ulceration, necrosis, and chemical burns. Shock symptoms may develop including rapid pulse, sweating and collapse. Photosensitization reactions may occur in persons previously exposed. Contact with compressed gas may cause frostbite.

CHRONIC EXPOSURE:

HYDROGEN CHLORIDE (HYDROCHLORIC ACID): Repeated or prolonged contact with vapors or dilute solutions may cause dermatitis. Photosensitization may occur.

EYE CONTACT:

ACUTE EXPOSURE:

HYDROGEN CHLORIDE (HYDROCHLORIC ACID): Contact may cause severe irritation, conjunctivitis, corneal necrosis, and burns with impairment or permanent loss of vision. A drop of hydrochloric acid splashed in the eye and immediately washed out has produced a white coagulation of the corneal and conjunctival epithelium. Animals exposed to vapor concentrations of 1350 ppm for one and a half hours showed clouding of the cornea. Those exposed to 300 ppm for 6 hours showed slight erosion of the corneal epithelium. Contact with compressed gas may cause frostbite.

CHRONIC EXPOSURE:

HYDROGEN CHLORIDE (HYDROCHLORIC ACID): Animals exposed to vapor at 100 ppm for 6 hours daily, for 50 days, showed only slight unrest and irritation of the eyes, but no ocular injury. Effects are dependent upon concentration and duration of exposure. Conjunctivitis or effects similar to those for acute exposure may occur.

INGESTION:

ACUTE EXPOSURE:

HYDROGEN CHLORIDE (HYDROCHLORIC ACID): Ingestion of the acid may cause burns of the mouth, throat, esophagus, and stomach with consequent pain, uneasiness, nausea, salivation, vomiting, diarrhea, chills, shock, and intense thirst. Nephritis, fever, perforation of the intestinal tract, and circulatory collapse may occur. Death may be due to esophageal or gastric necrosis.

CHRONIC EXPOSURE:

HYDROGEN CHLORIDE (HYDROCHLORIC ACID): No data available.

SECTION 12 ECOLOGICAL INFORMATION

ECOTOXICITY DATA:
FISH TOXICITY: 21900 ug/L 96 hour(s) LC50 (Mortality) Fathead minnow (Pimephales promelas)

INVERTEBRATE TOXICITY: 560 ug/L 48 hour(s) EC50 (Immobilization) Water flea (Daphnia magna)

ALGAL TOXICITY: 800 ug/L 1600 week(s) EC50 (Population Size Reduction) Green algae (Chlorella pyrenoidosa)

PHYTOTOXICITY: 1000 ug/L 4-48 week(s) (Residue) Water-hyacinth (Eichhornia crassipes)

FATE AND TRANSPORT:
BIOCONCENTRATION: 1000 M 24 week(s) BCF (Residue) Blue-green algae (Coccochloris sp) 1E-6.5 M

SECTION 13 DISPOSAL CONSIDERATIONS

Dispose in accordance with all applicable regulations.

SECTION 14 TRANSPORT INFORMATION

U.S. DOT 49 CFR 172.101:
PROPER SHIPPING NAME: Hydrochloric acid
ID NUMBER: UN1789
HAZARD CLASS OR DIVISION: 8
PACKING GROUP: II

CANADIAN TRANSPORTATION OF DANGEROUS GOODS: No classification assigned.

LAND TRANSPORT ADR/RID:
PROPER SHIPPING NAME: Hydrochloric acid
UN NUMBER: UN1789
ADR/RID CLASS: 8
CLASSIFICATION CODE: C1
PACKING GROUP: II

AIR TRANSPORT IATA/ICAO:
PROPER SHIPPING NAME: Hydrochloric acid/Hydrochloric acid solution
UN/ID NUMBER: UN1789
IATA/ICAO CLASS: 8
PACKING GROUP: II

MARITIME TRANSPORT IMDG:
PROPER SHIPPING NAME: Hydrochloric acid
UN NUMBER: UN1789
IMDG CLASS: 8
PACKING GROUP: II

SECTION 15 REGULATORY INFORMATION

U.S. REGULATIONS:
CERCLA SECTIONS 102a/103 HAZARDOUS SUBSTANCES (40 CFR 302.4):
HYDROGEN CHLORIDE (HYDROCHLORIC ACID): 5000 LBS RQ (liquid)

SARA TITLE III SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355.30):
HYDROGEN CHLORIDE (HYDROCHLORIC ACID): 500 LBS TPQ (gas)

SARA TITLE III SECTION 304 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355.40):
HYDROGEN CHLORIDE (HYDROCHLORIC ACID): 5000 LBS RQ (gas)

SARA TITLE III SARA SECTIONS 311/312 HAZARDOUS CATEGORIES (40 CFR 370.21):
ACUTE: Yes
CHRONIC: No
FIRE: No
REACTIVE: Yes
SUDDEN RELEASE: No

SARA TITLE III SECTION 313 (40 CFR 372.65):
HYDROGEN CHLORIDE (HYDROCHLORIC ACID): except non-aerosol forms

OSHA PROCESS SAFETY (29CFR1910.119):
HYDROGEN CHLORIDE (HYDROCHLORIC ACID): 5000 LBS TQ (gas)

STATE REGULATIONS:
California Proposition 65: Not regulated.

CANADIAN REGULATIONS:
WHMIS CLASSIFICATION: Not determined.

EUROPEAN REGULATIONS:
EC CLASSIFICATION (ASSIGNED):
T Toxic
C Corrosive

EC Classification may be inconsistent with independently-researched data.

DANGER/HAZARD SYMBOL:
T Toxic

EC RISK AND SAFETY PHRASES:

R 23	Toxic by inhalation.
R 35	Causes severe burns.
S 1/2	Keep locked-up and out of reach of children.
S 9	Keep container in a well-ventilated place.
S 26	In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
S 36/37/39	Wear suitable protective clothing, gloves and eye/face protection.
S 45	In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

CONCENTRATION LIMITS:

C>=5%	T; C	R 23-35
1%<=C<5%	C	R 20-35
0.5%<=C<1%	C	R 20-34
0.2%<=C<0.5%	C	R 34
0.02%<=C<0.2%	Xi	R 36/37/38

GERMAN REGULATIONS:

WATER HAZARD CLASS (WGK):

STATE OF CLASSIFICATION: VwVwS

CLASSIFICATION UNDER HAZARD TO WATER: 1

NATIONAL INVENTORY STATUS:

U.S. INVENTORY (TSCA): Listed on inventory.

TSCA 12(b) EXPORT NOTIFICATION: Not listed.

SECTION 16 OTHER INFORMATION

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OHS16540

SECTION 1 CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

MDL INFORMATION SYSTEMS, INC.
1281 Murfreesboro Road, Suite 300
Nashville, TN 37217-2423
1-615-366-2000

EMERGENCY TELEPHONE NUMBER:
1-800-424-9300 (NORTH AMERICA)
1-703-527-3887 (INTERNATIONAL)

SUBSTANCE: NITRIC ACID, FUMING

TRADE NAMES/SYNONYMS:
NITRIC ACID, RED FUMING; NITROUS FUMES; RFNA; RED FUMING NITRIC ACID; A-202; UN 2032; STCC 4918529; OHS16540; RTECS QU5900000

CHEMICAL FAMILY: acids, inorganic

CREATION DATE: Nov 04 1985
REVISION DATE: Dec 16 2002

SECTION 2 COMPOSITION, INFORMATION ON INGREDIENTS

COMPONENT: NITRIC ACID
CAS NUMBER: 7697-37-2
EC NUMBER (EINECS): 231-714-2
PERCENTAGE: >90.0

COMPONENT: NITROGEN DIOXIDE
CAS NUMBER: 10102-44-0
EC NUMBER (EINECS): 233-272-6
PERCENTAGE: 7.5-12.7

OTHER CONTAMINANTS:
FORMALDEHYDE AND OTHER ORGANIC REDUCING AGENTS

SECTION 3 HAZARDS IDENTIFICATION

NFPA RATINGS (SCALE 0-4): HEALTH=4 FIRE=0 REACTIVITY=1

EMERGENCY OVERVIEW:
COLOR: yellow to red
PHYSICAL FORM: fuming liquid
MAJOR HEALTH HAZARDS: potentially fatal if inhaled, respiratory tract burns,

skin burns, eye burns, mucous membrane burns
PHYSICAL HAZARDS: Strong oxidizer. May ignite or explode on contact with combustible materials. May react on contact with water.

POTENTIAL HEALTH EFFECTS:
INHALATION:
SHORT TERM EXPOSURE: burns, nausea, stomach pain, difficulty breathing, irregular heartbeat, headache, dizziness, bluish skin color, lung damage, death
LONG TERM EXPOSURE: burns, tooth decay, digestive disorders, lung damage
SKIN CONTACT:
SHORT TERM EXPOSURE: irritation (possibly severe)
LONG TERM EXPOSURE: same as effects reported in short term exposure, burns
EYE CONTACT:
SHORT TERM EXPOSURE: irritation (possibly severe), tearing, eye damage
LONG TERM EXPOSURE: same as effects reported in short term exposure, burns
INGESTION:
SHORT TERM EXPOSURE: burns, changes in body temperature, nausea, diarrhea, stomach pain, vomiting
LONG TERM EXPOSURE: burns

CARCINOGEN STATUS:
OSHA: No
NTP: No
IARC: No

SECTION 4 FIRST AID MEASURES

INHALATION: If adverse effects occur, remove to uncontaminated area. Give artificial respiration if not breathing. If breathing is difficult, oxygen should be administered by qualified personnel. Get immediate medical attention.

SKIN CONTACT: Wash skin with soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get immediate medical attention. Thoroughly clean and dry contaminated clothing and shoes before reuse. Destroy contaminated shoes.

EYE CONTACT: Immediately flush eyes with plenty of water for at least 15 minutes. Then get immediate medical attention.

INGESTION: Contact local poison control center or physician immediately. Never make an unconscious person vomit or drink fluids. Give large amounts of water or milk. Allow vomiting to occur. When vomiting occurs, keep head lower than hips to help prevent aspiration. If person is unconscious, turn head to side. Get medical attention immediately.

NOTE TO PHYSICIAN: For inhalation, consider oxygen. Avoid gastric lavage or

emesis.

SECTION 5 FIRE FIGHTING MEASURES

FIRE AND EXPLOSION HAZARDS: Negligible fire hazard. Oxidizer. May ignite or explode on contact with combustible materials.

EXTINGUISHING MEDIA: regular dry chemical, soda ash, water

Large fires: Flood with water. Apply water from a protected location or from a safe distance.

FIRE FIGHTING: Move container from fire area if it can be done without risk. Cool containers with water spray until well after the fire is out. Stay away from the ends of tanks. For fires in cargo or storage area: Cool containers with water from unmanned hose holder or monitor nozzles until well after fire is out. If this is impossible then take the following precautions: Keep unnecessary people away, isolate hazard area and deny entry. Let the fire burn. Flood with water. Cool containers with water spray until well after the fire is out. Apply water from a protected location or from a safe distance. Stay upwind and keep out of low areas. Evacuate if fire gets out of control or containers are directly exposed to fire. Evacuation radius: 800 meters (1/2 mile).

FLASH POINT: No data available.

SECTION 6 ACCIDENTAL RELEASE MEASURES

AIR RELEASE:
Reduce vapors with water spray. Collect runoff for disposal as potential hazardous waste.

SOIL RELEASE:
Trap spilled material at bottom in deep water pockets, excavated holding areas or within sand bag barriers. Dike for later disposal. Absorb with sand or other non-combustible material. Add an alkaline material (lime, crushed limestone, sodium bicarbonate, or soda ash).

WATER RELEASE:
Neutralize.

OCCUPATIONAL RELEASE:
Avoid contact with combustible materials. Do not touch spilled material. Stop leak if possible without personal risk. Reduce vapors with water spray. Do not get water inside container. Small spills: Flood with water. Large spills: Dike

for later disposal. Keep unnecessary people away, isolate hazard area and deny entry. Ventilate closed spaces before entering. Notify Local Emergency Planning Committee and State Emergency Response Commission for release greater than or equal to RQ (U.S. SARA Section 304). If release occurs in the U.S. and is reportable under CERCLA Section 103, notify the National Response Center at (800)424-8802 (USA) or (202)426-2675 (USA).

SECTION 7 HANDLING AND STORAGE

STORAGE: Store and handle in accordance with all current regulations and standards. Notify State Emergency Response Commission for storage or use at amounts greater than or equal to the TPQ (U.S. EPA SARA Section 302). SARA Section 303 requires facilities storing a material with a TPQ to participate in local emergency response planning (U.S. EPA 40 CFR 355.30). NFPA 430 Code for the Storage of Liquid and Solid Oxidizing Materials. Keep separated from incompatible substances.

SECTION 8 EXPOSURE CONTROLS, PERSONAL PROTECTION

EXPOSURE LIMITS:
NITRIC ACID, FUMING:
NITRIC ACID:
2 ppm (5 mg/m3) OSHA TWA
4 ppm (10 mg/m3) OSHA STEL (vacated by 58 FR 35338, June 30, 1993)
2 ppm ACGIH TWA
4 ppm ACGIH STEL
2 ppm (5 mg/m3) NIOSH recommended TWA 10 hour(s)
4 ppm (10 mg/m3) NIOSH recommended STEL
5.2 mg/m3 (2 ml/m3) DFG MAK (peak limitation category - I, with excursion factor of 1)
2 ppm (5.2 mg/m3) UK OES TWA
4 ppm (10 mg/m3) UK OES STEL

MEASUREMENT METHOD: Silica gel tube; Sodium bicarbonate/Sodium carbonate; Ion chromatography; NIOSH IV # 7903, Inorganic Acids

VENTILATION: Provide local exhaust or process enclosure ventilation system. Ensure compliance with applicable exposure limits.

EYE PROTECTION: Wear splash resistant safety goggles with a faceshield. Provide an emergency eye wash fountain and quick drench shower in the immediate work area.

CLOTHING: Wear appropriate chemical resistant clothing.

GLOVES: Wear appropriate chemical resistant gloves.

RESPIRATOR: The following respirators and maximum use concentrations are drawn from NIOSH and/or OSHA.

25 ppm

Any supplied-air respirator operated in a continuous-flow mode.
Any chemical cartridge respirator with a full facepiece and cartridge(s) providing protection against this substance.
Only non-oxidizable sorbents are allowed (not charcoal).
Any air-purifying respirator with a full facepiece and a canister providing protection against this substance.
Only non-oxidizable sorbents are allowed (not charcoal).
Any self-contained breathing apparatus with a full facepiece.
Any supplied-air respirator with a full facepiece.

Escape -

Any air-purifying respirator with a full facepiece and a canister providing protection against this substance.
Only non-oxidizable sorbents are allowed (not charcoal).
Any appropriate escape-type, self-contained breathing apparatus.

For Unknown Concentrations or Immediately Dangerous to Life or Health -

Any supplied-air respirator with full facepiece and operated in a pressure-demand or other positive-pressure mode in combination with a separate escape supply.
Any self-contained breathing apparatus with a full facepiece.

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE: liquid
APPEARANCE: clear
COLOR: yellow to red
PHYSICAL FORM: fuming liquid
ODOR: Not available
MOLECULAR WEIGHT: 63.02
MOLECULAR FORMULA: H-N-O3 AND N-O2
BOILING POINT: 181 F (83 C)
FREEZING POINT: -44 F (-42 C)
VAPOR PRESSURE: 62 mmHg @ 25 C
VAPOR DENSITY (air=1): 2.2
SPECIFIC GRAVITY (water=1): 1.526-1.544
WATER SOLUBILITY: miscible
PH: Not available
VOLATILITY: Not available
ODOR THRESHOLD: <5.0 ppm
EVAPORATION RATE: Not available
COEFFICIENT OF WATER/OIL DISTRIBUTION: Not available
SOLVENT SOLUBILITY:
Soluble: ether

SECTION 10 STABILITY AND REACTIVITY

REACTIVITY: May react with evolution of heat on contact with water.

CONDITIONS TO AVOID: Avoid contact with combustible materials. Keep dry. Dangerous gases may accumulate in confined spaces. Keep out of water supplies and sewers.

INCOMPATIBILITIES: acids, combustible materials, halo carbons, amines, bases, metals, halogens, metal carbide, oxidizing materials, metal salts, metal oxides, reducing agents, cyanides

NITRIC ACID:
ACETIC ACID: Explosive reaction if not kept cold.
ACETIC ACID + ACETONE: Explosive reaction.
ACETIC ANHYDRIDE: Explosive reaction if not kept cold.
ACETONE + SULFURIC ACID: Violent decomposition.
ACETONITRILE: Explosive reaction.
ACETYLENE: Yields trinitromethane, which melts at 15 C; liquid is explosive.
ACROLEIN: Temperature and pressure increase in closed container.
ACRYLONITRILE: Explosive reaction at 90 C.
ALLYL ALCOHOL: Temperature and pressure increase in closed container.
ALLYL CHLORIDE: Temperature and pressure increase in closed container.
2-AMINOETHANOL: Temperature and pressure increase in closed container.
2-AMINOTHIAZOLE + SULFURIC ACID: Possible explosive reaction.
AMMONIA (GAS): Burns in an atmosphere of nitric acid vapor.
AMMONIUM HYDROXIDE: Temperature and pressure increase in closed container.
ANILINE: Ignites spontaneously.
ANION EXCHANGE RESINS: Possible violent exothermic reaction.
ANTIMONY: Violent reaction.
AROMATIC AMINES: Possible ignition reaction.
ARSINE: Explosive reaction.
BENZENE: Explosive reaction.
BENZOTHIOPHENE DERIVATIVES: Formation of possibly explosive compounds.
BISMUTH (POWDERED): Intense exothermic reaction.
BORON: Violent reaction with incandescence.
BORON DECAHYDRATE: Explosive reaction.
BORON PHOSPHIDE: Ignition reaction with possible deflagration.
BROMINE PENTAFLUORIDE: Ignition reaction.
BUTANE THIOL: Violent decomposition.
N-BUTYL MERCAPTAN: Ignition reaction.
N-BUTYRALDEHYDE: Temperature and pressure increase in closed container.
CALCIUM HYPOPHOSPHITE: Ignition reaction.
CARBON (PULVERIZED): Violent reaction.
CELLULOSE: Forms easily combustible ether.
CESIUM CARBIDE: Explosive reaction.

CHLORINE: Incompatible.
4-CHLORO-2-NITROANILINE: Forms explosive compound.
CHLOROSULFONIC ACID: Temperature and pressure increase in closed container.
CROTONALDEHYDE: Violent decomposition with ignition.
CRESOL: Temperature and pressure increase in closed container.
CUMENE: Temperature and pressure increased in closed container.
CUPRIC NITRIDE: Explosive reaction.
CUPROUS NITRIDE: Violent reaction.
CYANATES: Possible explosive reaction.
CYCLIC KETONES: Violent reaction.
CYCLOHEXYLAMINE: Forms explosive solution.
CYCLOHEXANOL: Violent reaction.
CYCLOHEXANONE: Violent reaction.
CYCLOPENTADIENE: Explosive reaction.
1,2-DIAMINOETHANE BISTRIMETHYL GOLD: Explosive reaction.
DIBORANE: Spontaneous ignition.
DICHLOROMETHANE: Forms explosive solution.
DIENE OR ACETYLENE DERIVATIVES: Possible ignition reaction.
DIETHYL ETHER: Intense reaction.
DIISOPROPYL ETHER: Temperature and pressure increase in closed container.
DINITROTOLUENE: Explosive reaction.
DIPHENYL DISTIBENE: Explosive oxidation.
DIPHENYL TINE: Ignition reaction.
2,6-DI-T-BUTYL PHENOL: Forms explosive compound.
DIVINYL ETHER: Possible ignition reaction.
EPICHLOROHYDRIN: Temperature and pressure increase in closed container.
ETHANOL: Violent reaction.
ETHANOL: Forms explosive products.
M-ETHYL ANILINE: Ignition reaction.
ETHYL PHOSPHINE: Ignition reaction.
5-ETHYL-2-PICOLINE: Forms explosive compounds.
5-ETHYL-2-METHYL PYRIDINE: Explosive reaction.
ETHYLENE DIAMINE: Temperature and pressure increase in closed container.
FERROUS OXIDE (POWDERED): Intense exothermic reaction.
FLUORINE: Possible explosive reaction.
FURFURYL ALCOHOL: Ignition reaction.
GERMANIUM: Violent reaction.
GLYOXAL: Temperature and pressure increase in closed container.
HALOGEN PHOSPHIDES: Ignition reaction.
HYDRAZINE: Violent reaction.
HYDRAZOIC ACID: Energetic reaction.
HYDROGEN IODIDE: Ignition reaction.
HYDROGEN PEROXIDE + KETONES: Forms explosive products.
HYDROGEN PEROXIDE + MERCURIC OXIDE: Forms explosive compounds.
HYDROGEN PEROXIDE + THIOUREA: Forms explosive compounds.
HYDROGEN SULFIDE: Incandescent reaction.
INDANE + SULFURIC ACID: Explosive reaction.
ISOPRENE: Temperature and pressure increase in closed container.
LACTIC ACID + HYDROGEN FLUORIDE: Possible explosive reaction.

LITHIUM: Ignition reaction.
LITHIUM SILICIDE: Incandescent reaction.
MAGNESIUM: Explosive reaction.
MAGNESIUM PHOSPHIDE: Incandescent reaction.
MESITYL OXIDE: Temperature and pressure increase in closed container.
MESITYLENE: Possible explosive reaction.
METALS: Violent reaction with explosion or ignition.
METAL CARBIDES: Explosive or violent reaction.
METAL FERRICYANIDE: Incompatible.
METAL FERROCYANIDE: Incompatible.
METAL SALICYLATES: Forms explosive compounds.
METHANOL: Mixtures of greater than 25% acid may decompose violently.
4-METHYLCYCLOHEXANONE: Explosive reaction.
2-METHYL-5-ETHYLPYRIDINE: Temperature/pressure increase in closed container.
NEODYMIUM PHOSPHIDE: Violent reaction.
NITRO AROMATIC HYDROCARBONS: Forms highly explosive products.
NITROBENZENE: Explosive reaction.
NITROBENZENE + WATER: Explosive reaction.
NITROMETHANE: Explosive reaction.
NON-METAL OXIDES: Explosive reaction.
OLEUM: Temperature and pressure increase in closed container.
ORGANIC SUBSTANCES + PERCHLORATES: Possible explosion.
ORGANIC SUBSTANCES + SULFURIC ACID: Possible explosion.
PHENYL ACETYLENE + 1,1-DIMETHYLHYDRAZINE: Violent reaction.
PHENYL ORTHOPHOSPHORIC ACID DISODIUM SALT: Forms explosive products.
PHOSPHINE: Violent decomposition.
PHOSPHONIUM IODIDE: Ignition reaction.
PHOSPHORUS: Ignition reaction.
PHOSPHORUS TETRAIODIDE: Vigorous reaction.
PHOSPHORUS TRICHLORIDE: Explosive reaction.
PHTHALIC ACID + SULFURIC ACID: Possible explosive reaction.
PHTHALIC ANHYDRIDE: Exothermic reaction and forms explosive products.
POLYALKENES: Intense reaction.
POLYDIBROMOSILANES: Explosive reaction.
POTASSIUM HYPOPHOSPHITE: Explosive reaction.
B-PROPIOLACTONE: Temperature and pressure increase in closed container.
PROPYLENE OXIDE: Temperature and pressure increase in closed container.
PYRIDINE: Temperature and pressure increase in closed container.
REDUCING AGENTS: Possible explosive or ignition reaction.
RUBIDIUM CARBIDE: Explosive reaction.
SELENIUM: Intense reaction.
SELENIUM HYDRIDE: Ignition or incandescent reaction.
SELENIUM IODOPHOSPHIDE: Explosive reaction.
SILVER: Explosive reaction.
SODIUM: Spontaneous ignition.
SODIUM AZIDE: Energetic reaction.
SULFAMIC ACID: Violent reaction.
STIBENE: Explosive reaction.
SULFUR DIOXIDE: Explosive reaction.

SULFUR HALIDES: Violent reaction.
SULFURIC ACID: Possible explosive reaction.
SULFURIC ACID + GLYCERIDES: Explosive reaction.
SULFURIC ACID + TEREPHTHALIC ACID: Violent reaction.
TERPENES: Spontaneous ignition.
TETRABORANE: Explosive reaction.
TETRABORANE DECAHYDRATE: Explosive reaction.
THIOALDEHYDES OR THIOKETONES: Violent reaction.
THIOCYANATES: Explosive reaction.
THIOCYANIC ACID METAL SALTS: Explosive reaction.
THIOPHENES: Explosive reaction.
TITANIUM: Forms explosive compound.
TITANIUM ALLOY: Possible explosive reaction.
TITANIUM-MAGNESIUM ALLOY: Possible explosion on impact.
TOLUENE: Intense or explosive reaction.
TOLUENE + SULFURIC ACID: Violent decomposition.
TOLUIDENE: Ignition reaction.
TRIAZINE: Explosive reaction.
TRICADMIUM DIPHOSPHIDE: Explosive reaction.
TRIETHYLGALLIUM MONOETHYL ETHER COMPLEX: Ignition reaction.
TRIMETHYLTRIOXANE: Intense reaction.
TRITHIOACETONE: Explosive reaction.
UNSYMMETRICAL DIMETHYL HYDRAZINE: Explosive reaction.
URANIUM: Explosive reaction.
URANIUM ALLOY: Violent reaction.
URANIUM-NEODYMIUM ALLOY: Explosive reaction.
URANIUM-NEODYMIUM-ZIRCONIUM ALLOY: Explosive reaction.
VINYL ACETATE: Temperature and pressure increase in closed container.
VINYLIDENE CHLORIDE: Temperature and pressure increase in closed container.
P-XYLENE: Intense reaction in presence of sulfuric acid.
ZINC: Incandescent reaction.
ZIRCONIUM-URANIUM ALLOYS: Explosive reaction.

NITROGEN DIOXIDE (NITROGEN TETROXIDE):
ACETIC ANHYDRIDE: Violent explosion.
ACETONITRILE: Possible explosion.
ALCOHOLS: Possible explosion.
ALUMINUM POWDER: Possible ignition.
AMMONIA: Explosive reaction.
BARIUM OXIDE: Intense reaction at 200 C.
BORON TRICHLORIDE: Interaction is energetic.
CALCIUM: Explosive interaction.
CARBON DICHLORIDE: Formation of explosive mixture.
CARBON DISULFIDE: Fire and explosion hazard.
CARBONYL METALS: Combination is hypergolic.
CESIUM ACETYLENE CARBIDE: Ignition at 100 C.
CHLOROFORM: Explosion on impact.
CELLULOSE PERCHLORATE: Possible explosion.
COATINGS: Attacks.

COMBUSTIBLE MATERIALS: Fire and explosion hazard.
CYCLOALKENES: Formation of explosive compound.
CYCLOHEXANE: Violent reaction.
1,2-DICHLOROETHANE: Formation of explosive mixture.
DICHLOROETHYLENE: Formation of explosive compound.
DIFLUOROTRIFLUOROMETHYLPHOSPHINE: Possible ignition.
DIMETHYL SULFOXIDE: Explosive reaction.
ETHYLENE: Formation of unstable compound.
FLUORINE: Possible ignition.
FORMALDEHYDE: Possible explosion.
FUELS: Possible ignition.
HALOCARBONS: Formation of explosive compound.
HETEROCYCLIC BASES: Violent reaction.
HYDRAZINE DERIVATIVES: Formation of explosive mixture.
HYDROCARBONS: Formation of explosive product.
HYDROGEN: Formation of explosive mixture.
INDIUM: Possible explosion.
IRON (REDUCED): Decomposes with incandescence.
IRON OXIDE: Incandescent reaction by heating.
ISOPROPYL NITRITE: Possible explosion.
MAGNESIUM: Burns vigorously.
MAGNESIUM PERCHLORATE: Possible explosion.
MANGANESE: Possible ignition.
METALS: Possible ignition.
METAL ACETYLIDES: Possible ignition.
METAL CARBONYLS: Violent reaction.
METHYLENE CHLORIDE: Formation of explosive mixture.
NITROANILINE: Possible ignition.
NITROAROMATICS: Possible explosion.
NITROBENZENE: Formation of explosive mixture.
NITROGEN TRICHLORIDES: Possible explosion.
OLEFINS: Formation of explosive product.
OXIDIZERS (STRONG): Reacts.
OXYGEN: Formation of explosive compound.
OZONE: Explosive reaction.
PETROLEUM: Violent reaction.
PHOSPHAM: Possible ignition.
PHOSPHINE: Possible ignition.
PHOSPHORUS: Violent combustion.
PHOSPHORUS TRICHLORIDE: Possible explosion.
PHTHALIC ANHYDRIDE: Explosive decomposition.
PLASTICS: Attacks.
POTASSIUM: Possible ignition.
PROPYL NITRITE: Possible explosion.
PROPYLENE: Possible explosion.
REDUCING AGENTS: Reacts violently.
RUBBER: Attacks.
SODIUM (GASEOUS): Reacts with marked luminescence at 260 C.
SODIUM AMIDE: Violent reaction.

STEEL: Corrosive when wet.
SULFUR: Violent combustion.
SULFURIC ACID: Explosive decomposition.
SULFURYL CHLORIDE: Explosive reaction.
TETRACARBONYLNICKEL: Violent reaction.
TETRACHLOROETHANE: Formation of explosive compound.
TETRACHLOROETHYLENE: Formation of explosive compound.
TETRAMETHYLTIN: Interaction is explosively violent even at -80 C.
TOLUENE: Violent reaction.
TRICHLOROETHANE: Formation of explosive compound.
TRICHLOROETHYLENE: Formation of explosive compound.
TRIETHYLAMINE: Formation of explosive compound.
TRIETHYLAMMONIUM NITRATE: Formation of heat-sensitive explosive compound.
TUNGSTEN CARBIDE: Burns with incandescence.
VINYL CHLORIDE: Possible explosion.

HAZARDOUS DECOMPOSITION:
Thermal decomposition products or contact with air or organic compounds: oxides of nitrogen

POLYMERIZATION: Will not polymerize.

SECTION 11 TOXICOLOGICAL INFORMATION

NITRIC ACID, FUMING:
TOXICITY DATA:
67 ppm/4 hour(s) inhalation-rat LC50; 9300 ppb/4 hour(s)-10 day(s) intermittent inhalation-rat TCLo
ACUTE TOXICITY LEVEL:
Highly Toxic: inhalation

NITRIC ACID:
TOXICITY DATA:
2500 ppm/1 hour(s) inhalation-rat LC50; 50-500 mg/kg oral-unspecified species LD50; 430 mg/kg oral-human LDLo; 110 mg/kg unreported-man LDLo; 1071 ug/m3/24 hour(s)-84 day(s) continuous inhalation-rat TCLo; 50 ug/m3/4 hour(s)-3 day(s) intermittent inhalation-rat TCLo
LOCAL EFFECTS:
Corrosive: inhalation, skin, eye, ingestion
ACUTE TOXICITY LEVEL:
Moderately Toxic: inhalation
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: eye disorders, respiratory disorders, skin disorders and allergies
REPRODUCTIVE EFFECTS DATA:
21150 mg/kg oral-rat TDLo 1-21 day(s) pregnant female continuous; 2345 mg/kg oral-rat TDLo 18 day(s) pregnant female continuous

NITROGEN DIOXIDE:
TOXICITY DATA:
200 ppm/1 minute(s) inhalation-human LCLo; 2 ppm/4 hour(s) inhalation-man TCLo; 6200 ppb/10 minute(s) inhalation-man TCLo; 90 ppm/40 minute(s) inhalation-man TCLo; 88 ppm/4 hour(s) inhalation-rat LC50; 1000 ppm/10 minute(s) inhalation-mouse LC50; 123 mg/m3/8 hour(s) inhalation-dog LCLo; 123 mg/m3/8 hour(s) inhalation-monkey LCLo; 315 ppm/15 minute(s) inhalation-rabbit LC50; 30 ppm/1 hour(s) inhalation-guinea pig LC50; 2 ppm/24 hour(s)-14 day(s) continuous inhalation-rat TCLo; 5800 ug/m3/4 hour(s)-17 week(s) intermittent inhalation-rat TCLo; 16 ppm/23 hour(s)-74 week(s) continuous inhalation-rat TCLo; 5700 ug/m3/6 hour(s)-26 week(s) intermittent inhalation-rat TCLo; 3 ppm/24 hour(s)-39 week(s) continuous inhalation-rat TCLo; 2 ppm/24 hour(s)-1 year(s) continuous inhalation-rat TCLo; 4 ppm/24 hour(s)-14 week(s) continuous inhalation-rat TCLo; 8 ppm/24 hour(s)-7 day(s) continuous inhalation-rat TCLo; 5 ppm/24 hour(s)-4 week(s) continuous inhalation-rat TCLo; 250 ppb/7 hour(s)-7 week(s) intermittent inhalation-mouse TCLo; 20 ppm/24 hour(s)-4 day(s) continuous inhalation-mouse TCLo; 10 ppm/2 hour(s)-30 week(s) intermittent inhalation-mouse TCLo; 500 ppb/30 day(s) continuous inhalation-mouse TCLo; 5800 ug/m3/4 hour(s)-17 week(s) intermittent inhalation-guinea pig TCLo; 15 ppm/24 hour(s)-10 week(s) continuous inhalation-guinea pig TCLo; 3284 ug/m3/8 hour(s)-26 week(s) intermittent inhalation-guinea pig TCLo; 30 ppm/22 hour(s)-36 week(s) intermittent inhalation-hamster TCLo; 10 ppm/4 hour(s)-15 week(s) intermittent inhalation-mammal TCLo; 10 ppm/3 day(s) continuous inhalation-rat TCLo
CARCINOGEN STATUS: ACGIH: A4 -Not Classifiable as a Human Carcinogen
LOCAL EFFECTS:
Corrosive: inhalation, skin, eye
ACUTE TOXICITY LEVEL:
Highly Toxic: inhalation
TUMORIGENIC DATA:
108 mg/kg inhalation-rat TCLo/300 day(s) intermittent
MUTAGENIC DATA:
mutation in microorganisms - Salmonella typhimurium 6 ppm (+S9); mutation in microorganisms - Salmonella typhimurium 5 ppm (-S9); other mutation test systems - Salmonella typhimurium 50 ppm; mutation in microorganisms - Escherichia coli 198 ug/L (-S9); other mutation test systems - Escherichia coli 297 ug/L; unscheduled DNA synthesis - rat inhalation 30 ppm 1 hour(s); cytogenetic analysis - rat inhalation 27 ppm 3 hour(s)-continuous; mutation in mammalian somatic cells - rat inhalation 15 ppm 3 hour(s)-continuous; DNA damage - hamster lung 10 ppm; cytogenetic analysis - hamster fibroblast 10 ppm 10 minute(s)-continuous; sister chromatid exchange - hamster lung 5 ppm 10 minute(s)-continuous; DNA adduct - rat inhalation 108 mg/kg 300 day(s)-intermittent
REPRODUCTIVE EFFECTS DATA:
10 mg/m3 inhalation-rat TCLo/6 hour(s) 1-22 day(s) pregnant female continuous; 85 ug/m3 inhalation-rat TCLo/24 hour(s) 1-22 day(s) pregnant female continuous; 800 ug/m3 inhalation-rat TCLo/24 hour(s) 1-22 day(s) pregnant female continuous; 2360 ug/m3 inhalation-rat TCLo/12 hour(s) 12

week(s) pre pregnancy continuous; 100 ug/m3 inhalation-rat TCLo/6 hour(s) 1-22 day(s) pregnant female continuous; 22 ppm inhalation-mouse TDLo 7-18 day(s) pregnant female continuous

HEALTH EFFECTS:
INHALATION:
ACUTE EXPOSURE:

NITRIC ACID, FUMING: May cause coughing, headache, dizziness, and weakness. Delayed symptoms may include dryness of the throat and nose, chest pain or tightness, dyspnea, frothy sputum, hypotension and cyanosis followed by pneumonitis and pulmonary edema, which may be fatal. If patient recovers, scar tissue may cause stricture of the pylorus or esophagus.

NITROGEN DIOXIDE: Usually no symptoms occur at the time of exposure, with the exception of a slight cough and perhaps fatigue and nausea. Exposure to low concentrations, below 50 ppm, may result in impaired pulmonary defense mechanisms. Only very concentrated fumes, above 100 ppm, may produce prompt coughing, choking, headache, dizziness, nausea, abdominal pain, and dyspnea. A symptom-free latent period may follow exposure lasting 5-72 hours. Fatigue, uneasiness, restlessness, cough, hyperpnea, and dyspnea may appear gradually. Increasingly rapid and shallow respirations, mild or violent coughing with frothy expectorations, cyanosis, possible formation of methemoglobin, and physical signs of pulmonary edema may occur. Anxiety, mental confusion, lethargy, and finally loss of consciousness may result. The circulatory system may be affected as noted by a weak, rapid pulse, dilated heart, venous congestion, intense cyanosis, and severe hemoconcentration. Circulatory collapse may occur but is secondary to anoxia and hemoconcentration. Death commonly occurs within a few hours after the first evidence of pulmonary edema and is due to asphyxiation. A second acute phase sometimes follows the initial pulmonary reaction after a latent period of several weeks. Signs may include fever, chills, cough, dyspnea, tachypnea, tachycardia, and cyanosis. The relapse may be abrupt and fulminating, leading either to death or a slow convalescence, which may be complicated by infectious bronchitis, bronchiolitis obliterans, pneumonia, and general asthenia. One study with rats indicated that exertion may potentiate the toxic effects of nitrogen dioxide.

CHRONIC EXPOSURE:

NITRIC ACID, FUMING: Repeated or prolonged exposure may cause dental erosion followed by jaw necrosis, chronic cough and bronchitis or chemical pneumonitis and gastrointestinal disturbances.

NITROGEN DIOXIDE: Prolonged exposure to low concentrations, insufficient to cause pulmonary edema, may result in chronic irritation of the respiratory tract, with headache, dizziness, ulcers of the nose and mouth, moist rales and wheezes, sporadic cough with mucopurulent expectoration, anorexia, dyspepsia, dental erosion, insomnia, gradual loss of strength,

dyspnea upon exertion, chronic bronchitis, and emphysematous lesions. Effects on fertility, embryo, and newborn have been reported when female rats were chronically exposed prior to mating. Effects on the newborns have also been reported from chronic exposure during pregnancy in rats.

SKIN CONTACT:

ACUTE EXPOSURE:

NITRIC ACID, FUMING: Direct contact with liquid or concentrated vapor causes immediate severe and penetrating burns, staining the skin yellow or yellowish-brown. Dilute solutions produce mild irritation and harden the skin without destroying it.

NITROGEN DIOXIDE: Direct contact with liquid may cause severe irritation, pain, yellow-brown discoloration, necrosis, frostbite, and possible burns either by the vapors or rapid evaporation of the liquid.

CHRONIC EXPOSURE:

NITRIC ACID, FUMING: Depending on concentration and duration of exposure, repeated or prolonged exposure may cause symptoms as those of acute exposure.

NITROGEN DIOXIDE: Effects depend on concentration and duration of exposure. Repeated or prolonged contact with corrosive substances may result in dermatitis or effects similar to acute exposure.

EYE CONTACT:

ACUTE EXPOSURE:

NITRIC ACID, FUMING: Direct contact with the liquid may cause pain, photophobia, tearing, edema, corneal ulceration, severe burns, and necrosis of the deeper tissues with permanent damage.

NITROGEN DIOXIDE: Direct contact with the liquid may cause severe irritation with redness, pain, blurred vision, edema of the eyelids, corneal ulceration, possible burns, and frostbite either by the vapors or rapid evaporation of the liquid.

CHRONIC EXPOSURE:

NITRIC ACID, FUMING: Depending on concentration and duration of contact, repeated or prolonged exposure may cause symptoms as those of acute exposure.

NITROGEN DIOXIDE: Effects depend on concentration and duration of exposure. Repeated or prolonged contact with corrosive substances may result in conjunctivitis or effects as in acute exposure.

INGESTION:

ACUTE EXPOSURE:

NITRIC ACID, FUMING: Immediate pain in the mouth, throat, and stomach may be followed by nausea, vomiting, diarrhea, hematemesis, hemoptysis,

hypotension, nephritis, albuminuria, oliguria, anuria, hematuria, and possibly circulatory collapse. Asphyxia is possible. Burns of the gastrointestinal tract may be severe enough to cause perforation of the esophagus and stomach which may be followed by mediastinitis or peritonitis, indicated by fever.

NITROGEN DIOXIDE: Ingestion of the liquid may cause an acid taste, nausea, vomiting, abdominal pain, and frostbite damage of the lips, mouth, and mucous membranes.

CHRONIC EXPOSURE:
NITRIC ACID, FUMING: No data available.

NITROGEN DIOXIDE: No data available.

SECTION 12 ECOLOGICAL INFORMATION

ECOTOXICITY DATA:
FISH TOXICITY: 2.8 ug/L 96 hour(s) LC50 (Mortality) Rainbow trout,donaldson trout (Oncorhynchus mykiss)

INVERTEBRATE TOXICITY: 16 ug/L 48 hour(s) EC50 (Immobilization) Water flea (Daphnia magna)

FATE AND TRANSPORT:
BIOCONCENTRATION: 17560 ug/L 30 hour(s) BCFD (Residue) Aquatic sowbug (Asellus aquaticus) 0.87 ug/L

SECTION 13 DISPOSAL CONSIDERATIONS

Subject to disposal regulations: U.S. EPA 40 CFR 262. Hazardous Waste Number(s): D001. Dispose in accordance with all applicable regulations.

SECTION 14 TRANSPORT INFORMATION

U.S. DOT 49 CFR 172.101:
PROPER SHIPPING NAME: Nitric acid, red fuming
ID NUMBER: UN2032
HAZARD CLASS OR DIVISION: 8
PACKING GROUP: I

CANADIAN TRANSPORTATION OF DANGEROUS GOODS:
SHIPPING NAME: Nitric acid, red fuming

ID NUMBER: UN2032
CLASSIFICATION: 8, 5.1, 6.1
PACKING GROUP: I

LAND TRANSPORT ADR/RID:
PROPER SHIPPING NAME: Nitric acid, red fuming
UN NUMBER: UN2032
ADR/RID CLASS: 8
CLASSIFICATION CODE: COT
PACKING GROUP: I

AIR TRANSPORT IATA/ICAO:
PROPER SHIPPING NAME: Nitric acid, red fuming
UN/ID NUMBER: UN2032
IATA/ICAO CLASS: 8

MARITIME TRANSPORT IMDG:
PROPER SHIPPING NAME: Nitric acid, red fuming
UN NUMBER: UN2032
IMDG CLASS: 8
PACKING GROUP: I

SECTION 15 REGULATORY INFORMATION

U.S. REGULATIONS:
CERCLA SECTIONS 102a/103 HAZARDOUS SUBSTANCES (40 CFR 302.4):
NITRIC ACID: 1000 LBS RQ

SARA TITLE III SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355.30):
NITRIC ACID: 1000 LBS TPQ

SARA TITLE III SECTION 304 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355.40):
NITRIC ACID: 1000 LBS RQ

SARA TITLE III SARA SECTIONS 311/312 HAZARDOUS CATEGORIES (40 CFR 370.21):
ACUTE: Yes
CHRONIC: No
FIRE: Yes
REACTIVE: Yes
SUDDEN RELEASE: No

SARA TITLE III SECTION 313 (40 CFR 372.65):
NITRIC ACID

OSHA PROCESS SAFETY (29CFR1910.119):
NITRIC ACID: 500 LBS TQ (>=94.5% by weight)

STATE REGULATIONS:
California Proposition 65: Not regulated.

CANADIAN REGULATIONS:
WHMIS CLASSIFICATION: Not determined.

EUROPEAN REGULATIONS:
EC CLASSIFICATION (ASSIGNED):
O Oxidizing
C Corrosive

EC Classification may be inconsistent with independently-researched data.

DANGER/HAZARD SYMBOL:
O Oxidizing
C Corrosive

EC RISK AND SAFETY PHRASES:

R 8	Contact with combustible material may cause fire.
R 35	Causes severe burns.
S 1/2	Keep locked-up and out of reach of children.
S 23	Do not breathe gas, fumes, vapor, or spray.
S 26	In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
S 36	Wear suitable protective clothing.
S 45	In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

CONCENTRATION LIMITS:

C>=70%	O; C	R 8-35
20%<=C<70%	C	R 35
5%<=C<20%	C	R 34

GERMAN REGULATIONS:
WATER HAZARD CLASS (WGK):
STATE OF CLASSIFICATION: VwVwS
CLASSIFICATION UNDER HAZARD TO WATER: 1

NATIONAL INVENTORY STATUS:
U.S. INVENTORY (TSCA): Listed on inventory.

TSCA 12(b) EXPORT NOTIFICATION: Not listed.

SECTION 16 OTHER INFORMATION

MSDS SUMMARY OF CHANGES

SECTION 3 HAZARDS IDENTIFICATION
SECTION 11 TOXICOLOGICAL INFORMATION

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