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HEALTH AND SAFETY PLAN FOR BASE REALIGNMENT AND CLOSURE TANK
MANAGEMENT PLAN NTC ORLANDO FL
6/1/1995
ABB ENVIRONMENTAL SERVICES, INC



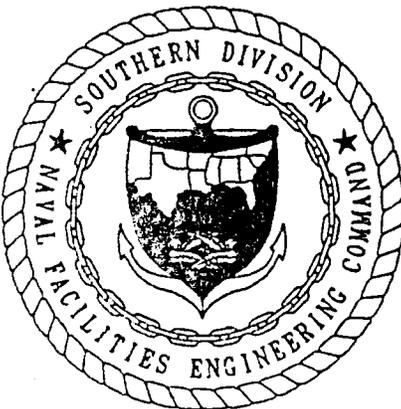
HEALTH AND SAFETY PLAN

**BASE REALIGNMENT AND CLOSURE
TANK MANAGEMENT PLAN**

**NAVAL TRAINING CENTER
ORLANDO, FLORIDA**

**UNIT IDENTIFICATION CODE: N65928
CONTRACT NO. N62467-89-D-0317/107**

JUNE 1995



**SOUTHERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
NORTH CHARLESTON, SOUTH CAROLINA
29419-9010**

HEALTH AND SAFETY PLAN
BASE REALIGNMENT AND CLOSURE
TANK MANAGEMENT PLAN
NAVAL TRAINING CENTER
ORLANDO, FLORIDA

Unit Identification Code (UIC): N65928

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Prepared by:

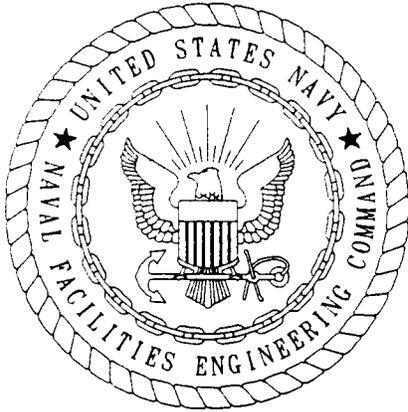
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Nicholas Ugolini, Code 184NJU, Engineer-in-Charge

June 1995



CERTIFICATION OF TECHNICAL
DATA CONFORMITY (MAY 1987)

The Contractor, ABB Environmental Services, Inc., hereby certifies that, to the best of its knowledge and belief, the technical data delivered herewith under Contract No. N62467-89-D-0317/031 are complete and accurate and comply with all requirements of this contract.

DATE: June 2, 1995

NAME AND TITLE OF CERTIFYING OFFICIAL: John Kaiser
Task Order Manager

NAME AND TITLE OF CERTIFYING OFFICIAL: Michael J. Williams
Project Technical Lead

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REFERENCES

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<input checked="" type="checkbox"/>	4.0	MEDICAL SURVEILLANCE PROGRAM	
<input checked="" type="checkbox"/>	5.0	ENGINEERING CONTROLS	
<input checked="" type="checkbox"/>	6.0	PERSONAL PROTECTIVE LEVEL DETERMINATION	
<input checked="" type="checkbox"/>	7.0	MONITORING EQUIPMENT	
<input checked="" type="checkbox"/>	8.0	ZONATION	
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<input type="checkbox"/>	11.0	EXCAVATION AND TRENCHING	
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		<input type="checkbox"/> TRISODIUM PHOSPHATE	
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GLOSSARY

ABB-ES	ABB Environmental Services, Inc.
BCP	BRAC Cleanup Plan
BRAC	Base Realignment and Closure
CFR	Code of Federal Regulations
CLEAN	Comprehensive Long-term Environmental Activity, Navy
CPR	cardiopulmonary resuscitation
CRZ	Contamination Reduction Zone
DPDO	Defense Property Disposal Office
EBS	Environmental Baseline Survey
FID	flame ionization detector
FOL	Field Operations Leader
HASP	Health and Safety Plan
HSM	Health and Safety Manager
HSO	Health and Safety Officer
HSS	Health and Safety Supervisor
LEL	lower explosive limit
msl	mean sea level
NEESA	Naval Energy and Environmental Support Activity
NTC	Naval Training Center
OSHA	Occupational Safety and Health Administration
OVA	organic vapor analyzer
PCBs	polychlorinated biphenyls
PID	photoionization detector
POI	point of interest
ppb	part per billion
PPE	personnel protective equipment
ppm	parts per million
RAC	Remedial Action Contract
SCBA	self-contained breathing apparatus
SOUTHNAV- FACENCOM	Southern Division, Naval Facilities Engineering Command
SS	site supervisor
TL	Technical Lead
TLD	thermoluminescent dosimetry
TOM	Task Order Manager

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USEPA U.S. Environmental Protection Agency
UST underground storage tank

1.0 GENERAL

1.1 SCOPE AND PURPOSE. This Health and Safety Plan (HASP) has been prepared in conformance with the ABB Environmental Services, Inc. (ABB-ES), Health and Safety Program and the Comprehensive Long-Term Environmental Action, Navy (CLEAN) District I Contract (CLEAN HASP) and is intended to meet the requirements of 29 Code of Federal Regulation (CFR), Part 1910.120. As such, the HASP addresses those activities associated with field operations for this project. Compliance with this HASP is required for all ABB-ES personnel, contractor personnel, or third parties entering any site at Naval Training Center (NTC), Orlando, Florida.

1.2 PERSONNEL

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

1.2.2 Field Operations Leader The Field Operations Leader (FOL) is either the TOM or the TOM's designee who is onsite and is vested with the authority by the TOM to carry out day-to-day site operations, including interfacing with the NTC, Orlando Health and Safety Officer (HSO).

1.2.3 Health and Safety Officer The HSO for this project has been designated by the TOM with concurrence from the Health and Safety Manager (HSM). The HSO will have at least an indirect line of reporting to the HSM for the duration of his/her assignment as project HSO. The HSO is responsible for developing and implementing this site-specific HASP in accordance with the ABB-ES Health and Safety Program. The HSO will investigate all accidents, illnesses, and incidents occurring onsite. The HSO will also conduct safety briefings and site-specific training for onsite personnel. As necessary, the HSO will accompany all U.S. Environmental Protection Agency (USEPA), Occupational Safety and Health Administration (OSHA), or other governmental agency personnel visiting an ABB-ES site in response to health and safety issues. The HSO, in consultation with the HSM, is responsible for updating and modifying this HASP as site or environmental conditions change.

1.3 TRAINING. Training is defined under the ABB-ES Health and Safety Program, and all personnel entering potentially contaminated areas of this site must meet the requirements of 29 CFR 1910.120. Personnel without the required training will not be permitted in any area with potential for exposure to toxic substances or harmful physical agents (i.e., in the exclusion zone). Refer to Chapter 3.0 of the CLEAN HASP for further information.

1.4 MEDICAL SURVEILLANCE. All personnel entering potentially contaminated areas of this site will be medically qualified for site assignment through a medical surveillance program outlined in the ABB-ES Health and Safety Program. Personnel who have not received medical clearance will not be permitted in any area with potential for exposure to toxic substances or harmful physical agents (i.e., in the exclusion zone). Refer to Chapter 4.0 of the CLEAN HASP for further information.

2.0 SITE CHARACTERIZATION AND ANALYSIS

2.1 SITE NAME, LOCATION, AND SIZE. NTC, Orlando (Figure 2-1) encompasses 2,072 acres in Orange County, Florida, and consists of four discrete facilities: the Main Base, McCoy Annex, Herndon Annex, and Area "C". A total of 207 petroleum storage tanks will be assessed and/or removed as part of the Tank Management Plan (ABB-ES, 1995).

The Main Base occupies approximately 1,095 acres within the city limits of Orlando and is located approximately 3 miles east of Interstate 4 and less than 1 mile north of State Road 50. Operations at the Main Base include the Recruit Training Command, Service School Command, Naval Administrative Command, Nuclear Power School, and the Naval Hospital (C.C. Johnson, 1985).

The facilities that comprise the McCoy Annex occupy 877 acres outside of the Orlando city limits and are located 12 miles south of the Main Base and just west of the Orlando International Airport. The Annex serves as a housing and community support activity for NTC, Orlando (C.C. Johnson, 1985).

Area "C" occupies an area of 46 acres and is located 1 mile west of the main base off Maguire Boulevard, and serves as a supply center for NTC, Orlando (C.C. Johnson, 1985).

Herndon Annex occupies 54 acres and is situated 1.5 miles south of the Main Base, within the confines of the general aviation Herndon Public Airport. Herndon Annex provides research, design, development, testing, evaluation, procurement, fabrication, maintenance, and logistical support for naval training equipment and devices. Herndon Annex is comprised of a computer center, flight-training building, uniform-supply warehouse, and several office buildings (C.C. Johnson, 1985).

2.2 SITE HISTORY AND LAYOUT

Main Base. The facilities at the Main Base were owned and operated by the Army Air Corps from 1940 to 1947 as the Orlando Air Base. The U.S. Air Force took command of the facilities during 1947, at which point it became the Orlando Air Force Base. The Air Photographic and Charter Service was the most active facility on the base and was responsible for photographic development of U.S. Air Force movies and still photographs. The property was commissioned as the Naval Training Center in 1968 when the U.S. Air Force ceased operations at the facility (ABB-ES, 1994a).

The area of the Main Base varies in elevation from approximately 125 feet above mean sea level (msl) at the Recruit Training Command (C.C. Johnson, 1985) to approximately 91 feet above msl at Lake Baldwin. Surface water runoff from this area flows through small intermittent streams and the storm drainage system to Lake Susannah and Lake Baldwin, and eventually to the Little Econlockhatchee River. Both of these lakes are used for fishing and recreation and are Class III waters according to the State of Florida (ABB-ES, 1994a).

The Main Base occupies approximately 1,095 acres within the Orlando city limits and is comprised mainly of operational and training facilities. These facilities

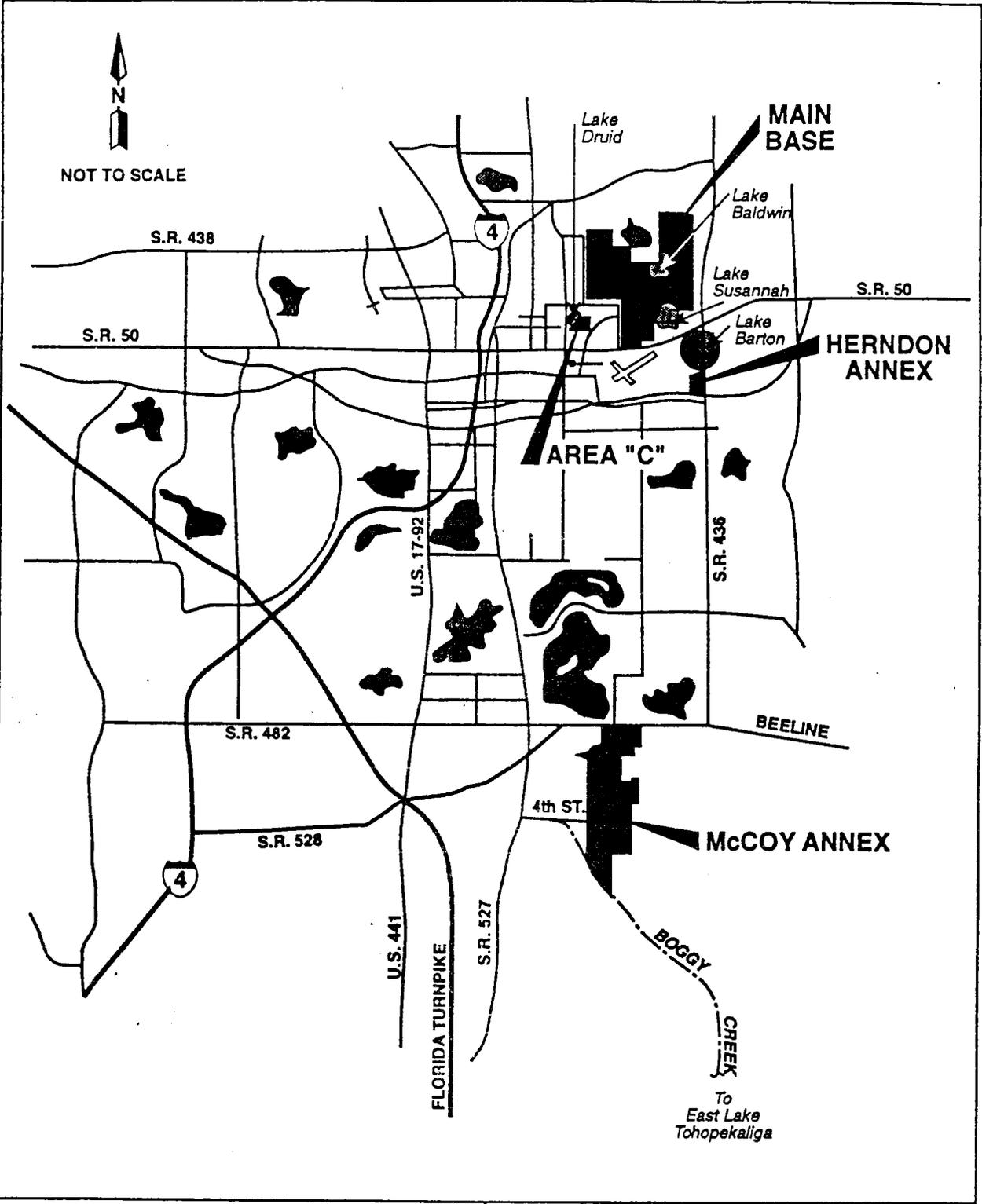


FIGURE 2-1
VICINITY MAP



HEALTH AND SAFETY PLAN
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are used for training new recruits, and the land use is primarily barracks, training facilities, administrative buildings, drill fields, and recreational areas.

The area surrounding the Main Base is primarily residential with a commercially zoned area adjacent to the residential areas. There are two lakes within the Main Base property (Lakes Baldwin and Susannah) and four lakes (Spier, Forest, Shannon, and Gear) located in the residential areas adjacent to the facility (C.C. Johnson, 1985).

McCoy Annex. The McCoy Annex was originally owned and operated from 1950 to the late 1950's by the U.S. Air Force Strategic Air Command as the Pinecastle Air Force Base. It then became the McCoy Air Force Base from the late 1950's to 1974 when NTC, Orlando acquired the facility and renamed it the McCoy Annex (C.C. Johnson, 1985).

The land at McCoy Annex is essentially flat and gently sloping from north to south with little change in grade. The elevation is approximately 90 feet above msl and surface water flows south into the Boggy Creek Drainage Basin approximately 4 miles south of the Annex (C.C. Johnson, 1985). Surface water from Boggy Creek then flows into East Lake Tohopekaliga approximately 12.5 miles south of the Annex.

The McCoy Annex occupies 877 acres outside of the Orlando city limits and is located adjacent to Orlando International Airport on the east. There are two elementary schools located within a mile of the Annex on the west boundary and most of the area immediately adjacent to the Annex to the west is vacant wooded land. The Beeline Expressway forms the northern boundary. The property north of this expressway is used primarily for airport-related industry. Adjacent to the southern boundary are undeveloped woodlands. Land use at McCoy Annex is primarily housing and recreation (golf course) with limited operational facilities (C.C. Johnson, 1985).

Area "C". Area "C" was constructed in 1942 to provide support services for the Army Air Corps Orlando Air Base and consists of a laundry facility, supply storage, and the Defense Property Disposal Office (DPDO) facility. The laundry facility has been operated for military use since 1942. From 1942 to 1957, the supply storage warehouses and salvage yard received military supplies and salvageable material transported there by a railroad system. Since 1957, all materials have been shipped to Area "C" for storage via truck. In 1959, the DPDO took over operation of the salvage yard. The laundry facility, supply storage warehouses, and the DPDO have operated under the command of NTC, Orlando (ABB-ES, 1994a).

Area "C" is surrounded by urban development and multi-family residences to the north (with single family residences across Lake Druid), single family residences to the south and west, and an office park to the east. There are no industrial facilities in the vicinity of Area "C" (C.C. Johnson, 1985).

Herndon Annex. Herndon Annex borders a major residential area and is adjacent to the Herndon airport (C.C. Johnson, 1985). The Herndon Annex land surface slopes from a high of approximately 120 feet msl at the southwest corner to its low point of about 93 feet msl at the northeast corner adjacent to Lake Barton. Surface water runoff flows into Lake Barton or to a closed depression with a small sinkhole lake located on the east side of the area (USGS, 1980).

3.0 HAZARD ANALYSIS

3.1 INVASIVE SAMPLING. Invasive sampling at NTC, Orlando will include soil borings and monitoring well installation, and tank removal.

The potential hazards to workers are mainly physical ones related to manual labor, such as that involved in drilling operations and tank removal, but limited hazards exist for exposure to chemical compounds that are known to be present or suspected to be present in the soil at the site. A potential for exposure may exist during intrusive activities, such as drilling, tank removal, and sampling, when the ground surface and subsurface soil are disturbed. Elevated ambient levels of organic vapors and particulates may be encountered during these periods. Personnel exposures are expected to be minimal during the field drilling and sampling activities. However, the tank removal activities will involve large scale earth-moving equipment, and risk of personnel exposures will be greater. Air monitoring will be conducted to assess the need for use of personal protective equipment.

Contamination of soil and groundwater at the site has occurred from spillage, disposal, and leakage of petroleum products associated with the operation and maintenance activities at the site. The purpose of this activity is to assess the extent of that contamination. Caution and awareness should be exercised during drilling and sampling operations pending further definitions of chemical hazards. Any condition encountered that has not been discussed in training should be brought to the attention of the HSO, FOL, and TOM immediately.

The potential presence of chemicals poses exposure hazards in addition to respiratory hazards. All efforts should be made by field personnel to avoid exposure to chemicals via inhalation, ingestion, absorption through the skin, or injection under the skin. All efforts must be taken to implement use of safe personal work practices, personal protective equipment, and decontamination practices.

3.2 SITE RISKS. The health and safety hazards for all sites at NTC, Orlando are addressed in the following pages.

3.2.1 Health Hazards Health hazards include those hazards that personnel may be exposed to that are related to petroleum contamination. The contaminants of concern known or suspected to be present on the facility, along with any established exposure limits for those substances, are listed in Table 3-1.

3.2.2 Safety Hazards Safety hazards include those hazards to which personnel may be exposed that are unrelated to the contaminants of concern. These include hazards such as heat stress, operation and presence around heavy equipment, lifting of objects, and vehicle traffic. Extreme caution should be exhibited by all personnel while conducting work around drill rigs, backhoes, and other heavy equipment. During hot days, personnel should take time to drink fluids and cool off to avoid overheating and symptoms related to heat stress.

Lifting of heavy objects should be done with caution. Personnel should assist one another with moving heavy objects or use appropriate equipment to accomplish these tasks. Power substations, power lines, underground utilities, and underground pipelines are to be avoided during drilling and tank removal operations. Necessary work permits for activities at NTC, Orlando will be obtained.

**Table 3-1
Contaminants of Concern**

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Chemical	Approximate Odor Threshold (ppm)	OSHA Permissible Exposure Limit	Threshold Limit Value (ppm)	Physical Characteristics	Dermal Toxicity	Remarks
Benzene	4.7	1	1	Colorless to light yellow liquid; pleasant aromatic odor.	Moderate skin irritant.	Inhalation of large amounts attacks central nervous system; chronic poisoning may cause leukemia and/or decreases circulating levels of blood cells.
Ethylbenzene	140	100	100	Colorless liquid; gasoline like odor.	Moderate skin irritant.	Liquid blisters skin; inhalation results in dizziness and depression.
Lead	--	--	--	Soft, ductile, gray metal; soluble in water containing weak acid.	--	Lead poisoning may cause fatigue, anemia, abdominal pain, and neurological damage.
Toluene	0.17	100	100	Colorless liquid; pleasant aromatic odor.	Mild skin irritant.	Ingestion or aspiration can cause pulmonary edema and depressed respiration.
Xylene	0.05	100	100	Colorless liquid; aromatic odor.	Moderate skin irritant.	Inhalation causes headache and dizziness; vapors irritate eyes; can be fatal if ingested.
Naphthalene	--	10	10	Colorless to brown solid with an odor of mothballs.	Moderate skin irritant.	Inhalation causes headache and confusion; vapors irritate eyes.
Tetraethyl lead	No data	0.006 (skin)	0.007 (skin)	Colorless liquid with a pleasant, sweet odor.	Contact with the skin may cause itching, burning, and skin redness. The chemical can be absorbed through the skin into the body.	Symptoms of tetraethyl lead exposure include headache, anxiety, nausea, loss of appetite, and tremors.

Notes: ppm = parts per million.
OSHA = Occupational Safety and Health Administration.

3.2.3 Conclusions and Risk Assessment Based on all available information (nature of the work, potential onsite chemicals and their properties, exposure limits, etc.), hazards associated with conducting the described field work are considered to be low, assuming appropriate health and safety practices are maintained.

3.3 PROTECTIVE MEASURES. The following are the protective measures that will be used at the site.

3.3.1 Engineering Controls (General) Whenever needed, engineering controls (i.e., fans to blow volatilized chemicals away from the work area) will be used.

3.3.2 Levels of Protection (General) A level D work uniform will be used at the site when organic vapor concentrations of petroleum and gasoline constituents in the breathing zone are less than 25 parts per million (ppm) and benzene concentrations are less than 0.5 ppm during sustained drilling or sampling operations. Organic vapor concentrations will be monitored in the breathing zone using an organic vapor analyzer (OVA). Benzene concentrations in the breathing zone will be monitored using a benzene 0.5/a Dräger tube. Level D protection should only be used when the atmosphere contains no known hazard, all potential airborne contaminants can be monitored, and work functions preclude splash, immersion, or the potential for unexpected inhalation or contact with hazardous levels of any chemical.

Because of the threat of heat stress, Level D personnel protective equipment (PPE) will consist of a shirt, long pants, and steel-toed work boots. A Tyvek™ suit will not be worn. When working around heavy equipment, such as a drill rig, a hard hat will be worn.

Level C PPE will be used by all personnel working in the contaminated zone if OVA monitoring of the breathing zone detects concentrations greater than or equal to 25 ppm but less than 170 ppm. Level C PPE will be used by personnel in the contaminated zone if benzene concentrations exceed 0.5 ppm but remain less than 50 ppm.

Level C equipment includes the following items:

- full-face respirator (cartridge),
- Tyvek™ suit,
- gloves (outer, chemical-resistant),
- gloves (inner, chemical-resistant),
- boots (steel toe),
- hard hat, and
- face shield.

Level B PPE will be used by all personnel working in the contaminated zone if OVA monitoring in the breathing zone detects concentrations greater than or equal to 170 ppm and Dräger tube (5/b) monitoring indicates greater than or equal to 50 ppm benzene.

Level B equipment includes the following items:

- self-contained breathing apparatus (SCBA) (pressure demand) or supplied air respirator (pressure demand with escape SCBA),

- Tyvek™ suit,
- gloves (outer, chemical-resistant),
- gloves (inner, chemical-resistant),
- boots (steel toe),
- hard hat, and
- face shield.

Procedures using level B and C PPE, heat stress monitoring associated with upgrading levels of protection, and other relevant factors associated with the respiratory protection program are described in the CLEAN HASP.

3.4 MONITORING (GENERAL). It is intended that real-time monitoring instrumentation will be used to monitor the work environment in order to ensure the appropriate level of protection for the site team.

3.4.1 Air Sampling (General) To the extent feasible, the presence of airborne contaminants will be monitored through the use of direct reading instrumentation. Information gathered will be used to ensure that the levels of protection being used at the site are adequate. In addition, these data may be used as the basis for upgrading or downgrading the levels of protection in conformance with action levels provided in this HASP and at the direction of the site HSO. During operations, air monitoring with a flame ionization detector (FID) or OVA will be conducted regularly in the breathing zone. If the FID readings show a persistent rise above background levels, monitoring with Dräger tubes will be initiated.

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

1. HeathTech PORTA-FID II™
2. Dräger Tubes:
 - Benzene 0.5/a
 - Benzene 5/b

3.4.2 Personal Monitoring (General) All personnel onsite will be enrolled in the ABB-ES medical surveillance program. In addition, all personnel onsite will wear a thermoluminescent dosimetry body badge to measure possible exposure to radiation.

4.0 DATA SHEETS

The Chemical Hazard Data Sheets for the chemicals that may likely be encountered at NTC, Orlando are attached.

BENZENE

BNZ

Common Symptoms	Watery liquid Colorless Gasoline-like odor
Benzol Benzole	Floats on water. Flammable, irritating vapor is produced. Freezing point is 42°F.
<p>Avoid contact with liquid and vapor. Keep people away. Wear goggles and self-contained breathing apparatus. Shut off ignition sources and call fire department. Stop discharge if possible. Stay upwind and use water spray to "knock down" vapor. Isolate and remove discharged material. Notify local health and pollution control agencies.</p>	
Fire	<p>FLAMMABLE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemical, foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.</p>
Exposure	<p>CALL FOR MEDICAL AID.</p> <p>VAPOR Irritating to eyes, nose, and throat. If inhaled, will cause headache, difficult breathing, or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.</p> <p>LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected area with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.</p>
Water Pollution	<p>HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes.</p> <p>Notify local health and wildlife officials. Notify operators of nearby water intakes.</p>
1. RESPONSE TO DISCHARGE	2. LABEL
(See Response Methods Handbook) Issue warning-high flammability Restrict access	2.1 Category: Flammable liquid 2.2 Class: 3
3. CHEMICAL DESIGNATIONS	4. OBSERVABLE CHARACTERISTICS
3.1 CG Compatibility Class: Aromatic Hydrocarbon 3.2 Formula: C ₆ H ₆ 3.3 IMO/UN Designation: 3.2/1114 3.4 DOT ID No.: 1114 3.5 CAS Registry No.: 71-43-2	4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Aromatic; rather pleasant aromatic odor; characteristic odor
5. HEALTH HAZARDS	
<p>5.1 Personal Protective Equipment: Hydrocarbon vapor canister, supplied air or a hose mask; hydrocarbon-insoluble rubber or plastic gloves; chemical goggles or face splash shield; hydrocarbon-insoluble apron such as neoprene.</p> <p>5.2 Symptoms Following Exposure: Dizziness, excitation, pallor, followed by flushing, weakness, headache, breathlessness, chest constriction. Coma and possible death.</p> <p>5.3 Treatment of Exposure: SKIN: flush with water followed by soap and water; remove contaminated clothing and wash skin. EYES: flush with plenty of water until irritation subsides. INHALATION: remove from exposure immediately. Call a physician. If breathing is irregular or stopped, start resuscitation, administer oxygen.</p> <p>5.4 Threshold Limit Value: 10 ppm 5.5 Short Term Inhalation Limits: 75 ppm for 30 min. 5.6 Toxicity by Ingestion: Grade 3; LD₅₀ = 50 to 500 mg/kg 5.7 Late Toxicity: Leukemia 5.8 Vapor (Gas) Irritant Characteristics: If present in high concentrations, vapors may cause irritation of eyes or respiratory system. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin. 5.10 Odor Threshold: 4.88 ppm 5.11 IDLH Value: 2,000 ppm</p>	

6. FIRE HAZARDS	10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook)
<p>6.1 Flash Point: 12°F C.C. 6.2 Flammable Limits in Air: 1.3%-7.9% 6.3 Fire Extinguishing Agents: Dry chemical, foam, or carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back 6.7 Ignition Temperature: 1097°F 6.8 Electrical Hazard: Class I, Group D 6.9 Burning Rate: 6.0 mm/min 6.10 Adiabatic Flame Temperature: Data not available 6.11 Stoichiometric Air to Fuel Ratio: Data not available 6.12 Flame Temperature: Data not available</p>	A-T-U-V-W
7. CHEMICAL REACTIVITY	11. HAZARD CLASSIFICATIONS
<p>7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent 7.7 Molar Ratio (Reactant to Product): Data not available 7.8 Reactivity Group: 32</p>	<p>11.1 Code of Federal Regulations: Flammable liquid 11.2 NAS Hazard Rating for Bulk Water Transportation: Category Rating Fire 3 Health 1 Vapor Irritant 1 Liquid or Solid Irritant 1 Poisons 3 Water Pollution 3 Human Toxicity 3 Aquatic Toxicity 1 Aesthetic Affect 3 Reactivity 2 Other Chemicals 2 Water 1 Self Reaction 0 11.3 NFPA Hazard Classification: Category Classification Health Hazard (Blue) 2 Flammability (Red) 3 Reactivity (Yellow) 0</p>
8. WATER POLLUTION	12. PHYSICAL AND CHEMICAL PROPERTIES
<p>8.1 Aquatic Toxicity: 5 ppm/8 hr/minnow/lethal/distilled water 20 ppm/24 hr/sunfish/TL₅₀/tap water 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): 1.2 lb/lb, 10 days 8.4 Food Concentration Potential: None</p>	<p>12.1 Physical State at 15°C and 1 atm: Liquid 12.2 Molecular Weight: 78.11 12.3 Boiling Point at 1 atm: 178°F = 80.1°C = 363.3°K 12.4 Freezing Point: 42.0°F = 5.5°C = 278.7°K 12.5 Critical Temperature: 662.0°F = 288.9°C = 662.1°K 12.6 Critical Pressure: 710 psia = 48.3 atm = 4.89 MN/m² 12.7 Specific Gravity: 0.879 at 20°C (liquid) 12.8 Liquid Surface Tension: 28.9 dynes/cm = 0.289 N/m at 20°C 12.9 Liquid Water Interfacial Tension: 35 dynes/cm = 0.035 N/m at 20°C 12.10 Vapor (Gas) Specific Gravity: 2.7 12.11 Ratio of Specific Heats of Vapor (Gas): 1.061 12.12 Latent Heat of Vaporization: 169 Btu/lb = 94.1 cal/g = 3.94 X 10⁶ J/kg 12.13 Heat of Combustion: -17,460 Btu/lb = -9698 cal/g = -408.0 X 10⁶ J/kg 12.14 Heat of Decomposition: Not pertinent 12.15 Heat of Solution: Not pertinent 12.16 Heat of Polymerization: Not pertinent 12.25 Heat of Fusion: 30.45 cal/g 12.26 Limiting Value: Data not available 12.27 Reid Vapor Pressure: 3.22 psia</p>
9. SHIPPING INFORMATION	NOTES
<p>9.1 Grades of Purity: Industrial pure 99+ % Thiophene-free 99+ % Nitration 99+ % Industrial 90% 85+ % Reagent 99+ % 9.2 Storage Temperature: Open 9.3 Inert Atmosphere: No requirement 9.4 Venting: Pressure-vacuum</p>	

ETHYLBENZENE

ETB

<p>Common Symptoms Phenylethane EB</p>	<p>Liquid Flows on water.</p>	<p>Colorless</p>	<p>Sweet, gasoline-like odor Flammable, irritating vapor is produced.</p>
<p>Avoid contact with liquid and vapor. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Shut off ignition sources and call fire department. Stop discharge if possible. Keep people away. Stay upwind and use water spray to "knock down" vapor. Isolate and remove discharged material. Notify local health and pollution control agencies.</p>			
Fire	<p>FLAMMABLE Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles, self-contained breathing apparatus and rubber overclothing (including gloves). Extinguish with dry chemical, foam, or carbon dioxide. Water may be ineffective on fire. Cook exposed containers with water.</p>		
Exposure	<p>CALL FOR MEDICAL AID.</p> <p>VAPOR Irritating to eyes, nose, and throat. If inhaled, will cause dizziness and/or difficult breathing. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.</p> <p>LIQUID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.</p>		
Water Pollution	<p>HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.</p>		
<p>1. RESPONSE TO DISCHARGE (See Response Methods Handbook) Mechanical containment Should be removed Chemical and physical treatment</p>		<p>2. LABEL 2.1 Category: Flammable liquid 2.2 Class: 3</p>	
<p>3. CHEMICAL DESIGNATIONS 3.1 CG Compatibility Class: Aromatic Hydrocarbon 3.2 Formula: C₈H₈CH₂CH₃ 3.3 IMO/UN Designation: 3.3/1176 3.4 DOT ID No.: 1176 3.5 CAS Registry No.: 100-41-4</p>		<p>4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Aromatic</p>	
<p>5. HEALTH HAZARDS</p>			
<p>5.1 Personal Protective Equipment: Self-contained breathing apparatus; safety goggles. 5.2 Symptoms Following Exposure: Inhalation may cause irritation of nose, dizziness, depression. Moderate irritation of eye with corneal injury possible. Irritates skin and may cause blisters. 5.3 Treatment of Exposure: INHALATION: If ill effects occur, remove to fresh air, keep him warm and quiet, and get medical help promptly; if breathing stops, give artificial respiration. INGESTION: Induce vomiting only upon physician's approval; material in lung may cause chemical pneumonia. SKIN AND EYES: promptly flush with plenty of water (15 min. for eyes) and get medical attention; remove and wash contaminated clothing before reuse. 5.4 Threshold Limit Value: 100 ppm 5.5 Short Term Inhalation Limit: 200 ppm for 30 min. 5.6 Toxicity by Ingestion: Grade 2; LD50 = 0.5 to 5 g/kg (rat) 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Causes smarting of the skin and first-degree burns on short exposure; may cause secondary burns on long exposure. 5.10 Odor Threshold: 140 ppm 5.11 IDLH Value: 2,000 ppm</p>			

<p>6. FIRE HAZARDS</p> <p>6.1 Flesh Point: 80°F O.C.; 59°F C.C. 6.2 Flammable Limits in Air: 1.0%-6.7% 6.3 Fire Extinguishing Agents: Foam (most effective), water fog, carbon dioxide or dry chemical. 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Irritating vapors are generated when heated. 6.6 Behavior in Fire: Vapor is heavier than air and may travel considerable distance to the source of ignition and flash back. 6.7 Ignition Temperature: 860°F 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: 5.8 mm/min. 6.10 Adiabatic Flame Temperature: Data not available 6.11 Stoichiometric Air to Fuel Ratio: Data not available 6.12 Flame Temperature: Data not available</p>	<p>10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook) A-T-U</p>																														
<p>7. CHEMICAL REACTIVITY</p> <p>7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent 7.7 Molar Ratio (Reactant to Product): Data not available 7.8 Reactivity Group: 32</p>	<p>11. HAZARD CLASSIFICATIONS</p> <p>11.1 Code of Federal Regulations: Flammable liquid. 11.2 NAS Hazard Rating for Bulk Water Transportation:</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: right;">Category</td> <td style="text-align: right;">Rating</td> </tr> <tr> <td>Fire</td> <td>3</td> </tr> <tr> <td>Health</td> <td>2</td> </tr> <tr> <td>Water Pollution</td> <td>2</td> </tr> <tr> <td>Human Toxicity</td> <td>1</td> </tr> <tr> <td>Aquatic Toxicity</td> <td>3</td> </tr> <tr> <td>Aesthetic Affect</td> <td>2</td> </tr> <tr> <td>Reactivity</td> <td>0</td> </tr> <tr> <td>Other Chemicals</td> <td>1</td> </tr> <tr> <td>Water</td> <td>0</td> </tr> <tr> <td>Self Reaction</td> <td>0</td> </tr> </table> <p>11.3 NFPA Hazard Classification:</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: right;">Category</td> <td style="text-align: right;">Classification</td> </tr> <tr> <td>Health Hazard (Blue)</td> <td>2</td> </tr> <tr> <td>Flammability (Red)</td> <td>3</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td>0</td> </tr> </table>	Category	Rating	Fire	3	Health	2	Water Pollution	2	Human Toxicity	1	Aquatic Toxicity	3	Aesthetic Affect	2	Reactivity	0	Other Chemicals	1	Water	0	Self Reaction	0	Category	Classification	Health Hazard (Blue)	2	Flammability (Red)	3	Reactivity (Yellow)	0
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<p>8. WATER POLLUTION</p> <p>8.1 Aquatic Toxicity: 29 ppm/96 hr/bluegill/TL/fresh water 8.2 Waterflow Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): 2.8% (theor.), 5 days 8.4 Food Concentration Potential: None</p>	<p>12. PHYSICAL AND CHEMICAL PROPERTIES</p> <p>12.1 Physical State at 15°C and 1 atm: Liquid 12.2 Molecular Weight: 106.17 12.3 Boiling Point at 1 atm: 277.2°F = 138.2°C = 409.4°K 12.4 Freezing Point: -139°F = -95.0°C = 178°K 12.5 Critical Temperature: 861.0°F = 343.9°C = 817.1°K 12.6 Critical Pressure: 523 psia = 35.8 atm = 3.61 MN/m² 12.7 Specific Gravity: 0.867 at 20°C (liquid) 12.8 Liquid Surface Tension: 29.2 dynes/cm = 0.0292 N/m at 20°C 12.9 Liquid Water Interfacial Tension: 36.48 dynes/cm = 0.03648 N/m at 20°C 12.10 Vapor (Gas) Specific Gravity: Not pertinent 12.11 Ratio of Specific Heats of Vapor (Gas): 1.071 12.12 Latent Heat of Vaporization: 144 Btu/lb = 80.1 cal/g = 3.36 X 10⁴ J/kg 12.13 Heat of Combustion: -17,780 Btu/lb = -9877 cal/g = -413.5 X 10⁴ J/kg 12.14 Heat of Decomposition: Not pertinent 12.15 Heat of Solution: Not pertinent 12.16 Heat of Polymerization: Not pertinent 12.25 Heat of Fusion: Data not available 12.26 Limiting Value: Data not available 12.27 Reid Vapor Pressure: 0.4 psia</p>																														
<p>9. SHIPPING INFORMATION</p> <p>9.1 Grade of Purity: Research grade: 99.98%; pure grade: 99.5%; technical grade: 99.0% 9.2 Storage Temperature: Ambient 9.3 Inert Atmosphere: No requirement 9.4 Venting: Open (flame arrester) or pressure-vacuum.</p>																															
<p>NOTES</p>																															

TOLUENE

TOL

<p>Common Symptoms</p> <p>Toluol Methylbenzene Methylbenzol</p>	<p>Watery liquid Colorless Pleasant odor</p> <p>Floats on water. Flammable, irritating vapor is produced.</p>
<p>Stop discharge if possible. Keep people away. Shut off ignition sources and call fire department. Stay upwind and use water spray to "knock down" vapor. Avoid contact with liquid and vapor. Isolate and remove discharged material. Notify local health and pollution control agencies.</p>	
<p>Fire</p>	<p>FLAMMABLE Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemical, foam, or carbon dioxide. Water may be ineffective on fire. Cook exposed containers with water.</p>
<p>Exposure</p>	<p>CALL FOR MEDICAL AID.</p> <p>VAPOR Irritating to eyes, nose, and throat. If inhaled, will cause nausea, vomiting, headache, dizziness, difficult breathing, or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.</p> <p>LIQUID Irritating to skin and eyes. If swallowed, will cause nausea, vomiting, or loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.</p>
<p>Water Pollution</p>	<p>Dangerous to aquatic life in high concentrations. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.</p>
<p>1. RESPONSE TO DISCHARGE</p> <p>(See Response Methods Handbook) Issue warning-high flammability Evacuate area</p>	<p>2. LABEL</p> <p>2.1 Category: Flammable liquid 2.2 Class: 3</p>
<p>3. CHEMICAL DESIGNATIONS</p> <p>3.1 CG Compatibility Class: Aromatic Hydrocarbon 3.2 Formula: C₆H₅CH₃ 3.3 IMO/JUN Designation: 3.2/1294 3.4 DOT ID No.: 1294 3.5 CAS Registry No.: 108-88-3</p>	<p>4. OBSERVABLE CHARACTERISTICS</p> <p>4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Pungent, aromatic, benzene-like; distinct, pleasant</p>
<p>5. HEALTH HAZARDS</p>	
<p>5.1 Personal Protective Equipment: Air-supplied mask; goggles or face shield; plastic gloves. 5.2 Symptoms Following Exposure: Vapors irritate eyes and upper respiratory tract; cause dizziness, headache, anesthesia, respiratory arrest. Liquid irritates eyes and causes drying of skin. If aspirated, causes coughing, gagging, distress, and rapidly developing pulmonary edema. If ingested, causes vomiting, griping, diarrhea, depressed respiration. 5.3 Treatment of Exposure: INHALATION: remove to fresh air, give artificial respiration and oxygen if needed; call a doctor. INGESTION: do NOT induce vomiting; call a doctor. EYES: flush with water for at least 15 min. SKIN: wipe off, wash with soap and water. 5.4 Threshold Limit Value: 100 ppm 5.5 Short Term Inhalation Limits: 600 ppm for 30 min. 5.6 Toxicity by Ingestion: Grade 2; LD₅₀ = 0.6 to 5 g/kg 5.7 Late Toxicity: Kidney and liver damage may follow ingestion. 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin. 5.10 Odor Threshold: 0.17 ppm 5.11 IDLH Value: 2,000 ppm</p>	

<p>6. FIRE HAZARDS</p> <p>6.1 Flash Point: 40°F C.C.; 55° F. O.C. 6.2 Flammable Limits in Air: 1.27% - 7% 6.3 Fire Extinguishing Agents: Carbon dioxide or dry chemical for small fires, ordinary foam for large fires. 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective. 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back. 6.7 Ignition Temperature: 997°F 6.8 Electrical Hazard: Class I, Group D 6.9 Burning Rate: 5.7 mm/min. 6.10 Adiabatic Flame Temperature: Data not available. 6.11 Stoichiometric Air to Fuel Ratio: Data not available. 6.12 Flame Temperature: Data not available.</p>	<p>10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook)</p> <p style="text-align: center;">A-T-U</p>																																				
<p>7. CHEMICAL REACTIVITY</p> <p>7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent 7.7 Molar Ratio (Reactant to Product): Data not available 7.8 Reactivity Group: 32</p>	<p>11. HAZARD CLASSIFICATIONS</p> <p>11.1 Code of Federal Regulations: Flammable liquid. 11.2 NAS Hazard Rating for Bulk Water Transportation:</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: right;">Category</td> <td style="text-align: right;">Rating</td> </tr> <tr> <td>Fire</td> <td style="text-align: right;">3</td> </tr> <tr> <td>Health</td> <td style="text-align: right;">1</td> </tr> <tr> <td> Vapor Irritant</td> <td style="text-align: right;">1</td> </tr> <tr> <td> Liquid or Solid Irritant</td> <td style="text-align: right;">2</td> </tr> <tr> <td>Poisons</td> <td style="text-align: right;">2</td> </tr> <tr> <td>Water Pollution</td> <td style="text-align: right;">1</td> </tr> <tr> <td> Human Toxicity</td> <td style="text-align: right;">3</td> </tr> <tr> <td> Aquatic Toxicity</td> <td style="text-align: right;">2</td> </tr> <tr> <td> Aesthetic Affect</td> <td style="text-align: right;">1</td> </tr> <tr> <td>Reactivity</td> <td style="text-align: right;">1</td> </tr> <tr> <td> Other Chemicals</td> <td style="text-align: right;">0</td> </tr> <tr> <td> Water</td> <td style="text-align: right;">0</td> </tr> <tr> <td> Self Reaction</td> <td style="text-align: right;">0</td> </tr> </table> <p>11.3 NFPA Hazard Classification:</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: right;">Category</td> <td style="text-align: right;">Classification</td> </tr> <tr> <td>Health Hazard (Blue)</td> <td style="text-align: right;">2</td> </tr> <tr> <td>Flammability (Red)</td> <td style="text-align: right;">3</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td style="text-align: right;">0</td> </tr> </table>	Category	Rating	Fire	3	Health	1	Vapor Irritant	1	Liquid or Solid Irritant	2	Poisons	2	Water Pollution	1	Human Toxicity	3	Aquatic Toxicity	2	Aesthetic Affect	1	Reactivity	1	Other Chemicals	0	Water	0	Self Reaction	0	Category	Classification	Health Hazard (Blue)	2	Flammability (Red)	3	Reactivity (Yellow)	0
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<p>8. WATER POLLUTION</p> <p>8.1 Aquatic Toxicity: 1180 mg/l/96 hr/sunfish/TL/fresh water 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): 0%, 5 days; 38% (theor.), 8 days 8.4 Food Concentration Potential: None</p>	<p>12. PHYSICAL AND CHEMICAL PROPERTIES</p> <p>12.1 Physical State at 15°C and 1 atm: Liquid 12.2 Molecular Weight: 92.14 12.3 Boiling Point at 1 atm: 231.1°F = 110.6°C = 383.8°K 12.4 Freezing Point: -139°F = -95.0°C = 178.2°K 12.5 Critical Temperature: 605.4°F = 318.6°C = 581.8°K 12.6 Critical Pressure: 598.1 psia = 40.55 atm = 4.108 MN/m² 12.7 Specific Gravity: 0.867 at 20°C (liquid) 12.8 Liquid Surface Tension: 29.0 dynes/cm = 0.0290 N/m at 20°C 12.9 Liquid Water Interfacial Tension: 36.1 dynes/cm = 0.0361 N/m at 25°C 12.10 Vapor (Gas) Specific Gravity: Not pertinent 12.11 Ratio of Specific Heats of Vapor (Gas): 1.089 12.12 Latent Heat of Vaporization: 165 Btu/lb = 86.1 cal/g = 3.61 X 10⁵ J/kg 12.13 Heat of Combustion: -17.430 Btu/lb = 9886 cal/g = -4.065 X 10⁵ J/kg 12.14 Heat of Decomposition: Not pertinent 12.15 Heat of Solution: Not pertinent 12.16 Heat of Polymerization: Not pertinent 12.25 Heat of Fusion: 17.17 cal/g 12.26 Limiting Value: Data not available 12.27 Reid Vapor Pressure: 1.1 psia</p>																																				
<p>9. SHIPPING INFORMATION</p> <p>9.1 Grades of Purity: Research, reagent, nitration-all 99.8 + %; industrial, contains 84 + %, with 5% xylene and small amounts of benzene and nonaromatic hydrocarbons; 90/120; less pure than industrial. 9.2 Storage Temperature: Ambient 9.3 Inert Atmosphere: No requirement 9.4 Venting: Open (flame arrester) or pressure-vacuum.</p>	<p style="text-align: center;">NOTES</p>																																				

m-XYLENE

XLM

Common Symptoms 1,3-Dimethylbenzene Xylol	Watery liquid Colorless Sweet odor Floats on water. Flammable, irritating vapor is produced.
Stop discharges if possible. Keep people away. Call fire department. Avoid contact with liquid and vapor. Isolate and remove discharged material. Notify local health and pollution control agencies.	
Fire	FLAMMABLE Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear self-contained breathing apparatus. Extinguish with foam, dry chemical, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
Exposure	CALL FOR MEDICAL AID. VAPOR Irritating to eyes, nose, and throat. If inhaled, will cause headache, difficult breathing, or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. LIQUID Irritating to skin and eyes. If swallowed, will cause nausea, vomiting, or loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.
1. RESPONSE TO DISCHARGE (See Response Methods Handbook) Issue warning-high flammability Evacuate area Should be removed Chemical and physical treatment	2. LABEL 2.1 Category: Flammable liquid 2.2 Class: 3
3. CHEMICAL DESIGNATIONS 3.1 CG Compatibility Class: Aromatic Hydrocarbon 3.2 Formula: m-C ₈ H ₁₀ (CH ₃) ₂ 3.3 IMO/JUN Designation: 3.2/1307 3.4 DOT ID No.: 1307 3.5 CAS Registry No.: 108-38-3	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Like benzene; characteristic aromatic
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Approved canister or air-supplied mask; goggles or face shield; plastic gloves and boots. 5.2 Symptoms Following Exposure: Vapors cause headache and dizziness. Liquid irritates eyes and skin. If taken into lungs, causes severe coughing, distress, and rapidly developing pulmonary edema. If ingested, causes nausea, vomiting, cramps, headache, and coma; can be fatal. Kidney and liver damage can occur. 5.3 Treatment of Exposure: INHALATION: remove to fresh air; administer artificial respiration and oxygen if required; call a doctor. INGESTION: do NOT induce vomiting; call a doctor. EYES: flush with water for at least 15 min. SKIN: wipe off, wash with soap and water. 5.4 Threshold Limit Value: 100 ppm 5.5 Short Term Inhalation Limits: 300 ppm for 30 min. 5.6 Toxicity by Ingestion: Grade 3; LD ₅₀ = 50 to 600 g/kg 5.7 Late Toxicity: Kidney and liver damage 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled or clothing and allowed to remain, may cause smarting and reddening of the skin. 5.10 Odor Threshold: 0.05 ppm 5.11 IDLH Value: 10,000 ppm	

6. FIRE HAZARDS 6.1 Flash Point: 84°F C.C. 6.2 Flammable Limits in Air: 1.1%-6.4% 6.3 Fire Extinguishing Agents: Foam, dry chemical, or carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water be ineffective. 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back. 6.7 Ignition Temperature: 988°F 6.8 Electrical Hazard: Class I, Group D 6.9 Burning Rate: 5.8 mm/min. 6.10 Accelerated Flame Temperature: Data not available 6.11 Stoichiometric Air to Fuel Ratio: Data not available 6.12 Flame Temperature: Data not available	10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook) A-T-J 11. HAZARD CLASSIFICATIONS 11.1 Code of Federal Regulations: Flammable liquid 11.2 NAS Hazard Rating for Bulk Water Transportation: Category Rating Fire 3 Health 1 Vapor Irritant 1 Liquid or Solid Irritant 1 Poisons 2 Water Pollution Human Toxicity 1 Aquatic Toxicity 3 Aesthetic Affect 2 Reactivity Other Chemicals 1 Water 0 Self Reaction 0 11.3 NFPA Hazard Classification: Classification Health Hazard (Blue) 2 Flammability (Red) 3 Reactivity (Yellow) 0
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent 7.7 Molar Ratio (Reactant to Product): Data not available 7.8 Reactivity Group: 32	12. PHYSICAL AND CHEMICAL PROPERTIES 12.1 Physical State at 15°C and 1 atm: Liquid 12.2 Molecular Weight: 106.16 12.3 Boiling Point at 1 atm: 269.4°F = 131.9° = 405.1°K 12.4 Freezing Point: -64.2°F = -47.9°C = 225.3°K 12.5 Critical Temperature: 850.8°F = 343.8°C = 817.0°K 12.6 Critical Pressure: 513.8 atm = 34.95 psia = 3,540 MN/m ² 12.7 Specific Gravity: 0.864 at 20°C (liquid) 12.8 Liquid Surface Tension: 28.6 dyne/cm = 0.0286 N/m at 20°C 12.9 Liquid Water Interfacial Tension: 38.4 dyne/cm = 0.0384 N/m at 30°C 12.10 Vapor (Gas) Specific Gravity: Not pertinent 12.11 Ratio of Specific Heats of Vapor (Gas): 1.071 12.12 Latent Heat of Vaporization: 147 Btu/lb = 81.9 cal/g = 3.43 x 10 ⁶ J/kg 12.13 Heat of Combustion: -17,554 Btu/lb = -9752.4 cal/g = -408.31 x 10 ⁶ J/kg 12.14 Heat of Decomposition: Not pertinent 12.15 Heat of Solution: Not pertinent 12.16 Heat of Polymerization: Not pertinent 12.25 Heat of Fusion: 28.01 cal/g 12.26 Limiting Value: Data not available 12.27 Reid Vapor Pressure: 0.34 psia
8. WATER POLLUTION 8.1 Aquatic Toxicity: 22 ppm/96 hr/bluegill/T _L /fresh water 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): 0 lb/lb, 5 days 0% (theor.), 8 days 8.4 Food Concentration Potential: Data not available	9. SHIPPING INFORMATION 9.1 Grades of Purity: Research: 99.99%; Pure: 99.9%; Technical: 99.2% 9.2 Storage Temperature: Ambient 9.3 Inert Atmosphere: No requirement 9.4 Venting: Open (flame arrester) or pressure-vacuum
NOTES	

o-XYLENE

XLO

<p>Common Symptoms 1,2-Dimethylbenzene Xylol</p>	<p>Watery liquid Colorless Sweet odor</p> <p>Floats on water. Flammable, irritating vapor is produced.</p>
<p>Stop discharge if possible. Keep people away. Call fire department. Avoid contact with liquid and vapor. Isolate and remove discharged material. Notify local health and pollution control agencies.</p>	
Fire	<p>FLAMMABLE Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear self-contained breathing apparatus. Extinguish with foam, dry chemical, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.</p>
Exposure	<p>CALL FOR MEDICAL AID.</p> <p>VAPOR Irritating to eyes, nose, and throat. If inhaled, will cause headache, difficult breathing, or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.</p> <p>LIQUID Irritating to skin and eyes. If swallowed, will cause nausea, vomiting, or loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES: hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.</p>
Water Pollution	<p>Dangerous to aquatic life in high concentrations. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.</p>
<p>1. RESPONSE TO DISCHARGE (See Response Methods Handbook) Issue warning-high flammability Evacuate area Should be removed Chemical and physical treatment</p>	<p>2. LABEL</p> <p>2.1 Category: Flammable liquid 2.2 Class: 3</p>
<p>3. CHEMICAL DESIGNATIONS</p> <p>3.1 CG Compatibility Class: Aromatic Hydrocarbon 3.2 Formula: C₈H₁₀(CH₃)₂ 3.3 IMO/UN Designation: 3.2/1307 3.4 DOT ID No.: 1307 3.5 CAS Registry No.: 95-47-8</p>	<p>4. OBSERVABLE CHARACTERISTICS</p> <p>4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Benzene-like; characteristic aromatic</p>
5. HEALTH HAZARDS	
<p>5.1 Personal Protective Equipment: Approved canister or air-supplied mask; goggles or face shield; plastic gloves and boots.</p> <p>5.2 Symptoms Following Exposure: Vapors cause headache and dizziness. Liquid irritates eyes and skin. If taken into lungs, causes severe coughing, distress, and rapidly developing pulmonary edema. If ingested, causes nausea, vomiting, cramps, headache, and coma; can be fatal. Kidney and liver damage can occur.</p> <p>5.3 Treatment of Exposure: INHALATION: remove to fresh air; administer artificial respiration and oxygen if required; call a doctor. INGESTION: do NOT induce vomiting; call a doctor. EYES: flush with water for at least 15 min. SKIN: wipe off, wash with soap and water.</p> <p>5.4 Threshold Limit Value: 100 ppm 5.5 Short Term Inhalation Limits: 300 ppm for 30 min. 5.6 Toxicity by Ingestion: Grade 3; LD₅₀ = 50 to 500 g/kg 5.7 Late Toxicity: Kidney and liver damage 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled or clothing allowed to remain, may cause smarting and reddening of the skin. 5.10 Odor Threshold: 0.05 ppm 5.11 IDLH Value: 10,000 ppm</p>	

<p>6. FIRE HAZARDS</p> <p>6.1 Flash Point: 63°F C.C.; 75°F O.C. 6.2 Flammable Limits in Air: 1.1%-7.0% 6.3 Fire Extinguishing Agents: Foam, dry chemical, or carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water is ineffective. 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back. 6.7 Ignition Temperature: 868°F 6.8 Electrical Hazard: Class I, Group D 6.9 Burning Rate: 5.8 mm/min. 6.10 Adiabatic Flame Temperature: Data not available 6.11 Stoichiometric Air to Fuel Ratio: Data not available 6.12 Flame Temperature: Data not available</p>	<p>10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook)</p> <p style="text-align: center;">A-T;U</p>																																				
<p>7. CHEMICAL REACTIVITY</p> <p>7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent 7.7 Molar Ratio (Reactant to Product): Data not available 7.8 Reactivity Group: 32</p>	<p>11. HAZARD CLASSIFICATIONS</p> <p>11.1 Code of Federal Regulations: Flammable liquid 11.2 NAS Hazard Rating for Bulk Water Transportation:</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">Category</td> <td style="width: 50%;">Rating</td> </tr> <tr> <td>Fire</td> <td>3</td> </tr> <tr> <td>Health</td> <td>1</td> </tr> <tr> <td>Vapor Irritant</td> <td>1</td> </tr> <tr> <td>Liquid or Solid Irritant</td> <td>1</td> </tr> <tr> <td>Poisons</td> <td>2</td> </tr> <tr> <td>Water Pollution</td> <td></td> </tr> <tr> <td>Human Toxicity</td> <td>1</td> </tr> <tr> <td>Aquatic Toxicity</td> <td>3</td> </tr> <tr> <td>Aesthetic Affect</td> <td>2</td> </tr> <tr> <td>Reactivity</td> <td></td> </tr> <tr> <td>Other Chemicals</td> <td>1</td> </tr> <tr> <td>Water</td> <td>0</td> </tr> <tr> <td>Self Reaction</td> <td>0</td> </tr> </table> <p>11.3 NFPA Hazard Classification:</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">Category</td> <td style="width: 50%;">Classification</td> </tr> <tr> <td>Health Hazard (Blue)</td> <td>2</td> </tr> <tr> <td>Flammability (Red)</td> <td>3</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td>0</td> </tr> </table>	Category	Rating	Fire	3	Health	1	Vapor Irritant	1	Liquid or Solid Irritant	1	Poisons	2	Water Pollution		Human Toxicity	1	Aquatic Toxicity	3	Aesthetic Affect	2	Reactivity		Other Chemicals	1	Water	0	Self Reaction	0	Category	Classification	Health Hazard (Blue)	2	Flammability (Red)	3	Reactivity (Yellow)	0
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<p>8. WATER POLLUTION</p> <p>8.1 Aquatic Toxicity: > 100 mg/l/96 hr/D, magna/TL₁₀₀/fresh water 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): 0 lb/lb, 6 days; 2.5% (theor.), 8 days 8.4 Food Concentration Potential: Data not available</p>	<p>12. PHYSICAL AND CHEMICAL PROPERTIES</p> <p>12.1 Physical State at 15°C and 1 atm: Liquid 12.2 Molecular Weight: 106.16 12.3 Boiling Point at 1 atm: 291.9°F = 144.4°C = 417.8°K 12.4 Freezing Point: -13.3°F = -25.2°C = 248.0°K 12.5 Critical Temperature: 874.8°F = 367.1°C = 630.3°K 12.6 Critical Pressure: 541.5 atm = 38.84 psia = 3.732 MN/m² 12.7 Specific Gravity: 0.880 at 20°C (liquid) 12.8 Liquid Surface Tension: 30.63 dynes/cm = 0.03063 N/m at 15.5°C 12.9 Liquid Water Interfacial Tension: 38.08 dynes/cm = 0.03608 N/m at 20°C 12.10 Vapor (Gas) Specific Gravity: Not pertinent 12.11 Ratio of Specific Heats of Vapor (Gas): 1.068 12.12 Latent Heat of Vaporization: 149 Btu/lb = 82.9 cal/g = 3.47 x 10⁵ J/kg 12.13 Heat of Combustion: -17,668 Btu/lb = -8754.7 cal/g = -408.41 x 10³ J/kg 12.14 Heat of Decomposition: Not pertinent 12.15 Heat of Solution: Not pertinent 12.16 Heat of Polymerization: Not pertinent 12.25 Heat of Fusion: 30.84 cal/g 12.26 Limiting Value: Data not available 12.27 Reid Vapor Pressure: 0.28 psia</p>																																				
9. SHIPPING INFORMATION																																					
<p>9.1 Grades of Purity: Research: 99.99%; Pure: 99.7%; Commercial: 95+ % 9.2 Storage Temperature: Ambient 9.3 Inert Atmosphere: No action 9.4 Venting: Open (flame arrester) or pressure-vacuum</p>																																					
NOTES																																					

p-XYLENE

XLP

Common Symptoms 1,4-Dimethylbenzene Xylol	Watery liquid Colorless Sweet odor Floats on water. Flammable, irritating vapor is produced. Freezing point is 58°F.
Stop discharge if possible. Keep people away. Call fire department. Avoid contact with liquid and vapor. Isolate and remove discharged material. Notify local health and pollution control agencies.	
Fire	FLAMMABLE Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear self-contained breathing apparatus. Extinguish with foam, dry chemical, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
Exposure	CALL FOR MEDICAL AID. VAPOR Irritating to eyes, nose, and throat. If inhaled, will cause dizziness, difficult breathing, or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. LIQUID Irritating to skin and eyes. If swallowed, will cause nausea, vomiting, loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.
1. RESPONSE TO DISCHARGE (See Response Methods Handbook) Issue warning-high flammability Evacuate area Should be removed Chemical and physical treatment	2. LABEL 2.1 Category: Flammable liquid 2.2 Class: 3
3. CHEMICAL DESIGNATIONS 3.1 CG Compatibility Class: Aromatic Hydrocarbon 3.2 Formula: p-C ₈ H ₁₀ (CH ₃) ₂ 3.3 IMO/UN Designation: 3.2/1307 3.4 DOT ID No.: 1307 3.5 CAS Registry No.: 108-42-3	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Like benzene; characteristic aromatic
5. HEALTH HAZARDS	
5.1 Personal Protective Equipment: Approved canister or air-supplied mask; goggles or face shield; plastic gloves and boots. 5.2 Symptoms Following Exposure: Vapors cause headache and dizziness. Liquid irritates eyes and skin. If taken into lungs, causes severe coughing, distress, and rapidly developing pulmonary edema. If ingested, causes nausea, vomiting, cramps, headache, and coma. Can be fatal. Kidney and liver damage can occur. 5.3 Treatment of Exposure: INHALATION: remove to fresh air; administer artificial respiration and oxygen if required; call a doctor. INGESTION: do NOT induce vomiting; call a doctor. EYES: flush with water for at least 15 min. SKIN: wipe off, wash with soap and water. 5.4 Threshold Limit Value: 100 ppm 5.5 Short Term Inhalation Limits: 300 ppm for 30 min. 5.6 Toxicity by Ingestion: Grade 3; LD50 = 60 to 600 mg/kg 5.7 Late Toxicity: Kidney and liver damage. 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin. 5.10 Odor Threshold: 0.05 ppm 5.11 IDLH Value: 10,000 ppm	

6. FIRE HAZARDS
6.1 Flash Point: 81°F C.C. 6.2 Flammable Limits in Air: 1.1%-6.8% 6.3 Fire Extinguishing Agents: Foam, dry chemical, or carbon dioxide. 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective. 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back. 6.7 Ignition Temperature: 870°F 6.8 Electrical Hazard: Class I, Group D 6.9 Burning Rate: 5.8 mm/min. 6.10 Adiabatic Flame Temperature: Data not available 6.11 Stoichiometric Air to Fuel Ratio: Data not available 6.12 Flame Temperature: Data not available
7. CHEMICAL REACTIVITY
7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent 7.7 Molar Ratio (Reactant to Product): Data not available 7.8 Reactivity Group: 32
8. WATER POLLUTION
8.1 Aquatic Toxicity: 22 ppm/98/hr/ bluegill/fresh water 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): 0 lb/lb in 5 days 8.4 Food Concentration Potential: Data not available
9. SHIPPING INFORMATION
9.1 Grades of Purity: Research: 99.99%; Pure: 99.8%; Technical: 99.0% 9.2 Storage Temperature: Ambient 9.3 Inert Atmosphere: No requirement 9.4 Venting: Open (flame arrester) or pressure-vacuum

10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook)																																
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TETRAETHYL LEAD

TEL

<p>Common Symptoms. TEL Lead tetraethyl</p>	<p>Oily liquid Sinks in water. Poisonous, flammable vapor is produced.</p>	<p>Colorless, but generally dyed red Fruity odor</p>
<p>AVOID CONTACT WITH LIQUID AND VAPOR. Keep people away. Wear goggles, self-contained breathing apparatus, and rubber overclothing. Stop discharge if possible. Call fire department. Stay upwind and use water spray to "knock down" vapor. Isolate and remove discharged material. Notify local health and pollution control agencies.</p>		
Fire	<p>Combustible. POISONOUS GASSES ARE PRODUCED IN FIRE. Containers may explode in fire. Vapor may explode if ignited in an enclosed area. Wear goggles, self-contained breathing apparatus, and rubber overclothing, including gloves. Combat fires from behind barrier or protected location. Flood discharge area with water. Extinguish with water, dry chemicals, foam, or carbon dioxide. Cool exposed containers with water.</p>	
Exposure	<p>CALL FOR MEDICAL AID. VAPOR POISONOUS IF INHALED OR IF SKIN IS EXPOSED. Irritating to eyes. Move to fresh air. If breathing has stopped, give artificial respiration. LIQUID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED. Will burn eyes. Remove contaminated clothing and shoes. Flush affected area with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.</p>	
Water Pollution	<p>HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.</p>	
1. RESPONSE TO DISCHARGE <small>(See Response Methods Handbook)</small> Issue warning-poison, water contaminant Restrict access Should be removed Chemical and physical treatment	2. LABEL 2.1 Category: Poison 2.2 Class: 6	
3. CHEMICAL DESIGNATIONS 3.1 CG Compatibility Class: Not listed 3.2 Formula: Pb(C ₂ H ₅) ₄ 3.3 IMO/IUN Designation: 6.1/1849 3.4 DOT ID No.: 1849 3.5 CAS Registry No.: 78-00-2	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Dyed red or other distinctive color. 4.3 Odor: Sweet	
5. HEALTH HAZARDS		
<p>5.1 Personal Protective Equipment: Organic vapor type canister face mask for short periods; air line type for longer periods; neoprene-coated, liquid-proof gloves; protective goggles or face shield; white or light-colored clothing; rubber shoes or boots.</p> <p>5.2 Symptoms Following Exposure: Increased urinary output of lead. If a large degree of absorption from inhalation or skin contact, may cause insomnia, excitability, delirium, coma, and death. Do not confuse with inorganic lead.</p> <p>5.3 Treatment of Exposure: Remove victim from contaminated area and consult physician immediately. INGESTION: Induce vomiting. SKIN: wash immediately with kerosene or similar petroleum distillate followed by soap and water.</p> <p>5.4 Threshold Limit Value: 0.1 mg/m³</p> <p>5.5 Short Term Inhalation Limits: 0.15 mg Pb/m³ for 30 min.</p> <p>5.6 Toxicity by Ingestion: Oral rate LD₅₀ = 17 mg/kg</p> <p>5.7 Late Toxicity: Lead poisoning</p> <p>5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.</p> <p>5.9 Liquid or Solid Irritant Characteristics: Causes smarting of the skin and first-degree burns on short exposure; may cause secondary burns on long exposure.</p> <p>5.10 Odor Threshold: Data not available</p> <p>5.11 IDLH Value: 40 mg/m³</p>		

<p style="text-align: center;">6. FIRE HAZARDS</p> <p>6.1 Flash Point: 200°F C.C.; 285°F O.C. 6.2 Flammable Limits in Air: Data not available 6.3 Fire Extinguishing Agents: Water, foam, dry chemical, or carbon dioxide. 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Toxic gases are generated in fires. 6.6 Behavior in Fire: May explode in fire. 6.7 Ignition Temperature: Decomposes above 230°F 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Data not available 6.10 Adiabatic Flame Temperature: Data not available. 6.11 Stoichiometric Air to Fuel Ratio: Data not available 6.12 Flame Temperature: Data not available</p>	<p style="text-align: center;">10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook) A-X-Y</p>
<p style="text-align: center;">7. CHEMICAL REACTIVITY</p> <p>7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: Rust and some metals cause decomposition. 7.3 Stability During Transport: Stable below 230°F. At higher temperatures, may detonate or explode when confined. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent 7.7 Molar Ratio (Reactant to Product): Data not available 7.8 Reactivity Group: Data not available</p>	<p style="text-align: center;">11. HAZARD CLASSIFICATIONS</p> <p>11.1 Code of Federal Regulations: Poison B 11.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 11.3 NFPA Hazard Classification: Health Hazard (Blue) 3 Flammability (Red) 2 Reactivity (Yellow) 3</p>
<p style="text-align: center;">8. WATER POLLUTION</p> <p>8.1 Aquatic Toxicity: 0.20 mg/l/96 hr/bluegill/TL₅₀/fresh water 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Concentration Potential: Data not available</p>	<p style="text-align: center;">12. PHYSICAL AND CHEMICAL PROPERTIES</p> <p>12.1 Physical State at 15°C and 1 atm: Liquid 12.2 Molecular Weight: 323.44 12.3 Boiling Point at 1 atm: Decomposes 12.4 Freezing Point: -215°F = -137°C = 136°K 12.5 Critical Temperature: Not pertinent 12.6 Critical Pressure: Not pertinent 12.7 Specific Gravity: 1.833 at 20°C (liquid) 12.8 Liquid Surface Tension: 28.5 dynes/cm = 0.285 N/m at 25°C 12.9 Liquid Water Interfacial Tension: (est.) 40 dynes/cm = 0.04 N/m at 20°C 12.10 Vapor (Gas) Specific Gravity: Not pertinent 12.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 12.12 Latent Heat of Vaporization: Not pertinent 12.13 Heat of Combustion: (est.) -7,870 Btu/lb = -4,380 cal/g = -183 X 10³ J/kg 12.14 Heat of Decomposition: Not pertinent 12.15 Heat of Solution: Not pertinent 12.16 Heat of Polymerization: Not pertinent 12.25 Heat of Fusion: Data not available 12.26 Limiting Value: Data not available 12.27 Reid Vapor Pressure: Data not available</p>
<p style="text-align: center;">9. SHIPPING INFORMATION</p> <p>9.1 Grades of Purity: Technical 9.2 Storage Temperature: Ambient 9.3 Inert Atmosphere: No requirement 9.4 Vending: Pressure-vacuum</p>	
<p>NOTES</p>	

PETROLEUM NAPHTHA

PTN

Common Symptoms Petroleum solvent	Liquid Colorless Gasoline odor Floats on water. Flammable vapor is produced.
<p>Stop discharge if possible. Keep people away. Shut off ignition sources and call fire department. Stay upwind and use water spray to knock down vapor. Avoid contact with liquid. Isolate and remove discharged material. Notify local health and pollution control agencies.</p>	
Fire	<p>FLAMMABLE Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with foam, dry chemical, or carbon dioxide. Cool exposed containers with water.</p>
Exposure	<p>CALL FOR MEDICAL AID.</p> <p>VAPOR Not irritating to eyes, nose, or throat.</p> <p>LIQUID Harmful if swallowed. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.</p>
Water Pollution	<p>Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.</p>
1. RESPONSE TO DISCHARGE (See Response Methods Handbook) Issue warning-high flammability Restrict access Evacuate area	2. LABEL 2.1 Category: Flammable liquid 2.2 Class: 3
3. CHEMICAL DESIGNATIONS 3.1 CG Competibility Class: Miscellaneous Hydrocarbon Mixtures 3.2 Formula: Not applicable 3.3 IMO/UN Designation: 3.2/1255 3.4 DOT ID No.: 1255 3.5 CAS Registry No.: 8030-30-8	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Like gasoline and kerosene
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles or face shield (as for gasoline). 5.2 Symptoms Following Exposure: Inhalation of concentrated vapor may cause intoxication. Liquid is not very irritating to skin or eyes but may get into lungs by aspiration. 5.3 Treatment of Exposure: INHALATION: remove victim to fresh air and treat symptoms. INGESTION: have victim drink water or milk; do NOT induce vomiting. EYES: flush with water for 15 min. SKIN: wipe off and wash with soap and water. 5.4 Threshold Limit Value: No single TLV applicable. 5.5 Short Term Inhalation Limits: 500 ppm for 30 min. 5.6 Toxicity by Ingestion: Grade 2; LD50 = 0.5 to 5 g/kg 5.7 Late Toxicity: None 5.8 Vapor (Gas) Irritant Characteristics: Vapors are non-irritating to the eyes and throat. 5.9 Liquid or Solid Irritant Characteristics: No appreciable hazard. Practically harmless to the skin. 5.10 Odor Threshold: Data not available 5.11 IDLH Value: 10,000 ppm	

6. FIRE HAZARDS 6.1 Flash Point: 20°F (approx.) C.C. 6.2 Flammable Limits in Air: 0.9% - 8.0% 6.3 Fire Extinguishing Agents: Foam, carbon dioxide, or dry chemical 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective. 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: 450°F (approx.) 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: 4 mm/min. 6.10 Adiabatic Flame Temperature: Data not available 6.11 Stoichiometric Air to Fuel Ratio: Data not available 6.12 Flame Temperature: Data not available	10. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook) A-T-U;V-W
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent 7.7 Molar Ratio (Reactant to Product): Data not available 7.8 Reactivity Group: 33	11. HAZARD CLASSIFICATIONS 11.1 Code of Federal Regulations: Flammable liquid 11.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 11.3 NFPA Hazard Classification: Not listed
8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Concentration Potential: None	12. PHYSICAL AND CHEMICAL PROPERTIES 12.1 Physical State at 15°C and 1 atm: Liquid 12.2 Molecular Weight: Not pertinent 12.3 Boiling Point at 1 atm: 207.0°F = 97.2°C = 370.4°K 12.4 Freezing Point: Not pertinent 12.5 Critical Temperature: Not pertinent 12.6 Critical Pressure: Not pertinent 12.7 Specific Gravity: 0.74 at 20°C (liquid) 12.8 Liquid Surface Tension: 19-23 dynes/cm = 0.019-0.023 N/m at 20°C 12.9 Liquid Water Interfacial Tension: 39-51 dynes/cm = 0.039-0.051 N/m at 20°C 12.10 Vapor (Gas) Specific Gravity: Not pertinent 12.11 Ratio of Specific Heats of Vapor (Gas): (est.) 1.030 12.12 Latent Heat of Vaporization: 130-160 Btu/lb = 71-81 cal/g = 3.0-3.4 X 10 ⁵ J/kg 12.13 Heat of Combustion: Data not available 12.14 Heat of Decomposition: Not pertinent 12.15 Heat of Solution: Not pertinent 12.16 Heat of Polymerization: Not pertinent 12.25 Heat of Fusion: Data not available 12.26 Limiting Value: Data not available 12.27 Reid Vapor Pressure: Data not available
9. SHIPPING INFORMATION 9.1 Grades of Purity: Data not available 9.2 Storage Temperature: Ambient 9.3 Inert Atmosphere: No requirement 9.4 Venting: Open (flame arrester) or pressure-vacuum	NOTES

5.0 SITE CONTROL

5.1 ZONATION. Due to the nature of the work (multiple soil borings and monitoring well sampling throughout the study area) and the properties of the potential chemicals found onsite, typical exclusion, contamination reduction, and support zones are not necessary or practical at all locations. Therefore, where appropriate, a "floating" exclusion zone in the perimeter of the sampling site will be established to eliminate access to the area by the individuals not working on the project or involved in the assignment work. The perimeter will be at least 20 feet in radius and moved accordingly as the assessment points are moved.

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

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

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

- Work and sampling will be conducted in level D clothing and equipment.

6.0 DECONTAMINATION AND DISPOSAL

General decontamination practices used during ABB-ES projects are described in Chapter 13.0 of the CLEAN HASP.

6.1 PERSONNEL DECONTAMINATION. All personnel leaving the investigation area are subject to decontamination (as necessary). The decontamination procedure required will be determined by the nature and level of contamination found at the sites. At a minimum, site personnel will remove loose soil from boots and clothing before leaving the site. More thorough decontamination procedures will be observed as dictated by site conditions. These procedures are described in Chapter 13.0 of the CLEAN HASP.

6.1.1 Small Equipment Decontamination Small equipment will be protected from contamination as much as possible by keeping the equipment covered when at the site and placing the equipment on plastic sheeting, not the ground. Sampling equipment used at the site will be used only once or will be cleaned in the field between samples with soapy water (Alconox™), rinsed with clean water, rinsed with an approved Quality Assurance/Quality Control solvent, and given a final rinse with organic free water.

6.1.2 Heavy Equipment Decontamination Drilling rigs and other heavy equipment will be cleaned with high-pressure water or steam. Loose material will be removed with a brush. Downhole tools and heavy equipment will be similarly decontaminated.

The decontamination area, upwind of the sites, will include an area suitable for containment of washwater and waste derived from decontamination of heavy equipment. Large portable equipment (drill rods, auger flights, well casing, etc.) will be cleaned on sawhorses or other supports constructed above plastic sheeting. Storage of containerized waste, if appropriate, will be coordinated through the Activity Environmental Coordinator.

6.2 COLLECTION AND DISPOSAL OF DECONTAMINATION PRODUCTS. Investigation-derived wastes shall be handled in such a way as to preclude the potential for spreading contamination, creating a sanitary hazard, or causing litter to be left onsite. Potentially contaminated materials (e.g., clothing, gloves, etc.) will be bagged or drummed as necessary and segregated for disposal. Contaminated waste materials shall be disposed of as required by the provisions included in the contract and consistent with NTC and regulatory provisions. All non-contaminated materials shall be collected and bagged for appropriate disposal as normal domestic waste.

7.0 EMERGENCY AND CONTINGENCY PLAN

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

7.1 PERSONNEL ROLES, LINES OF AUTHORITY, AND COMMUNICATION. The site HSO or the Health and Safety designee is the primary authority for directing operations at the site under emergency conditions. All communications both onsite and offsite will be directed through the HSO or designee. Emergency telephone numbers are listed in Section 9.5.

7.2 EVACUATION. In the event of an emergency situation such as fire, explosion, significant release of toxic gases, etc., an air horn or other appropriate device will be sounded for three long blasts indicating the initiation of evacuation procedures. All personnel will evacuate the work area. The location of safe areas will be upwind of the site. For efficient and safe site evacuation and assessment of the emergency situation, the HSO will have authority to initiate proper action if outside services are required. Under no circumstances will incoming personnel or visitors be allowed to proceed into the area once the emergency signal has been given. The HSO must see that access for emergency equipment is provided and that all combustible apparatus have been shut down once the alarm has been sounded. Once the safety of all personnel is established, the NTC Environmental Coordinator, Dan Roberts, will be notified by telephone of the emergency (407-646-4661).

The HSO will notify local fire and police departments and other appropriate emergency response groups if lower explosive limit (LEL) values are above 20 percent in the work zone, or if an actual fire or explosion has taken place.

Fire Department: 9-911 or 646-4333
Police Department: 9-911 or 646-4444

7.3 EMERGENCY MEDICAL TREATMENT AND FIRST AID. Any personnel injured onsite will be rendered first aid as appropriate and transported to competent medical facilities for further examination and/or treatment. (Designated emergency medical facilities and routes from the site are listed in Section 8.6.) The preferred method of transport would be through professional emergency transportation means; however, when this is not readily available or would result in excessive delay, other transport will be authorized. Under no circumstances will injured persons transport themselves to a medical facility for emergency treatment.

8.0 SAFE WORK PRACTICES

All personnel onsite are required to promote and follow prudent work practices to provide a safe working environment. All individuals are to follow the guidelines given below for their specific work activities.

8.1 DRILL RIG SAFETY PROCEDURES. The ABB-ES FOL will observe drilling and well installation procedures and provide air monitoring, as needed, for specific activities. The FOL will remain outside the immediate work area around the rig, whenever possible, to avoid interference with drilling activities. In addition, drilling subcontractors are responsible for maintaining safe, fully operational drilling equipment in the field, and should conduct regular safety inspections of equipment and working conditions.

8.2 SAMPLING SAFETY PROCEDURES. Safety practices for sampling activities provide worker protection from chemical hazards associated with the sample materials, preservatives, and chemicals that may be required for equipment decontamination. In addition, the following points of good field practice should be implemented.

- Specified USEPA Region IV sampling techniques should be used.
- Good judgment should be used in collecting and handling samples. (If a proposed sampling site is not readily accessible or the sampling method is unfeasible, sample collection should not be attempted. The TOM and TL should be contacted to select an alternate sampling site.)
- Spills, dirt, and residue from sampling should be cleaned up immediately.
- Damaged sampling gear or equipment should be repaired or replaced immediately.
- The sampling area should be evacuated if any symptoms of overexposure are detected, and such incidents should be reported to the HSO and TOM.
- Unnecessary physical contact with sample material should be avoided.
- Exposure and environmental monitoring should be performed as required by the safety plan.
- Contact with chemicals used for sample preservation or decontamination of sampling equipment should be avoided.

8.3 TANK REMOVAL SAFETY PROCEDURES. The Remedial Action Contract (RAC) contractor will perform aboveground storage tank (AST) and underground storage tank (UST) removal. ABB-ES personnel will be present during the tank removal activities to screen the soil in the tank excavation and provide air monitoring. ABB-ES personnel will remain outside the immediate work area whenever possible, to avoid interference with heavy equipment associated with tank removal activities. The RAC contractor will be responsible for safety of operations and equipment.

9.0 ADMINISTRATION

9.1 PERSONNEL AUTHORIZED DOWNRANGE. Personnel authorized to participate in downrange activities at this site have been reviewed and certified for site operations by the TOM and the HSO. Certification involves the completion of appropriate training (including first-aid and cardiopulmonary resuscitation [CPR] training), a medical examination, and a review of this site-specific HASP. All persons entering the site must use the buddy system, and check in with the FOL and/or HSO before going downrange.

CERTIFIED ABB ENVIRONMENTAL TEAM PERSONNEL:

<u>Mike Dunaway**</u>	<u>John Kaiser**</u>
<u>Jay Koch**</u>	<u>Manuel Alonzo**</u>
<u>Scott Donelick**</u>	<u>Mirna Barq**</u>
<u>Pamela Wagner**</u>	<u>Celora Jackson**</u>
<u>James Huffman**</u>	<u>Blake Svendsen**</u>
<u>Joe Ullo**</u>	<u>Bob Burns**</u>
<u>Jim Williams **</u>	<u>Mark Dibli**</u>
<u>John Nash**</u>	<u>Matt Hennessey**</u>
<u>Erin Champ**</u>	<u>Joseph Beauchamp**</u>
<u>Dave Meyers**</u>	<u>Joseph Fugitt**</u>

* First Aid-trained

+ CPR-trained

9.2 HEALTH AND SAFETY PLAN (HASP) APPROVALS. By their signatures, the undersigned certify that this HASP will be used for the protection of the health and safety of all persons entering this site.

Health and Safety Officer

Date

Task Order Manager

Date

Health and Safety Manager/Supervisor

Date

9.3 FIELD TEAM REVIEW. I have read and reviewed the health and safety information in the HASP. I understand the information and will comply with the requirements of the HASP.

NAME: _____

DATE: _____

SITE/PROJECT: _____

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

Project: NTC, Orlando

Name: _____

Address: _____

Home Telephone: Area Code () _____

Age: _____ Height: _____ Weight: _____

In case of emergency, contact: _____

Address: _____

Telephone: Area Code () _____

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

Allergies: _____

List medication(s) taken regularly: _____

Particular sensitivities: _____

Previous/current medical conditions or exposures to hazardous chemicals:

Name of Personal Physician: _____

Telephone: Area Code () _____

9.5 EMERGENCY TELEPHONE NUMBERS

Orlando Police Department	911
Main Base Police Emergency	(407) 646-4444
Rescue Service	911
Main Base Naval Hospital	(407) 646-4911
Primary Hospital	
Main Base (Winter Park Memorial Hospital)	(407) 646-7320
Area "C" (Florida Hospital)	(407) 897-1940
Herndon Annex (Orlando General Hospital)	(407) 275-5150
McCoy Annex (Orlando Regional Medical Center)	(407) 841-5111
Alternate Hospital	
Main Base and Herndon Annex (Florida Hospital)	(407) 897-1940
Area "C" (Winter Park Memorial Hospital)	(407) 646-7320
McCoy Annex	None
Fire Department	
Main Base	(407) 646-4333
General	911
Offsite Emergency Services	911
Poison Control Center	(800) 962-1253
National Response Center	(800) 424-8802
Regional USEPA Emergency Response	(904) 488-1554
NTC, Orlando Officer of the Day	(407) 646-4501
Site HSO: To be determined	() -
Task Order Manager: <u>John Kaiser</u>	(407) 894-8876
ABB-ES HSM: <u>Meg Macleod</u>	(800) 341-0460 x3380

9.6 ROUTES TO EMERGENCY MEDICAL FACILITIES In the event of a life-threatening situation, the Naval Hospital on the Main Base will provide care. For less critical situations, or if medical assistance is required at other than the Main Base, the following sources of medical assistance apply. The NTC, Orlando Officer of the Day must be informed of any incident or accident that requires medical attention as soon as possible.

The primary source of medical assistance for Main Base is:

Facility Name: Winter Park Memorial Hospital

Address: 200 Lakemont Avenue, Winter Park, FL

Telephone Number: (407) 646-7000; Emergency (407) 646-7320

Directions to primary source of medical assistance from Main Base (Figure 9-1):

From project site leave Main Base going north through the North Gate. Continue north on Lakemont Avenue for about 1.7 miles. The hospital is on the right between the intersections of Mizell Avenue and Aloma Avenue.

The primary source of medical assistance for Area "C" is:

Facility Name: Florida Hospital

Address: 601 E. Rollins Street, Orlando, FL

Telephone Number: (407) 896-6611; Emergency (407) 897-1940

Directions to primary source of medical assistance from Area "C" (Figure 9-1):

From project site leave Area "C" and turn right onto Maguire. Continue to Colonial Drive (SR 50). Turn right (west) and continue to Mills Avenue (Highway 17/92). Turn right (north) to Rollins Street. The Florida Hospital is on the left (west) side of Mills Avenue, at the intersection with Rollins Street.

The primary source of medical assistance for Herndon Annex is:

Facility Name: Orlando General Hospital

Address: 7727 Lake Underhill Road, Orlando, FL

Telephone Number: (407) 277-8110; Emergency (407) 275-5150

Directions to primary source of medical assistance from Herndon Annex (Figure 9-1):

From project site leave Herndon Annex going east on Kalmia to Semoran Boulevard. Take a right (south) at Semoran Boulevard. Continue to the Lake Underhill Road intersection and turn left (east, just past the East-West Expressway overpass). Continue for about 1.8 miles to the hospital on the

left, which is between the intersections of Goldenrod Road and Chickasaw Trail.

The primary source of medical assistance for McCoy Annex is:

Facility Name: Orlando Regional Medical Center

Address: 1414 Kuhl Avenue, Orlando, FL

Telephone Number: (407) 841-5111; Emergency (407) 841-5111

Directions to primary source of medical assistance from McCoy Annex (Figure 9-2):

From project site leave McCoy Annex through the north Daetwyler Drive entrance. Turn left (west) on the frontage road (McCoy Road) along the Bee-Line Expressway and continue to the South Orange Avenue intersection. Turn right (north) and continue for about 5.4 miles to the hospital on the left, which is between the side roads of Sturtevant and Underwood Streets. Kuhl Avenue is behind the hospital.

Alternate source of medical assistance for Main Base and Herndon Annex is:

Facility Name: Florida Hospital

Address: 601 E. Rollins Street, Orlando, FL

Telephone Number: (407) 896-6611; Emergency (407) 897-1940

Directions to alternate source of medical assistance from Main Base (Figure 9-3):

From project site leave Main Base through the Maguire Gate. Continue on Maguire Boulevard to the Colonial Drive (SR 50) intersection. Turn right (west) and continue to the Mills Avenue intersection. Turn right (north) and continue about 1.4 miles to Rollins Street. The hospital is on the left (west).

Directions to alternate source of medical assistance from Herndon Annex (Figure 9-3):

From project site leave Herndon Annex going east on Kalmia. Take a left (north) onto Semoran Boulevard (SR 436) and continue to the Colonial Drive (SR 50) intersection. Turn left (west) and continue to the Mills Avenue intersection. Turn right (north) and continue about 1.4 miles to Rollins Street. The hospital is on the left (west).

The alternate source of medical assistance for Area "C" is:

Facility Name: Winter park Memorial Hospital

Address: 200 Lakemont Avenue, Winter Park, FL

Telephone Number: (407) 646-7000; Emergency (407) 646-7320

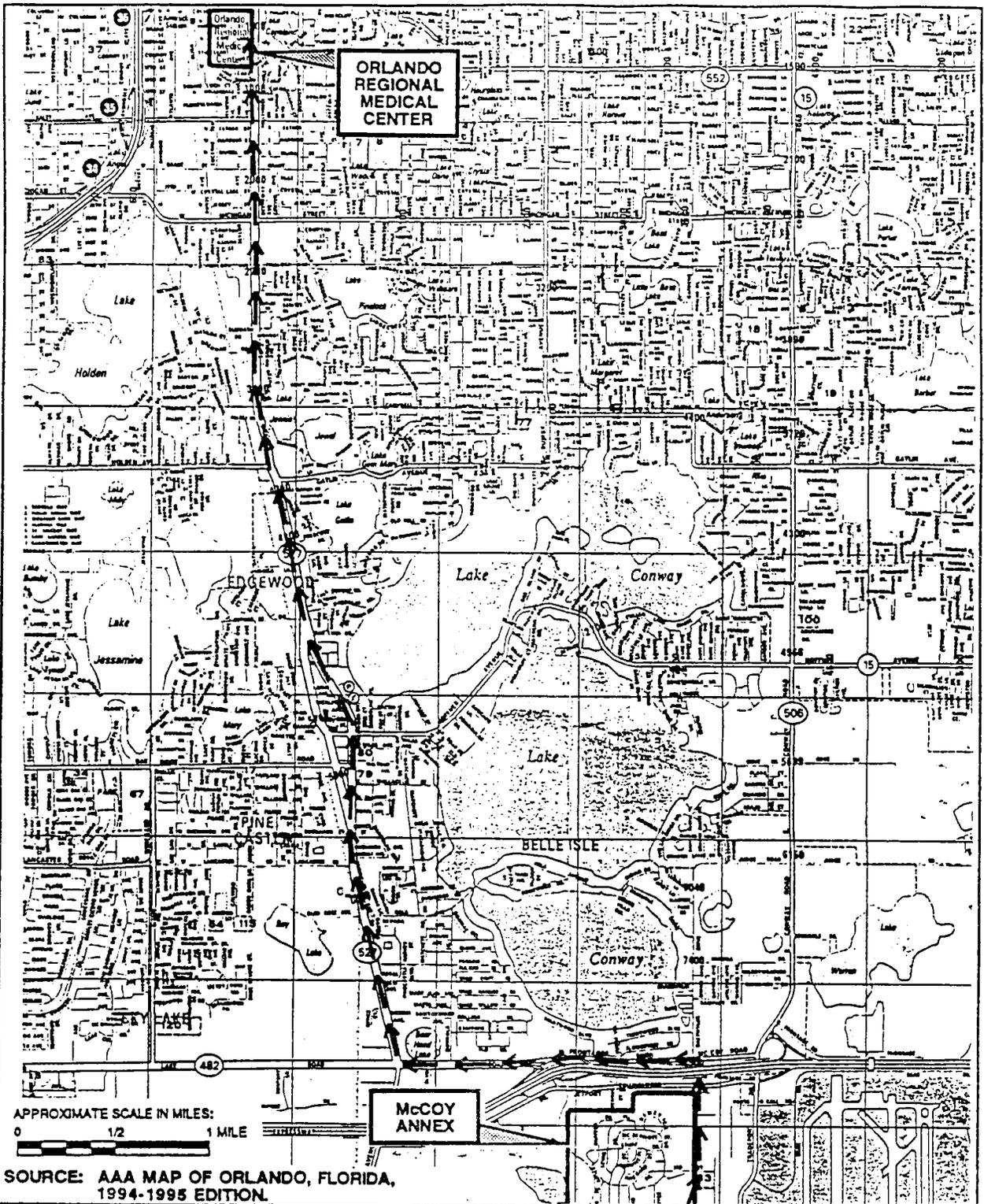


FIGURE 9-2

McCOY ANNEX
PRIMARY HOSPITAL ROUTES



HEALTH AND SAFETY PLAN

NAVAL TRAINING CENTER
ORLANDO, FLORIDA

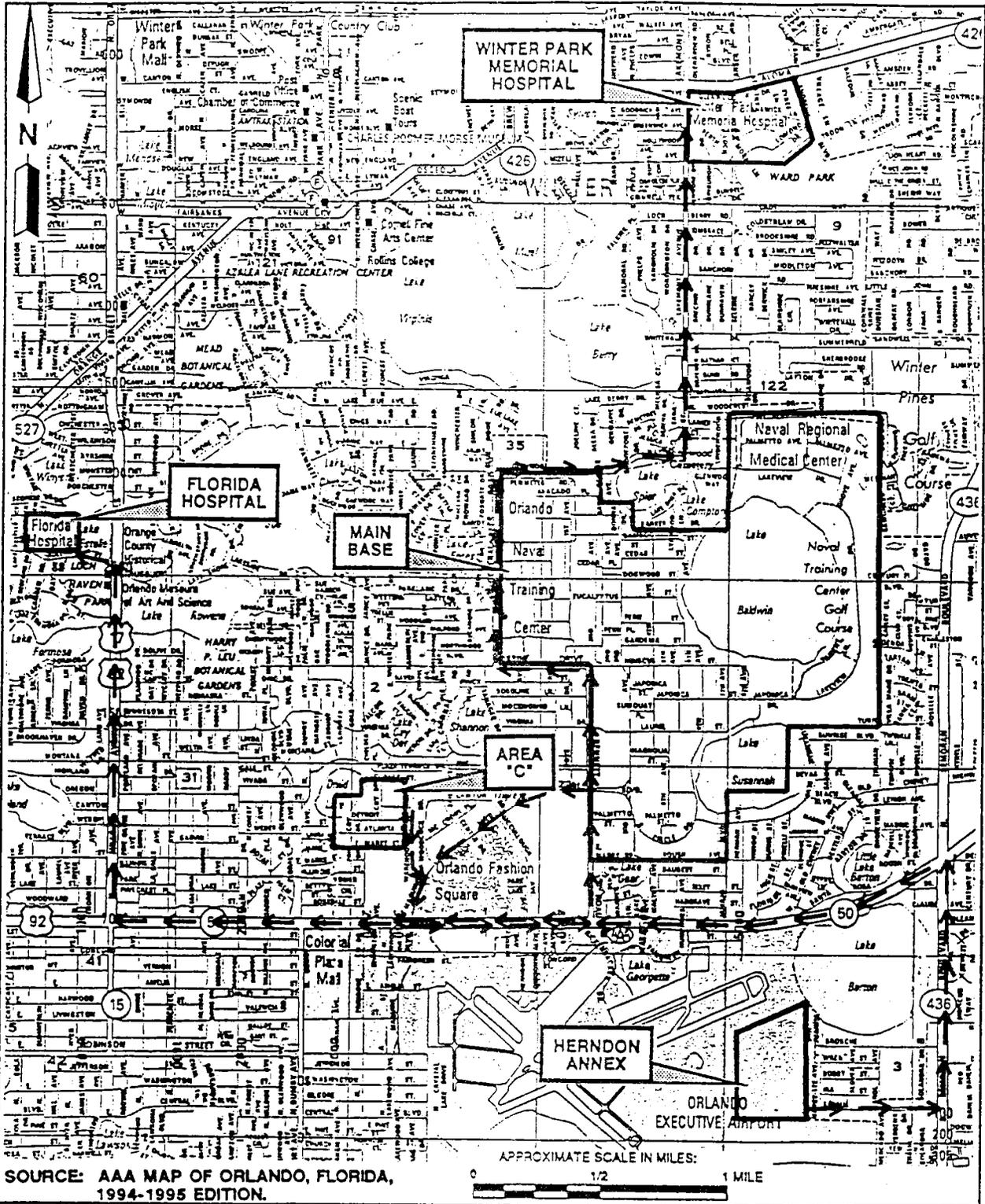


FIGURE 9-3

MAIN BASE AREA "C", AND HERNDON ANNEX
SECONDARY HOSPITAL ROUTES



HEALTH AND SAFETY PLAN

NAVAL TRAINING CENTER
ORLANDO, FLORIDA

REFERENCES

- ABB Environmental Services, Inc. (ABB-ES), 1992, Documentation Support and Hazard Ranking System II Scoring, Naval Training Center, Orlando, Florida: prepared for Southern Division, Naval Facilities Engineering Command (SOUTHNAVFACENGCOM).
- ABB-ES, 1994a, BRAC Cleanup Plan (BCP), 1994, 90 Percent Completion Draft BRAC Cleanup Plan, Naval Training Center, Orlando, Florida: prepared for SOUTHNAVFACENGCOM.
- ABB-ES, 1994b, Final Draft Environmental Baseline Survey (EBS), Naval Training Center, Orlando, Florida: prepared for SOUTHNAVFACENGCOM.
- ABB-ES, 1995, Final Draft Base Realignment and Closure (BRAC) Tank Management Plan, Naval Training Center, Orlando, Florida: prepared for SOUTHNAVFACENGCOM.
- C.C. Johnson & Associates, Inc., 1985, Initial Assessment Study of Naval Training Center Orlando, Florida: prepared for Naval Energy and Environmental Support Activity (NEESA), Port Hueneme, California, September 1985.
- Geraghty & Miller, 1986, Verification Study, Assessment of Potential Soil and Ground-Water Contamination at Naval Training Center, Orlando, Florida: prepared for SOUTHNAVFACENGCOM, December 1986.
- U.S. Geological Survey, 1980, Map of Orlando East, FL Quadrangle: 7.5 Minute Series (Topographic), Reston, Virginia.

JOB SAFETY & HEALTH PROTECTION

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

EMPLOYERS

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

EMPLOYEES

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

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

INSPECTION

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

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

COMPLAINT

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

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

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

CITATION

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

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

PROPOSED PENALTY

The Act provides for mandatory civil penalties against employers of up to \$7,000 for each serious violation and for optional penalties of up to \$7,000 for each nonserious violation. Penalties of up to \$7,000 per day may be proposed for failure to correct violations within the proposed time period and for each day the violation continues beyond the prescribed abatement date. Also, any employer who willfully or repeatedly violates the Act may be assessed penalties of up to \$70,000 for each such violation. A violation of posting requirements can bring a penalty of up to \$7,000.

There are also provisions for criminal penalties. Any willful violation resulting in the death of any employee, upon conviction, is punishable by a fine of up to \$250,000 (or \$500,000 if the employer is a corporation), or by imprisonment for up to six months, or both. A second conviction of an employer doubles the possible term of imprisonment. Falsifying records, reports, or applications is punishable by a fine of \$10,000 or up to six months in jail or both.

VOLUNTARY ACTIVITY

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

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

VOLUNTARY ACTIVITY

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

POSTING INSTRUCTIONS

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

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

More Information

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

Atlanta, Georgia

Boston, Massachusetts

Chicago, Illinois

Dallas, Texas

Denver, Colorado

Kansas City, Missouri

New York, New York

Philadelphia, Pennsylvania

San Francisco, California

Seattle, Washington

(404) 347-3573

(617) 565-7164

(312) 353-2220

(214) 767-4731

(303) 844-3061

(816) 426-5861

(212) 337-2378

(215) 596-1201

(415) 744-6670

(206) 442-5930

Washington, D.C.

1991 (Reprinted)

OSHA 2203

Lynn Martin, Secretary of Labor

U.S. Department of Labor

Occupational Safety and Health Administration

To report suspected fire hazards, imminent danger safety and health hazards in the workplace, or other job safety and health emergencies, such as toxic waste in the workplace, call OSHA's 24-hour hotline: 1-800-321-OSHA.

10/01/92

KIT BTEX-1M

BTEX MIXTURE

F4	Benzene
F86	Toluene
F38	Ethylbenzene
F719	o-Xylene
F829	m-Xylene
F830	p-Xylene

Cat No.

BTEX-1M 200ug/ml In Methanol - 5ml bottle

SECTION VI FIRST AID

An antidote is a substance intended to counteract the effect of a poison. It should be administered only by a physician or trained emergency personnel. Medical advice can be obtained from a Poison Control Center. In case of contact: Flush eyes continuously with water for 15-20 minutes. Flush skin with water for 15-20 minutes. If no burns have occurred, use soap and water to cleanse skin. If inhaled remove patient to fresh air. Administer oxygen if patient is having difficulty breathing. If patient has stopped breathing administer artificial respirations. If patient is in cardiac arrest administer CPR. Continue life supporting measures until medical assistance has arrived. Get medical attention if necessary. Do not wear shoes or clothing until absolutely free of all chemical odors.

SECTION VII REACTIVITY DATA

Flammable. Hygroscopic. Incompatible with strong acids. Reacts with Acid halides and anhydrides. Incompatible with strong oxidizing agents. Incompatible with strong reducing agents. Incompatible with active metals (e.g. Sodium). Decomposition liberates toxic fumes.

SECTION VIII SPILL OR LEAK PROCEDURES

Spills or leaks: Evacuate area. Wear appropriate OSHA-regulated equipment. Ventilate area. Absorb on vermiculite or similar material. Sweep up and place in an appropriate container. Hold for disposal. Wash contaminated surfaces to remove any residues.

DISPOSAL: Burn in a chemical incinerator equipped with an afterburner and scrubber.

SECTION IX PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE

This chemical should be handled only in a hood. Eye shields should be worn. Use appropriate OSHA/MSHA approved safety equipment. Avoid contact with skin, eyes and clothing. Keep tightly closed and store in a cool dry place. Store only with compatible chemicals.

SECTION X SPECIAL PRECAUTIONS AND COMMENTS

The above information is believed to be correct on the date it is published and must not be considered all inclusive. The information has been obtained only by a search of available literature and is only a guide for handling the chemicals. OSHA regulations require that if other hazards become evident, an updated MSDS must be made available to the employee within three months. Responsibility for updates lies with the employer and not with CHEM SERVICE INC. Persons not specifically and properly trained should not handle this chemical or its container. This MSDS is provided without any warranty expressed or implied including merchantability or fitness for any particular purpose.

This product is furnished FOR LABORATORY USE ONLY! Our products may NOT BE USED as drugs, cosmetics, agricultural or pesticidal products, food additives or as household chemicals.

CERTIFIED SPECIFICATIONS and
MATERIAL SAFETY DATA SHEET

Last Revised February 1990

SECTION I PRODUCT SPECIFICATIONS

Cat No. KIT BTEX-1M BTEX Mixture
200ug/ml in Methanol

CAS No. 67-56-1 (methanol)

Supplied by CHEM SERVICE INC. PO BOX 3108, WEST CHESTER, PA 19381
(215)692-3026

Lot No. _____ Concentration _____ Certified by _____

This is to certify that analysis of this sample was made by various chromatographic, spectral and thermal methods. The procedures used are considered to be STATE OF THE ART. CHEM SERVICE INC. guarantees purity of unopened bottle until the expiration on the bottle.

The following compounds are contained in this mixture at a concentration of 200ug/ml each in methanol.

<u>CAS #</u>	<u>IUPAC</u>	<u>COMMON</u>
71-43-2	Benzene	Benzol
108-88-3	Toluene	Methylbenzene
100-41-4	Ethylbenzene	Phenylethane
95-47-6	1,2-Dimethylbenzene	o-Xylene
108-38-3	1,3-Dimethylbenzene	m-Xylene
106-42-3	1,4-Dimethylbenzene	p-Xylene

Since this mixture contains very low concentrations of active components, the primary hazard is from the solvent. All information that follows is for the solvent.

SECTION II TOXICITY DATA

Rat or Mouse LD50 5628 mg/kg RTECS# PC1400000
This compound is considered to be slightly toxic.
OSHA PEL 200 ppm(260 mg/m3) ACGIH TLV 200 ppm(260 mg/m3)

SECTION III PHYSICAL DATA

Melting point: -98 C Boiling point: 64.6 C Density: 0.791
Vapor pressure: 97mm @20 C Vapor density (AIR=1): 1.11
Colorless liquid.
This compound is miscible with water.

SECTION IV FIRE AND EXPLOSION HAZARD DATA

Flash point: 11 C This is a flammable chemical.
Extinguishing media: Carbon dioxide or dry chemical powder. Do not use water.
Upper explosion limit: 36% Lower explosion limit: 6.7%

SECTION V HEALTH HAZARD DATA

Contact lenses should not be worn in the laboratory. All chemicals should be considered hazardous - Avoid direct physical contact! Can be fatal if absorbed through the skin! Can be fatal if inhaled! Can be fatal or cause blindness if swallowed. Repeated exposure to vapors and/or dust can cause eye injury. Can cause gastro-intestinal disturbances. Can cause liver injury. Can cause kidney injury. Can cause cardiovascular system injury. Can cause convulsions.

MALLINCKRODT

Material Safety Data Sheet

Mallinckrodt, Inc. Science Products Division, P.O. Box M Paris, KY 40361

Mallinckrodt provides the information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. Individuals receiving the information must exercise their independent judgment in determining its appropriateness for a particular purpose. MALLINCKRODT MAKES NO REPRESENTATIONS, OR WARRANTIES, EITHER EXPRESS OR IMPLIED, OF

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Emergency Telephone Number: 314-982-5000

Addendum to Material Safety Data Sheet

REGULATORY STATUS

This Addendum Must Not Be

Detached from the MSDS

Identifies SARA 313 substance(s)

Any copying or redistribution of the MSDS

must include a copy of this addendum

(Chem.Key: NITRA)

Hazard Categories for SARA

Section 311/312 Reporting

Acute Chronic Fire Pressure Reactive

X X ----- X

Product or Components
of Product:

NITRIC ACID, 70% (7697-37-2)

SARA EHS Sect. 302
RQ (lbs.) TPQ (lbs.)
1000 1,000

SARA Section 313 Chemicals
Name List Chemical Category
Yes No

CERCLA Sec.103
RQ (lbs.)
1000

RCRA
Sec. 261.33
No

SARA Section 302 EHS RQ: Reportable Quantity of Extremely Hazardous Substance, listed at 40 CFR 355.

SARA Section 302 EHS TPQ: Threshold Planning Quantity of Extremely Hazardous Substance. An asterisk (*) following a Threshold Planning Quantity signifies that if the material is a solid and has a particle size equal to or larger than 100 micrometers, the Threshold Planning Quantity = 10,000 LBS.

SARA Section 313 Chemicals: Toxic Substances subject to annual release reporting requirements listed at 40 CFR 372.65.

CERCLA Sec. 103: Comprehensive Environmental Response, Compensation and Liability Act (Superfund). Releases to air, land or water of these hazardous substances which exceed the Reportable Quantity (RQ) must be reported to the National Response Center, (800-424-8802); Listed at 40 CFR 302.4

RCRA: Resource Conservation and Reclamation Act. Commercial chemical product wastes designated as acute hazards and toxic under 40 CFR 261.33

Effective Date: 04-06-89 Supersedes 10-21-86

NITRIC ACID, 70%

SECTION 5 Health Hazard Information

A. EXPOSURE / HEALTH EFFECTS

Inhalation:

Corrosive! Inhalation of vapors can cause breathing difficulties and lead to pneumonia and pulmonary edema, which may be fatal. Other symptoms may include coughing, choking, and irritation of the nose, throat, and respiratory tract.

Ingestion:

Corrosive! Swallowing nitric acid can cause immediate pain and burns of the mouth, throat, esophagus and gastrointestinal tract.

Skin Contact:

Corrosive! Can cause redness, pain, and severe skin burns. Concentrated solutions cause deep ulcers and stain skin a yellow or yellow-brown color.

Eye Contact:

Corrosive! Vapors are irritating and may cause damage to the eyes. Splashes may cause severe burns and permanent eye damage.

Chronic Exposure:

Long-term exposure to concentrated vapors may cause erosion of teeth. Long term exposures seldom occur due to the corrosive properties of the acid.

Aggravation of Pre-existing Conditions:

Persons with pre-existing skin disorders or eye disease may be more susceptible to the effects of this substance.

B. FIRST AID

Inhalation:

Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.

Ingestion:

DO NOT INDUCE VOMITING! Give large quantities of water or milk if available. Never give anything by mouth to an unconscious person. Get medical attention immediately.

Skin Exposure:

In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Eye Exposure:

Wash eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

C. TOXICITY DATA (RTECS, 1986)

Inhalation (Rat) LC50: 244 ppm (NO₂)/30M

SECTION 6 Occupational Control Measures

Airborne Exposure Limits:

- OSHA Permissible Exposure Limit (PEL):
2 ppm (TWA), 4 ppm (STEL)
- ACGIH Threshold Limit Value (TLV):
2 ppm (TWA); 4 ppm (STEL)

Ventilation System:

A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, "Industrial Ventilation, A Manual of Recommended Practices", most recent edition, for details.

Personal Respirators: (NIOSH Approved)

If the TLV is exceeded, wear a supplied air, full-facepiece respirator, airtight hood, or self-contained breathing apparatus. Nitric acid is an oxidizer and should not come in contact with cartridges and canisters that contain oxidizable materials, such as activated charcoal.

Skin Protection:

Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls to prevent skin contact.

Eye Protection:

Use chemical safety goggles and/or a full face shield where splashing is possible. Contact lenses should not be worn when working with this material. Maintain eye wash fountain and quick-drench facilities in work area.

SECTION 7 Storage and Special Information

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect from physical damage and direct sunlight. Isolate from incompatible substances. Protect from moisture.

.....
NITRA

MALLINCKRODT

Material Safety Data Sheet

Mallinckrodt, Inc. Science Products Division, P.O. Box M Paris, KY 40361

Mallinckrodt provides the information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. Individuals receiving the information must exercise their independent judgment in determining its appropriateness for a particular purpose. MALLINCKRODT MAKES NO REPRESENTATIONS, OR WARRANTIES, EITHER EXPRESS OR IMPLIED, OF

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Emergency Telephone Number: 314-982-5000

NITRIC ACID 70%

PRODUCT IDENTIFICATION:

Synonyms: Aqua Fortis; Azotic Acid; Nitric Acid 70%

Formula CAS No.: 7697-37-2

Molecular Weight: 63.00

Chemical Formula: HNO₃

Hazardous Ingredients: Nitric acid

PRECAUTIONARY MEASURES

DANGER! STRONG OXIDIZER. CONTACT WITH OTHER MATERIAL MAY CAUSE FIRE. CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED. HARMFUL IF INHALED. INHALATION MAY CAUSE LUNG DAMAGE.

Do not get in eyes, on skin, or on clothing.
Avoid breathing mist.
Use only with adequate ventilation.
Wash thoroughly after handling.
Keep from contact with clothing and other combustible materials.
Do not store near combustible materials.
Store in a tightly closed container.
Remove and wash contaminated clothing promptly.
This substance is classified as a POISON under the Federal Caustic Poison Act.

EMERGENCY/FIRST AID

In case of contact, immediately flush skin or eyes with plenty of water for at least 15 minutes. If swallowed, DO NOT INDUCE VOMITING!
Give large quantities of water or milk if available. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In all cases call a physician.
SEE SECTION 5.

DOT Hazard Class: Oxidizer

SECTION 1 Physical Data

Appearance: Clear, colorless to slightly yellow liquid.

Odor: Suffocating acrid.

Solubility: Infinite in water.

Boiling Point: 122°C (252°F)

Melting Point: -34°C (-29°F)

Specific Gravity: 1.41

Vapor Density (Air = 1): 2-3 approximately

Vapor Pressure (mm Hg): 62 @ 20°C (68°F)

Evaporation Rate: No information found.

SECTION 2 Fire and Explosion Information

Fire:
Not combustible, but substance is a strong oxidizer and its heat of reaction with reducing agents or combustibles may cause ignition. Can react with metals to release flammable hydrogen gas.

Explosion:
Reacts explosively with combustible organic or readily oxidizable materials such as: alcohols, turpentine, charcoal, organic refuse, metal powder, hydrogen sulfide, etc.

Fire Extinguishing Media:
If involved in a fire, use water spray.

Special Information:
Increases the flammability of combustible, organic and readily oxidizable materials. In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

SECTION 3 Reactivity Data

Stability:
Stable under ordinary conditions of use and storage. Containers may burst when heated.

Hazardous Decomposition Products:
When heated to decomposition, emits toxic nitrogen oxides fumes and hydrogen nitrate. Will react with water or steam to produce heat and toxic and corrosive fumes.

Hazardous Polymerization:
Will not occur.

Incompatibilities:
A dangerously powerful oxidizing agent, concentrated nitric acid is incompatible with most substances, especially strong bases, metallic powders, carbides, hydrogen sulfide, turpentine, and combustible organics.

SECTION 4 Leak/Spill Disposal Information

Isolate or enclose the area of the leak or spill. Clean-up personnel should wear protective clothing and respiratory equipment suitable for toxic or corrosive fluids or vapors. Small Spills: Flush with water and neutralize with alkaline material (soda ash, lime, etc.). Sewer with excess water. Larger spills and lot sizes: Neutralize with alkaline material, pick up with absorbent material (sand, earth, vermiculite) and dispose in a RCRA-approved waste facility or sewer the neutralized slurry with excess water if local ordinances allow. Provide forced ventilation to dissipate fumes.

Reportable Quantity (RQ)(CWA/CERCLA) : 1000 lbs.

Ensure compliance with local, state and federal regulations.

NFPA Ratings: Health: 3 Flammability: 0 Reactivity: 0 Other: Oxidizer

Effective Date: (04-06-89) Supersedes 10-21-86

NITRIC ACID, 70%

AD

ZINC ETHOXIDE: POSSIBLE EXPLOSION.
ZIRCONIUM-URANIUM ALLOYS: EXPLOSIVE REACTION.

DECOMPOSITION:
THERMAL DECOMPOSITION PRODUCTS MAY INCLUDE TOXIC OXIDES OF NITROGEN.

POLYMERIZATION:
HAZARDOUS POLYMERIZATION HAS NOT BEEN REPORTED TO OCCUR UNDER NORMAL TEMPERATURES AND PRESSURES.

STORAGE AND DISPOSAL

OBSERVE ALL FEDERAL, STATE AND LOCAL REGULATIONS WHEN STORING OR DISPOSING OF THIS SUBSTANCE.

STORAGE

PROTECT AGAINST PHYSICAL DAMAGE. SEPARATE FROM METALLIC POWDERS, CARBIDES, HYDROGEN SULFIDE, TURPENTINE, ORGANIC ACIDS, AND ALL COMBUSTIBLE, ORGANIC OR OTHER READILY OXIDIZABLE MATERIALS. PROVIDE GOOD VENTILATION AND AVOID DIRECT SUNLIGHT (NFPA 49, HAZARDOUS CHEMICALS DATA, 1975).

STORE AWAY FROM INCOMPATIBLE SUBSTANCES.

THRESHOLD PLANNING QUANTITY (TPQ):
THE SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT (SARA) SECTION 302 REQUIRES THAT EACH FACILITY WHERE ANY EXTREMELY HAZARDOUS SUBSTANCE IS PRESENT IN A QUANTITY EQUAL TO OR GREATER THAN THE TPQ ESTABLISHED FOR THAT SUBSTANCE NOTIFY THE STATE EMERGENCY RESPONSE COMMISSION FOR THE STATE IN WHICH IT IS LOCATED. SECTION 303 OF SARA REQUIRES THESE FACILITIES TO PARTICIPATE IN LOCAL EMERGENCY RESPONSE PLANNING (40 CFR 355.30).

THRESHOLD QUANTITY (TQ): 500 POUNDS
THE OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA) PROCESS SAFETY MANAGEMENT (PSM) STANDARD REQUIRES THAT FACILITIES UTILIZING A PROCESS WHICH INVOLVES A CHEMICAL AT OR ABOVE ITS SPECIFIED THRESHOLD QUANTITY COMPLY WITH THE PROVISIONS OF 29 CFR 1910.119, PROCESS SAFETY MANAGEMENT OF HIGHLY HAZARDOUS CHEMICALS.

DISPOSAL

DISPOSAL MUST BE IN ACCORDANCE WITH STANDARDS APPLICABLE TO GENERATORS OF HAZARDOUS WASTE, 40 CFR 262, EPA HAZARDOUS WASTE NUMBER D002.
100 POUND CERCLA SECTION 103 REPORTABLE QUANTITY.

CONDITIONS TO AVOID

MAY IGNITE OTHER COMBUSTIBLE MATERIALS (WOOD, PAPER, OIL, ETC.). REACTS VIOLENTLY WITH WATER AND FUELS. FLAMMABLE, POISONOUS GASES MAY ACCUMULATE IN TANKS AND HOPPER CARS. RUNOFF TO SEWER MAY CREATE FIRE OR EXPLOSION HAZARD.

CONSULT NFPA PUBLICATION 43A, STORAGE OF LIQUID AND SOLID OXIDIZING MATERIALS, FOR STORAGE REQUIREMENTS.

SPILL AND LEAK PROCEDURES

SOIL SPILL:
DIG A HOLDING AREA SUCH AS A PIT, POND OR LAGOON TO CONTAIN SPILL AND DIKE SURFACE FLOW USING BARRIER OF SOIL, SANDBAGS, FOAMED POLYURETHANE OR FOAMED CONCRETE. ABSORB LIQUID MASS WITH FLY ASH OR CEMENT POWDER.

NEUTRALIZE SPILL WITH SLAKED LIME, SODIUM BICARBONATE OR CRUSHED LIMESTONE.

AIR SPILL:
APPLY WATER SPRAY TO KNOCK DOWN AND REDUCE VAPORS. KNOCK-DOWN WATER IS CORROSIVE AND TOXIC AND SHOULD BE DIKED FOR CONTAINMENT AND LATER DISPOSAL.

WATER SPILL:
ADD SUITABLE AGENT TO NEUTRALIZE SPILLED MATERIAL TO PH-7.

OCCUPATIONAL SPILL:
KEEP COMBUSTIBLES (WOOD, PAPER, OIL, ETC.) AWAY FROM SPILLED MATERIAL. DO NOT TOUCH SPILLED MATERIAL. STOP LEAK IF YOU CAN DO IT WITHOUT RISK. USE WATER SPRAY TO REDUCE VAPORS. DO NOT GET WATER INSIDE CONTAINER. FOR SMALL SPILLS, FLUSH AREA WITH FLOODING AMOUNTS OF WATER. FOR LARGER SPILLS, DIKE FAR AHEAD OF SPILL FOR LATER DISPOSAL. KEEP UNNECESSARY PEOPLE AWAY. ISOLATE HAZARD AREA AND DENY ENTRY. VENTILATE CLOSED SPACES BEFORE ENTERING.

REPORTABLE QUANTITY (RQ): 1000 POUNDS
THE SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT (SARA) SECTION 304 REQUIRES THAT A RELEASE EQUAL TO OR GREATER THAN THE REPORTABLE QUANTITY FOR THIS SUBSTANCE BE IMMEDIATELY REPORTED TO THE LOCAL EMERGENCY PLANNING COMMITTEE AND THE STATE EMERGENCY RESPONSE COMMISSION (40 CFR 355.40). IF THE RELEASE OF THIS SUBSTANCE IS REPORTABLE UNDER CERCLA SECTION 103, THE NATIONAL RESPONSE

CENTER MUST BE NOTIFIED IMMEDIATELY AT (800) 424-8802 OR (202) 426-2675 IN THE METROPOLITAN WASHINGTON, D.C. AREA (40 CFR 302.6).

PROTECTIVE EQUIPMENT

VENTILATION:
PROCESS ENCLOSURE RECOMMENDED TO MEET PUBLISHED EXPOSURE LIMITS.

RESPIRATOR:
THE FOLLOWING RESPIRATORS AND MAXIMUM USE CONCENTRATIONS ARE RECOMMENDATIONS BY THE U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES, NIOSH POCKET GUIDE TO CHEMICAL HAZARDS; NIOSH CRITERIA DOCUMENTS OR BY THE U.S. DEPARTMENT OF LABOR, 29 CFR 1910 SUBPART Z.
THE SPECIFIC RESPIRATOR SELECTED MUST BE BASED ON CONTAMINATION LEVELS FOUND IN THE WORK PLACE. MUST NOT EXCEED THE WORKING LIMITS OF THE RESPIRATOR AND BE JOINTLY APPROVED BY THE NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH AND THE MINE SAFETY AND HEALTH ADMINISTRATION (NIOSH-MSHA).

NITRIC ACID:

50 PPM- ANY SUPPLIED-AIR RESPIRATOR OPERATED IN A CONTINUOUS-FLOW MODE.

100 PPM- ANY SELF-CONTAINED BREATHING APPARATUS WITH A FULL FACEPIECE.
ANY SUPPLIED-AIR RESPIRATOR WITH A FULL FACEPIECE.
ANY AIR-PURIFYING, FULL-FACEPIECE RESPIRATOR (GAS MASK) WITH A CHIN-STYLE, FRONT- OR BACK-MOUNTED CANISTER PROVIDING PROTECTION AGAINST NITRIC ACID.*
ANY CHEMICAL CARTRIDGE RESPIRATOR WITH A FULL FACEPIECE AND CARTRIDGE(S) PROVIDING PROTECTION AGAINST NITRIC ACID.*

ESCAPE- ANY AIR-PURIFYING, FULL-FACEPIECE RESPIRATOR (GAS MASK) WITH A CHIN-STYLE, FRONT OR BACK-MOUNTED CANISTER PROVIDING PROTECTION AGAINST NITRIC ACID.*
ANY APPROPRIATE ESCAPE-TYPE, SELF-CONTAINED BREATHING APPARATUS.

* ONLY NONOXIDIZABLE SORBENTS ARE ALLOWED (NOT CHARCOAL).

FOR FIREFIGHTING AND OTHER IMMEDIATELY DANGEROUS TO LIFE OR HEALTH CONDITIONS:

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 THAT HAS A FULL FACEPIECE AND IS OPERATED IN A PRESSURE-DEMAND OR OTHER POSITIVE-PRESSURE MODE IN COMBINATION WITH AN AUXILIARY SELF-CONTAINED BREATHING APPARATUS OPERATED IN PRESSURE-DEMAND OR OTHER POSITIVE-PRESSURE MODE.

CLOTHING:
EMPLOYEE MUST WEAR APPROPRIATE PROTECTIVE (IMPERVIOUS) CLOTHING AND EQUIPMENT TO PREVENT ANY POSSIBILITY OF SKIN CONTACT WITH THIS SUBSTANCE.

GLOVES:
EMPLOYEE MUST WEAR APPROPRIATE PROTECTIVE GLOVES TO PREVENT CONTACT WITH THIS SUBSTANCE.

EYE PROTECTION:
EMPLOYEE MUST WEAR SPLASH-PROOF OR DUST-RESISTANT SAFETY GOGGLES AND A FACESHIELD TO PREVENT CONTACT WITH THIS SUBSTANCE.

EMERGENCY WASH FACILITIES:
WHERE THERE IS ANY POSSIBILITY THAT AN EMPLOYEE'S EYES AND/OR SKIN MAY BE EXPOSED TO THIS SUBSTANCE, THE EMPLOYER SHOULD PROVIDE AN EYE WASH FOUNTAIN AND QUICK DRENCH SHOWER WITHIN THE IMMEDIATE WORK AREA FOR EMERGENCY USE.

AUTHORIZED - FISHER SCIENTIFIC, INC.
CREATION DATE: 12/04/84 REVISION DATE: 03/24/93

-ADDITIONAL INFORMATION-
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DATE: 05/07/93
INDEX: 30931262195

ACCT: 169868-01
CAT NO: A509212

PAGE: 5
PO NBR: SE311380

CYCLOHEXANONE: VIOLENT REACTION.
CYCLOHEXYLAMINE: FORMS EXPLOSIVE COMPOUND.
CYCLOPENTADIENE: EXPLOSIVE REACTION.
1,2-DIAMINOETHANE(BIS(TRIMETHYLGOLD)): EXPLOSIVE REACTION.
DIBORANE: SPONTANEOUS IGNITION.
DI-2-BUTOXYETHYL ETHER: VIOLENT DECOMPOSITION REACTION.
2,6-DI-T-BUTYL PHENOL: FORMATION OF EXPLOSIVE COMPOUND.
DICHLOROETHANE: FORMS SHOCK AND HEAT SENSITIVE MIXTURE.
DICHLOROETHYLENE: FORMS EXPLOSIVE COMPOUND.
DICHLOROMETHANE: FORMS EXPLOSIVE SOLUTION.
DICYCLOPENTADIENE: SPONTANEOUS IGNITION.
DIENES: IGNITION REACTION.
DIETHYLAMINO ETHANOL: POSSIBLE EXPLOSION.
DIETHYL ETHER: POSSIBLE EXPLOSION.
3,6-DIHYDRO-1,2,2H-OXAZINE: EXPLOSIVE INTERACTION.
DISOPROPYL ETHER: TEMPERATURE AND PRESSURE INCREASE IN CLOSED CONTAINER.
DIMETHYLAMINOMETHYLFERROCENE: VIOLENT DECOMPOSITION IF HEATED.
DIMETHYL ETHER: FORMS EXPLOSIVE COMPOUND.
DIMETHYL HYDRAZINE: IGNITES ON CONTACT.
DIMETHYL SULFOXIDE + 1,4-DIOXANE: EXPLOSION.
DIMETHYL SULFOXIDE + 14% WATER: EXPLOSIVE REACTION.
DINITROBENZENE: EXPLOSION HAZARD.
DINITROTOLUENE: EXPLOSIVE REACTION.
DIOXANE + PERCHLORIC ACID: POSSIBLE EXPLOSION.
DIPHENYL DISTIBENE: FORMS EXPLOSIVE OXIDATION.
DIPHENYL MERCURY + CARBON DISULFIDE: VIOLENT REACTION.
DIPHENYL TIN: IGNITION REACTION.
DISODIUM PHENYL ORTHOPHOSPHATE: VIOLENT EXPLOSION.
DIVINYL ETHER: POSSIBLE IGNITION REACTION.
EPICHLOROHYDRIN: TEMPERATURE AND PRESSURE INCREASE IN CLOSED CONTAINER.
ETHANESULFONAMIDE: EXPLOSIVE REACTION.
ETHOXY-ETHYLENE DITHIOPHOSPHATE: IGNITION ON CONTACT.
M-ETHYL ANILINE: IGNITION REACTION.
ETHYLENE DIAMINE: TEMPERATURE AND PRESSURE INCREASE IN CLOSED CONTAINER.
ETHYLENE GLYCOL: FORMS SHOCK AND HEAT SENSITIVE MIXTURE.
ETHYLENEIMINE: TEMPERATURE AND PRESSURE INCREASE IN CLOSED CONTAINER.
5-ETHYL-2-METHYL PYRIDINE: EXPLOSIVE REACTION.
ETHYL PHOSPHINE: IGNITION REACTION.
5-ETHYL-2-PICOLINE: FORMS EXPLOSIVE COMPOUNDS.
FERROUS OXIDE (POWDERED): INTENSE EXOTHERMIC REACTION.
FLUORINE: POSSIBLE EXPLOSIVE REACTION.
FORMIC ACID: EXOTHERMIC REACTION WITH RELEASE OF TOXIC GASES.
2-FORMYLAMINO-1-PHENYL-1,3-PROPANEDIOL: POSSIBLE EXPLOSION.
FUEL OIL (BURNING): EXPLOSION.
FULMINATES: REACTS.
FURFURYLIDENE KETONES: IGNITES ON CONTACT.
GERMANIUM: VIOLENT REACTION.
GLYCEROL: POSSIBLE EXPLOSION.
GLYOXAL: TEMPERATURE AND PRESSURE INCREASE IN CLOSED CONTAINER.
HEXALITHIUM DISULFIDE: EXPLOSIVE REACTION.
HEXAMETHYLBENZENE: POSSIBLE EXPLOSION.
2,2,4,4,6,6-HEXAMETHYLTRITHIANE: EXPLOSIVE OXIDATION.
HEXENAL: EXPLODES ON HEATING.
HYDRAZINE: VIOLENT REACTION.
HYDRAZOIC ACID: ENERGETIC REACTION.
HYDROGEN IODIDE: IGNITION REACTION.
HYDROGEN PEROXIDE: FORMS UNSTABLE MIXTURE.
HYDROGEN PEROXIDE AND KETONES: FORMS EXPLOSIVE PRODUCTS.
HYDROGEN PEROXIDE AND MERCURIC OXIDE: FORMS EXPLOSIVE COMPOUNDS.
HYDROGEN PEROXIDE AND THIOUREA: FORMS EXPLOSIVE COMPOUNDS.
HYDROGEN SELENIDE: IGNITION REACTION.
HYDROGEN SULFIDE: INCANDESCENT REACTION.
HYDROGEN SULFIDE: IGNITION AND POSSIBLE EXPLOSIVE REACTION.
INDANE AND SULFURIC ACID: EXPLOSIVE REACTION.
ISOPRENE: TEMPERATURE AND PRESSURE INCREASE IN CLOSED CONTAINER.
KETONES (CYCLIC): VIOLENT REACTION.
LACTIC ACID + HYDROFLUORIC ACID: EXPLOSIVE REACTION.
LITHIUM: IGNITION REACTION.
LITHIUM SILICIDE: INCANDESCENT REACTION.
MAGNESIUM: EXPLOSIVE REACTION.
MAGNESIUM + 2-NITROANILINE: MAY IGNITE ON CONTACT.
MAGNESIUM PHOSPHIDE: INCANDESCENT REACTION.
MAGNESIUM SILICIDE: VIOLENT REACTION.
MAGNESIUM-TITANIUM ALLOY: FORMS SHOCK AND HEAT SENSITIVE MIXTURE.
MANGANESE (POWDERED): INCANDESCENCE AND POSSIBLE EXPLOSION.
METHYL OXIDE: TEMPERATURE AND PRESSURE INCREASE IN CLOSED CONTAINER.
MESITYLENE: POSSIBLE EXPLOSIVE REACTION.
METALS: VIOLENT REACTION WITH EXPLOSION OR IGNITION.
METAL ACETYLIDES: VIOLENT OR EXPLOSIVE REACTION.
METAL CARBIDES: VIOLENT OR EXPLOSIVE REACTION.
METAL CYANIDES: EXPLOSIVE REACTIONS.
METAL FERRICYANIDE OR FERROCYNANIDE: VIOLENT REACTION.
METAL SALICYLATES: FORMS EXPLOSIVE COMPOUNDS.
METAL THIOCYANATES: POSSIBLE EXPLOSION.
2-METHYLBENZIMIDAZOLE + SULFURIC ACID: POSSIBLE EXPLOSIVE REACTION.
4-METHYLCYCLOHEXANONE: EXPLOSIVE REACTION.
2-METHYL-5-ETHYLPYRIDINE: TEMPERATURE AND PRESSURE INCREASE IN CLOSED CONTAINER.
METHYL THIOPHENE: IGNITION REACTION.
NEODYMIUM PHOSPHIDE: VIOLENT REACTION.

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NICKEL TETRAPHOSPHIDE: IGNITION REACTION.
NITRO AROMATIC HYDROCARBONS: FORMS HIGHLY EXPLOSIVE PRODUCTS.
NITROBENZENE: EXPLOSIVE REACTION, ESPECIALLY IN THE PRESENCE OF WATER.
NITROMETHANE: EXPLOSIVE REACTION.
NITRONAPHTHALENE: EXPLOSION HAZARD.
NON-METAL OXIDES: EXPLOSIVE REACTION.
OLEUM: TEMPERATURE AND PRESSURE INCREASE IN CLOSED CONTAINER.
ORGANIC MATERIALS: FIRE AND EXPLOSION HAZARD.
ORGANIC SUBSTANCES AND PERCHLORATES: POSSIBLE EXPLOSION.
ORGANIC SUBSTANCES AND SULFURIC ACID: POSSIBLE EXPLOSION.
PHENYL ACETYLENE + 1,1-DIMETHYLHYDRAZINE: VIOLENT REACTION.
PHENYL ORTHOPHOSPHORIC ACID DISODIUM SALT: FORMS EXPLOSIVE PRODUCTS.
PHOSPHINE + OXYGEN: SPONTANEOUS IGNITION.
PHOSPHONIUM IODIDE: IGNITION REACTION.
PHOSPHORUS (VAPOR): IGNITES WHEN HEATED.
PHOSPHORUS HALIDES: IGNITION REACTION.
PHOSPHORUS TETRAIODIDE: VIGOROUS REACTION.
PHOSPHORUS TRICHLORIDE: EXPLOSIVE REACTION.
PHTHALIC ACID AND SULFURIC ACID: POSSIBLE EXPLOSIVE REACTION.
PHTHALIC ANHYDRIDE: EXOTHERMIC REACTION AND FORMS EXPLOSIVE PRODUCTS.
PICRATES: REACTS.
PLASTICS: MAY BE ATTACKED.
POLYALKENES: INTENSE REACTION.
POLYDIBROMOSILANES: EXPLOSIVE REACTION.
POLYETHYLENE OXIDE DERIVATIVES: POSSIBLE EXPLOSION.
POLYPROPYLENE: TEMPERATURE AND PRESSURE INCREASE IN A CLOSED CONTAINER.
POLY(SILYLENE): IGNITION.
POLYURETHANE (FOAM): VIGOROUS REACTION.
POTASSIUM HYPOPHOSPHITE: EXPLOSIVE REACTION.
POTASSIUM PHOSPHINATE: EXPLODES ON EVAPORATION.
B-PROPIOLACTONE: TEMPERATURE AND PRESSURE INCREASE IN CLOSED CONTAINER.
PROPIOPHENONE + SULFURIC ACID: EXOTHERMIC REACTION ABOVE -5 C.
PROPYLENE GLYCOL + HYDROFLUORIC ACID + SILVER NITRATE: EXPLOSIVE MIXTURE.
PROPYLENE OXIDE: TEMPERATURE AND PRESSURE INCREASE IN CLOSED CONTAINER.
PYRIDINE: TEMPERATURE AND PRESSURE INCREASE IN CLOSED CONTAINER.
PYROCATECHOL: IGNITES ON CONTACT.
REDUCING AGENTS: POSSIBLE EXPLOSIVE OR IGNITION REACTION.
RESORCINOL: POSSIBLE EXPLOSION.
RUBBER: VIGOROUS REACTION, POSSIBLE EXPLOSION.
SELENIUM: VIGOROUS REACTION.
SELENIUM HYDRIDE: IGNITION OR INCANDESCENT REACTION.
SELENIUM IODOPHOSPHIDE: EXPLOSIVE REACTION.
SILICON: VIOLENT REACTION.
SILICONE OIL: POSSIBLE EXPLOSION.
SILVER BUTEN-3-YNIDE: EXPLOSION.
SODIUM: SPONTANEOUS IGNITION.
SODIUM AZIDE: EXOTHERMIC REACTION.
SODIUM HYDROXIDE: TEMPERATURE AND PRESSURE INCREASE IN A CLOSED CONTAINER.
STIBINE: EXPLOSIVE REACTION.
SUCROSE (SOLID): VIGOROUS REACTION.
SULFAMIC ACID: VIOLENT REACTION WITH EVOLUTION OF TOXIC NITROUS OXIDE.
SULFIDES: REACTS.
SULFUR DIOXIDE: EXPLOSIVE REACTION.
SULFUR HALIDES: VIOLENT REACTION.
SULFURIC ACID + GLYCERIDES: EXPLOSIVE REACTION.
SULFURIC ACID + TEREPHTHALIC ACID: VIOLENT REACTION.
SURFACTANTS + PHOSPHORIC ACID: EXPLOSION HAZARD.
TERPENES: SPONTANEOUS IGNITION.
TETRABORANE: EXPLOSIVE REACTION.
TETRABORANE DECAHYDRIDE: EXPLOSIVE REACTION.
TETRAPHOSPHOROUS DIODOTRISSELENIIDE: EXPLOSIVE REACTION.
TETRAPHOSPHOROUS IODIDE: IGNITES ON CONTACT.
TETRAPHOSPHOROUS TETRAOXIDE TRISULFIDE: VIOLENT REACTION.
THIOACETALDEHYDES: VIOLENT REACTION.
THIOKETONES: VIOLENT REACTION.
THIOPHENES: EXPLOSIVE REACTION.
TITANIUM: FORMS SHOCK-SENSITIVE COMPOUND.
TITANIUM ALLOYS: POSSIBLE EXPLOSIVE REACTION.
TITANIUM-MAGNESIUM ALLOY: POSSIBLE EXPLOSION ON IMPACT.
TOLUENE: VIOLENT REACTION.
TOLUIDENE: IGNITION REACTION.
1,3,5-TRIACETYLHEXAHYDRO-1,3,5-TRIAZINE + TRIFLUOROACETIC ANHYDRIDE: EXPLOSIVE REACTION.
TRIAZINE: VIOLENTLY EXPLOSIVE REACTION.
TRICADMIUM DIPHOSPHIDE: EXPLOSIVE REACTION.
TRIETHYLALUMIUM MONOETHYL ETHER COMPLEX: IGNITION REACTION.
TRIMETHYLTRIOXANE: INTENSE REACTION.
TRISODIOMERCURIUM PHOSPHINE: VIOLENT DECOMPOSITION.
TRITHIOACETONE: EXPLOSIVE REACTION.
TURPENTINE: EXPLOSIVE MIXTURE.
UNSYMMETRICAL DIMETHYL HYDRAZINE: SPONTANEOUS IGNITION.
URANIUM: EXPLOSIVE REACTION.
URANIUM ALLOY: VIOLENT REACTION.
URANIUM DISULFIDE: VIOLENT REACTION.
URANIUM-NEODYMIUM ALLOYS: EXPLOSIVE REACTION.
VINYL ACETATE: TEMPERATURE AND PRESSURE INCREASE IN CLOSED CONTAINER.
VINYLIDENE CHLORIDE: TEMPERATURE AND PRESSURE INCREASE IN CLOSED CONTAINER.
WOOD: POSSIBLE IGNITION.
P-XYLENE: INTENSE REACTION IN PRESENCE OF SULFURIC ACID.
ZINC: INCANDESCENT REACTION.

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PRE-EXISTING EYE AND SKIN DISORDERS.

HEALTH EFFECTS AND FIRST AID

INHALATION:

NITRIC ACID:

CORROSIVE/HIGHLY TOXIC. 100 PPM IMMEDIATELY DANGEROUS TO LIFE OR HEALTH.
ACUTE EXPOSURE- INHALATION OF ACIDIC SUBSTANCES MAY CAUSE SEVERE RESPIRATORY IRRITATION WITH COUGHING, CHOKING, AND POSSIBLY YELLOWISH BURNS OF THE MUCOUS MEMBRANES. OTHER INITIAL SYMPTOMS MAY INCLUDE DIZZINESS, HEADACHE, NAUSEA, AND WEAKNESS. PULMONARY EDEMA MAY BE IMMEDIATE IN THE MOST SEVERE EXPOSURES, BUT MORE LIKELY WILL OCCUR AFTER A LATENT PERIOD OF 5-72 HOURS. THE SYMPTOMS MAY INCLUDE TIGHTNESS IN THE CHEST, DYSPNEA, DIZZINESS, FROTHY SPUTUM, AND CYANOSIS. PHYSICAL FINDINGS MAY INCLUDE HYPOTENSION, WEAK, RAPID PULSE, MOIST RALES, AND HEMOCONCENTRATION. IN NON-FATAL CASES, COMPLETE RECOVERY MAY OCCUR WITHIN A FEW DAYS OR WEEKS OR, CONVALESCENCE MAY BE PROLONGED WITH FREQUENT RELAPSES AND CONTINUED DYSPNEA AND OTHER SIGNS AND SYMPTOMS OF PULMONARY INSUFFICIENCY. IN SEVERE CASES, DEATH DUE TO ANOXIA MAY OCCUR WITHIN A FEW HOURS AFTER ONSET OF THE SYMPTOMS OF PULMONARY EDEMA OR FOLLOWING A RELAPSE.
CHRONIC EXPOSURE- DEPENDING ON THE CONCENTRATION AND DURATION OF EXPOSURE, REPEATED OR PROLONGED EXPOSURE TO AN ACIDIC SUBSTANCE MAY CAUSE EROSION OF THE TEETH, INFLAMMATORY AND ULCERATIVE CHANGES IN THE MOUTH, AND POSSIBLY JAW NECROSIS. BRONCHIAL IRRITATION WITH COUGH AND FREQUENT ATTACKS OF BRONCHIAL PNEUMONIA MAY OCCUR. GASTROINTESTINAL DISTURBANCES ARE ALSO POSSIBLE.

FIRST AID- REMOVE FROM EXPOSURE AREA TO FRESH AIR IMMEDIATELY. IF BREATHING HAS STOPPED, GIVE ARTIFICIAL RESPIRATION. MAINTAIN AIRWAY AND BLOOD PRESSURE AND ADMINISTER OXYGEN IF AVAILABLE. KEEP AFFECTED PERSON WARM AND AT REST. TREAT SYMPTOMATICALLY AND SUPPORTIVELY. ADMINISTRATION OF OXYGEN SHOULD BE PERFORMED BY QUALIFIED PERSONNEL. GET MEDICAL ATTENTION IMMEDIATELY.

SKIN CONTACT:

NITRIC ACID:

CORROSIVE.

ACUTE EXPOSURE- DIRECT CONTACT WITH LIQUID OR VAPOR MAY CAUSE SEVERE PAIN, BURNS AND POSSIBLY YELLOWISH STAINS. BURNS MAY BE DEEP WITH SHARP EDGES AND HEAL SLOWLY WITH SCAR TISSUE FORMATION. DILUTE SOLUTIONS OF NITRIC ACID MAY PRODUCE MILD IRRITATION AND HARDEN THE EPIDERMIS WITHOUT DESTROYING IT. CONCENTRATED ACID SOLUTIONS APPLIED TO OVER 25% OF THE SKIN AREA IN RATS PRODUCED ELEVATED METHEMOGLOBIN AND BLOOD NITRATE LEVELS.
CHRONIC EXPOSURE- EFFECTS DEPEND ON THE CONCENTRATION AND DURATION OF EXPOSURE. REPEATED OR PROLONGED CONTACT WITH ACIDIC SUBSTANCES MAY RESULT IN DERMATITIS OR EFFECTS SIMILAR TO ACUTE EXPOSURE.

FIRST AID- REMOVE CONTAMINATED CLOTHING AND SHOES IMMEDIATELY. WASH AFFECTED AREA WITH SOAP OR MILD DETERGENT AND LARGE AMOUNTS OF WATER UNTIL NO EVIDENCE OF CHEMICAL REMAINS (AT LEAST 15-20 MINUTES). IN CASE OF CHEMICAL BURNS, COVER AREA WITH STERILE, DRY DRESSING. BANDAGE SECURELY, BUT NOT TOO TIGHTLY. GET MEDICAL ATTENTION IMMEDIATELY.

EYE CONTACT:

NITRIC ACID:

CORROSIVE.

ACUTE EXPOSURE- DIRECT CONTACT WITH ACIDIC SUBSTANCES MAY CAUSE PAIN AND LACRIMATION, PHOTOPHOBIA, AND BURNS, POSSIBLY SEVERE. THE DEGREE OF INJURY DEPENDS ON THE CONCENTRATION AND DURATION OF CONTACT. IN MILD BURNS, THE EPITHELIUM REGENERATES RAPIDLY AND THE EYE RECOVERS COMPLETELY. IN SEVERE CASES, THE EXTENT OF INJURY MAY NOT BE FULLY APPARENT FOR SEVERAL WEEKS. ULTIMATELY, THE WHOLE CORNEA MAY BECOME DEEPLY VASCULARIZED AND OPAQUE RESULTING IN BLINDNESS. IN THE WORST CASES, THE EYE MAY BE TOTALLY DESTROYED. CONCENTRATED NITRIC ACID MAY IMPART A YELLOW COLOR TO THE EYE UPON CONTACT.

CHRONIC EXPOSURE- EFFECTS DEPEND ON THE CONCENTRATION AND DURATION OF EXPOSURE. REPEATED OR PROLONGED EXPOSURE TO ACIDIC SUBSTANCES MAY CAUSE CONJUNCTIVITIS OR EFFECTS AS IN ACUTE EXPOSURE.

FIRST AID- WASH EYES IMMEDIATELY WITH LARGE AMOUNTS OF WATER. OCCASIONALLY LIFTING UPPER AND LOWER LIDS, UNTIL NO EVIDENCE OF CHEMICAL REMAINS (AT LEAST 15-20 MINUTES). CONTINUE IRRIGATING WITH NORMAL SALINE UNTIL THE PH HAS RETURNED TO NORMAL (30-60 MINUTES). COVER WITH STERILE BANDAGES. GET MEDICAL ATTENTION IMMEDIATELY.

INGESTION:

NITRIC ACID:

CORROSIVE/TOXIC.

ACUTE EXPOSURE- ACIDIC SUBSTANCES MAY CAUSE CIRCUMORAL BURNS WITH YELLOW DISCOLORATION AND CORROSION OF THE MUCOUS MEMBRANES OF THE MOUTH, THROAT AND ESOPHAGUS. THERE MAY BE IMMEDIATE PAIN AND DIFFICULTY OR INABILITY TO SWALLOW OR SPEAK. EPIGLOTTAL EDEMA MAY RESULT IN RESPIRATORY DISTRESS AND POSSIBLY ASPHYXIA, MARKED THIRST, EPICASTRIC PAIN, NAUSEA, VOMITING AND DIARRHEA MAY OCCUR, DEPENDING ON THE DEGREE OF ESOPHAGEAL AND GASTRIC CORROSION. THE VOMITUS MAY CONTAIN FRESH OR DARK PRECIPITATED BLOOD AND LARGE SHREDS OF MUCOSA. SHOCK WITH MARKED HYPOTENSION, WEAK, RAPID PULSE, SHALLOW RESPIRATION, AND CLAMMY SKIN MAY OCCUR. CIRCULATORY COLLAPSE MAY ENSUE AND IF UNCORRECTED, LEAD TO RENAL FAILURE. IN SEVERE CASES, GASTRIC,

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AND TO A LESSER DEGREE, ESOPHAGEAL PERFORATION AND SUBSEQUENT PERITONITIS MAY OCCUR AND BE ACCOMPANIED BY FEVER AND ABDOMINAL RIGIDITY. ESOPHAGEAL GASTRIC AND PYLORIC STRICTURE MAY OCCUR WITHIN A FEW WEEKS, BUT MAY BE DELAYED FOR MONTHS OR EVEN YEARS. DEATH MAY RESULT WITHIN A SHORT TIME FROM ASPHYXIA, CIRCULATORY COLLAPSE OR ASPIRATION OF EVEN MINUTE AMOUNTS. LATER DEATH MAY BE DUE TO PERITONITIS, SEVERE NEPHRITIS OR PNEUMONIA. COMA AND CONVULSIONS SOMETIMES OCCUR TERMINALLY.
CHRONIC EXPOSURE- DEPENDING ON THE CONCENTRATION, REPEATED INGESTION OF ACIDIC SUBSTANCES MAY RESULT IN INFLAMMATORY AND ULCERATIVE CHANGES IN THE MUCOUS MEMBRANES OF THE MOUTH AND OTHER EFFECTS AS IN ACUTE INGESTION. REPRODUCTIVE EFFECTS HAVE BEEN REPORTED IN ANIMALS.

FIRST AID- DO NOT USE GASTRIC LAVAGE OR EMESIS. DILUTE THE ACID IMMEDIATELY BY DRINKING LARGE QUANTITIES OF WATER OR MILK. IF VOMITING PERSISTS, ADMINISTER FLUIDS REPEATEDLY. INGESTED ACID MUST BE DILUTED APPROXIMATELY 100 FOLD TO RENDER IT HARMLESS TO TISSUES. MAINTAIN AIRWAY AND TREAT SHOCK (DREIBSACH, HANDBOOK OF POISONING, 12TH ED.). GET MEDICAL ATTENTION IMMEDIATELY. IF VOMITING OCCURS, KEEP HEAD BELOW HIPS TO HELP PREVENT ASPIRATION.

ANTIDOTE:

NO SPECIFIC ANTIDOTE. TREAT SYMPTOMATICALLY AND SUPPORTIVELY.

REACTIVITY

REACTIVITY:

REACTS EXOTHERMICALLY WITH WATER.

INCOMPATIBILITIES:

NITRIC ACID:

ACETIC ACID: MAY REACT EXPLOSIVELY.
ACETIC ANHYDRIDE: EXPLOSIVE REACTION BY FRICTION OR IMPACT.
ACETONE: MAY REACT EXPLOSIVELY.
ACETONITRILE: EXPLOSIVE MIXTURE.
4-ACETOXY-3-METHOXYBENZALDEHYDE: EXOTHERMIC REACTION.
ACROLEIN: TEMPERATURE AND PRESSURE INCREASE IN CLOSED CONTAINER.
ACRYLONITRILE: EXPLOSIVE REACTION AT 90 C.
ACRYLONITRILE-METHACRYLATE COPOLYMER: INCOMPATIBLE.
ALANOLS: POSSIBLE VIOLENT REACTION OR EXPLOSION; FORMATION OF EXPLOSIVE COMPOUND IN THE PRESENCE OF HEAVY METALS.
ALKANETHIOLS: EXOTHERMIC REACTION WITH POSSIBLE IGNITION.
2-ALKOXY-1,3-DITHIA-2-PHOSPHOLANE: IGNITION REACTION.
ALLYL ALCOHOL: TEMPERATURE AND PRESSURE INCREASE IN CLOSED CONTAINER.
ALLYL CHLORIDE: TEMPERATURE AND PRESSURE INCREASE IN CLOSED CONTAINER.
AMINES (ALIPHATIC OR AROMATIC): POSSIBLE IGNITION REACTION.
2-AMINOETHANOL: TEMPERATURE AND PRESSURE INCREASE IN CLOSED CONTAINER.
2-AMINOTHIAZOLE: EXPLOSIVE REACTION.
AMMONIA (GAS): BURNS IN AN ATMOSPHERE OF NITRIC ACID VAPOR.
AMMONIUM HYDROXIDE: TEMPERATURE AND PRESSURE INCREASE IN CLOSED CONTAINER.
AMMONIUM NITRATE: FORMS EXPLOSIVE MIXTURE.
ANILINE: IGNITES ON CONTACT.
ANILINIUM NITRATE: FORMS EXPLOSIVE SOLUTION.
ANION EXCHANGE RESINS: POSSIBLE VIOLENT EXOTHERMIC REACTION.
ANTIMONY: VIOLENT REACTION.
ARSINE: EXPLOSIVE REACTION.
ARSINE-BORON TRIBROMIDE: VIOLENT OXIDATION.
BASES: REACTS.
BENZENE: EXPLOSIVE REACTION.
BENZIDINE: SPONTANEOUS IGNITION.
BENZONITRILE: POSSIBLE EXPLOSION.
BENZOTHIOPHENE DERIVATIVES: FORMATION OF POSSIBLY EXPLOSIVE COMPOUNDS.
N-BENZYL-N-ETHYLANILINE: VIGOROUS DECOMPOSITION.
1,4-BIS(METHOXYMETHYL)2,3,5,6-TETRAMETHYLBENZENE: GAS EVOLUTION.
BISMUTH: INTENSE EXOTHERMIC REACTION OR EXPLOSION.
1,3-BIS(TRIFLUOROMETHYL)BENZENE: POSSIBLE EXPLOSION.
BORON: VIOLENT REACTION WITH INCANDESCENCE.
BORON DECAHYDRIDE: EXPLOSIVE REACTION.
BORON PHOSPHIDE: IGNITION REACTION.
BROMINE PENTAFLUORIDE: IGNITION REACTION.
N-BUTYL MERCAPTAN: IGNITION REACTION.
N-BUTYRALDEHYDE: TEMPERATURE AND PRESSURE INCREASE IN CLOSED CONTAINER.
CADMIUM PHOSPHIDE: EXPLOSIVE REACTION.
CALCIUM HYDROPHOSPHITE: IGNITION REACTION.
CARBON (PULVERIZED): VIOLENT REACTION.
CELLULOSE: FORMS EASILY COMBUSTIBLE ESTER.
CHLORATES: REACTS.
CHLORINE: INCOMPATIBLE.
CHLORINE TRIFLUORIDE: VIOLENT REACTION.
CHLOROBENZENE: POSSIBLE EXPLOSION.
4-CHLORO-2-NITROANILINE: FORMS EXPLOSIVE COMPOUND.
CHLOROSULFONIC ACID: TEMPERATURE AND PRESSURE INCREASE IN CLOSED CONTAINER.
COAL: EXPLOSIVE MIXTURE.
COATINGS: MAY BE ATTACKED.
CREOSOL: TEMPERATURE AND PRESSURE INCREASE IN CLOSED CONTAINER.
CROTONALDEHYDE: VIOLENT DECOMPOSITION WITH IGNITION.
CUMENE: TEMPERATURE AND PRESSURE INCREASE IN CLOSED CONTAINER.
CUPROUS NITRIDE: EXPLOSIVE REACTION.
CUPROUS NITRIDE: VIOLENT REACTION.
CYANATES: POSSIBLE EXPLOSIVE REACTION.

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MATERIAL SAFETY DATA SHEET

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SUBSTANCE IDENTIFICATION

SUBSTANCE: **NITRIC ACID** CAS-NUMBER 7697-37-2

TRADE NAMES/SYNONYMS:
AQUA FORTIS; WFNA; RFNA; HYDROGEN NITRATE; AZOTIC ACID; NITRYL HYDROXIDE;
NITAL; STCC 4918528; UN 2031;
A200; A200C; A200S; A202; A206C; A509; A467; A200SI; A198C; A483; HNO3;
ACC16550

CHEMICAL FAMILY:
INORGANIC ACID

MOLECULAR FORMULA: H-N-O3

MOLECULAR WEIGHT: 63.01

CERCLA RATINGS (SCALE 0-3): HEALTH-3 FIRE-0 REACTIVITY-1 PERSISTENCE-0
NFPA RATINGS (SCALE 0-4): HEALTH-3 FIRE-0 REACTIVITY-0

COMPONENTS AND CONTAMINANTS

COMPONENT: NITRIC ACID PERCENT: 70
COMPONENT: WATER PERCENT: 30

OTHER CONTAMINANTS: NONE

EXPOSURE LIMITS:

NITRIC ACID:
2 PPM (5 MG/M3) OSHA TWA; 4 PPM (10 MG/M3) OSHA STEL
2 PPM (5 MG/M3) ACGIH TWA; 4 PPM (10 MG/M3) ACGIH STEL
2 PPM (5 MG/M3) NIOSH RECOMMENDED TWA;
4 PPM (10 MG/M3) NIOSH RECOMMENDED STEL
10 PPM (25 MG/M3) DFG MAK TWA;
20 PPM (50 MG/M3) DFG MAK 5 MINUTE PEAK, MOMENTARY VALUE, 8 TIMES/SHIFT

MEASUREMENT METHOD: SILICA GEL TUBE; SODIUM BICARBONATE/SODIUM CARBONATE;
ION CHROMATOGRAPHY; (NIOSH VOL. III # 7903, INORGANIC ACIDS).

1000 POUNDS SARA SECTION 302 THRESHOLD PLANNING QUANTITY
1000 POUNDS SARA SECTION 304 REPORTABLE QUANTITY
1000 POUNDS CERCLA SECTION 103 REPORTABLE QUANTITY
500 POUNDS OSHA PROCESS SAFETY MANAGEMENT THRESHOLD QUANTITY
(94.5% BY WEIGHT OR GREATER)
SUBJECT TO SARA SECTION 313 ANNUAL TOXIC CHEMICAL RELEASE REPORTING

**OSHA LIMITS ADOPTED JANUARY 19, 1989 ARE SUBJECT TO THE DECISION OF THE
11TH CIRCUIT COURT OF APPEALS (AFL-CIO V. OSHA) AS OF JULY 7, 1992.**

PHYSICAL DATA

DESCRIPTION: COLORLESS TO PALE YELLOW LIQUID WITH A SUFFOCATING ODOR.

BOILING POINT: 181 F (83 C) MELTING POINT: -44 F (-42 C)

SPECIFIC GRAVITY: 1.5027 @ 25 C VAPOR PRESSURE: 47.9 MMHG @ 20 C

EVAPORATION RATE: NOT AVAILABLE SOLUBILITY IN WATER: VERY SOLUBLE

VAPOR DENSITY: 3.2

SOLVENT SOLUBILITY: SOLUBLE IN ETHER.

FIRE AND EXPLOSION DATA

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FIRE AND EXPLOSION HAZARD:
NEGLECTIBLE FIRE HAZARD WHEN EXPOSED TO HEAT OR FLAME.

OXIDIZER: OXIDIZERS DECOMPOSE, ESPECIALLY WHEN HEATED, TO YIELD OXYGEN OR OTHER GASES WHICH WILL INCREASE THE BURNING RATE OF COMBUSTIBLE MATTER. CONTACT WITH EASILY OXIDIZABLE, ORGANIC, OR OTHER COMBUSTIBLE MATERIALS MAY RESULT IN IGNITION, VIOLENT COMBUSTION OR EXPLOSION.

FIREFIGHTING MEDIA:
WATER, DRY CHEMICAL OR SODA ASH
(1990 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.5).

FOR LARGER FIRES, FLOOD AREA WITH WATER FROM A DISTANCE
(1990 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.5).

FIREFIGHTING:
MOVE CONTAINER FROM FIRE AREA IF YOU CAN DO IT WITHOUT RISK. APPLY COOLING WATER TO SIDES OF CONTAINERS THAT ARE EXPOSED TO FLAMES UNTIL WELL AFTER FIRE IS OUT. STAY AWAY FROM ENDS OF TANKS. FOR MASSIVE FIRE IN CARGO AREA, USE UNMANNED HOSE HOLDER OR MONITOR NOZZLES; IF THIS IS IMPOSSIBLE, WITHDRAW FROM AREA AND LET FIRE BURN (1990 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.5, GUIDE PAGE 44).

USE FLOODING AMOUNTS OF WATER AS FOG. COOL CONTAINERS WITH FLOODING AMOUNTS OF WATER. APPLY FROM AS FAR A DISTANCE AS POSSIBLE. AVOID BREATHING CORROSIVE VAPORS, KEEP UPWIND. CONSIDER EVACUATION OF DOWNWIND AREA IF MATERIAL IS LEAKING.

TRANSPORTATION DATA

DEPARTMENT OF TRANSPORTATION HAZARD CLASSIFICATION 49-CFR 172.101:
OXIDIZER

DEPARTMENT OF TRANSPORTATION LABELING REQUIREMENTS 49-CFR 172.101 AND SUBPART E:
OXIDIZER AND CORROSIVE

DEPARTMENT OF TRANSPORTATION PACKAGING REQUIREMENTS: 49-CFR 173.268
EXCEPTIONS: NONE

FINAL RULE ON HAZARDOUS MATERIALS REGULATIONS (HMR, 49 CFR PARTS 171-180), DOCKET NUMBERS HM-181, HM-181A, HM-181B, HM-181C, HM-181D AND HM-204 EFFECTIVE DATE OCTOBER 1, 1991. HOWEVER, COMPLIANCE WITH THE REGULATIONS IS AUTHORIZED ON AND AFTER JANUARY 1, 1991. (55 FR 52402, 12/21/90)

EXCEPT FOR EXPLOSIVES, INHALATION HAZARDS, AND INFECTIOUS SUBSTANCES, THE EFFECTIVE DATE FOR HAZARD COMMUNICATION REQUIREMENTS IS EXTENDED TO OCTOBER 1, 1993. (56 FR 47158, 09/18/91)

U.S. DEPARTMENT OF TRANSPORTATION SHIPPING NAME-ID NUMBER, 49 CFR 172.101:
NITRIC ACID-UN 2031

U.S. DEPARTMENT OF TRANSPORTATION HAZARD CLASS OR DIVISION, 49 CFR 172.101:
8 - CORROSIVE MATERIAL

U.S. DEPARTMENT OF TRANSPORTATION PACKING GROUP, 49 CFR 172.101:
PG I

U.S. DEPARTMENT OF TRANSPORTATION LABELING REQUIREMENTS, 49 CFR 172.101 AND SUBPART E:
CORROSIVE

U.S. DEPARTMENT OF TRANSPORTATION PACKAGING AUTHORIZATIONS:

EXCEPTIONS: NONE
NON-BULK PACKAGING: 49 CFR 173.158
BULK PACKAGING: 49 CFR 173.243

U.S. DEPARTMENT OF TRANSPORTATION QUANTITY LIMITATIONS 49 CFR 172.101:
PASSENGER AIRCRAFT OR RAILCAR: FORBIDDEN
CARGO AIRCRAFT ONLY: 2.5 L

TOXICITY

NITRIC ACID:

TOXICITY DATA:
ANHYDROUS: 49 PPM/4 HOURS INHALATION-RAT LC50 (VAN WATER & ROGERS, INC MSDS); 2500 PPM/1 HOUR INHALATION-RAT LC50 (DUPONT MSDS); 430 MG/KG ORAL-HUMAN LDLO; 50-500 MG/KG ORAL-UNSPECIFIED SPECIES LD50 (DUPONT MSDS); 110 MG/KG UNREPORTED-MAN LDLO; REPRODUCTIVE EFFECTS DATA (RTECS).
MONOHYDRATE: NO DATA AVAILABLE.
TRIHYDRATE: NO DATA AVAILABLE.
CARCINOGEN STATUS: NONE.
LOCAL EFFECTS: CORROSIVE- INHALATION, SKIN, EYES, INGESTION.
ACUTE TOXICITY LEVEL: HIGHLY TOXIC BY INHALATION; TOXIC BY INGESTION.
TARGET EFFECTS: NO DATA AVAILABLE.
AT INCREASED RISK FROM EXPOSURE: PERSONS WITH IMPAIRED PULMONARY FUNCTION,

AVOID PROLONGED OR REPEATED SKIN CONTACT
ELECTRICALLY GROUND ALL EQUIPMENT WHEN HANDLING THIS PRODUCT
WORK/HYGIENIC PRACTICES: WASH THOROUGHLY AFTER HANDLING. DO NOT TAKE
INTERNALLY. EYE WASH AND SAFETY EQUIPMENT SHOULD BE READILY AVAILABLE.

SECTION X - OTHER INFORMATION

COMMENTS.....:

TESTS ON LABORATORY ANIMALS INDICATE MATERIAL MAY PRODUCE
ADVERSE MUTAGENIC AND REPRODUCTIVE EFFECTS.

REVISION HISTORY.....: 08/01/81, 8/83, 11/20/86, 10/27/87, 4/26/89

N/A = NOT AVAILABLE:

AS DIRECTED BY MEDICAL PERSONNEL. NEVER GIVE ANYTHING BY MOUTH TO AN UNCONSCIOUS PERSON.

SECTION VI - REACTIVITY DATA

STABILITY.....: YES
CONDITIONS TO AVOID: HEAT, CONTACT WITH IGNITION SOURCE.
MATERIALS TO AVOID.....: () WATER (X) ACIDS
() BASES () CORROSIVES (X) OXIDIZERS
(X) OTHER: HALOGENS AND HALOGEN COMPOUNDS; ALDEHYDES
HAZARDOUS POLYMERIZATION.: DOES NOT OCCUR
HAZARDOUS DECOMPOSITION...: CO.X.

SECTION VII - ENVIRONMENTAL PROTECTION PROCEDURES

SPILL RESPONSE:

DIKE SPILL; TAKE UP WITH ABSORBENT AND CONTAINERIZE FOR PROPER DISPOSAL

WASTE DISPOSAL: TO BE PERFORMED IN COMPLIANCE WITH ALL CURRENT LOCAL, STATE AND FEDERAL REGULATIONS.

SECTION VIII - SPECIAL PROTECTION INFORMATION

VENTILATION, RESPIRATORY PROTECTION, PROTECTIVE CLOTHING, EYE PROTECTION:

RESPIRATORY PROTECTION: IF WORKPLACE EXPOSURE LIMIT(S) OF PRODUCT OR ANY COMPONENT IS EXCEEDED (SEE TLV/PEL), A NIOSH/MSHA APPROVED AIR SUPPLIED RESPIRATOR IS ADVISED IN ABSENCE OF PROPER ENVIRONMENTAL CONTROL. OSHA REGULATIONS ALSO PERMIT OTHER NIOSH/MSHA RESPIRATORS (NEGATIVE PRESSURE TYPE) UNDER SPECIFIED CONDITIONS (SEE YOUR SAFETY EQUIPMENT SUPPLIER). ENGINEERING AND/OR ADMINISTRATIVE CONTROLS SHOULD BE IMPLEMENTED TO REDUCE EXPOSURE.

MATERIAL SHOULD BE HANDLED OR TRANSFERRED IN AN APPROVED FUME HOOD OR WITH ADEQUATE VENTILATION

PROTECTIVE GLOVES (BUTYL RUBBER, PVC OR EQUIVALENT) SHOULD BE WORN TO PREVENT SKIN CONTACT

SAFETY GLASSES WITH SIDE SHIELDS MUST BE WORN AT ALL TIMES

SECTION IX - SPECIAL PRECAUTIONS

HANDLING & STORAGE

-KEEP CONTAINER CLOSED

STORE IN A COOL AREA AWAY FROM IGNITION SOURCES AND OXIDIZERS

DO NOT BREATHE VAPOR

DO NOT GET IN EYES

FLASH POINT (F).....: 53F (TCC)

FLAMMABLE LIMITS LEL %.: 2

FLAMMABLE LIMITS UEL %.: 12

EXTINGUISHING MEDIA.....:

DRY CHEMICAL, CO₂, "ALCOHOL" FOAM; WATER SPRAY TO COOL FIRE-
EXPOSED CONTAINERS AND DISPERSE VAPORS.

FIRE FIGHTING PROC.....:

WEAR SELF-CONTAINED BREATHING APPARATUS

FIRE & EXPL. HAZARDS.....:

DANGEROUS FIRE AND EXPLOSION HAZARD.

VAPOR CAN TRAVEL DISTANCES TO IGNITION SOURCE AND FLASH BACK.
HOT ORGANIC CHEMICAL VAPORS OR MISTS ARE SUSCEPTIBLE TO SUDDEN
SPONTANEOUS COMBUSTION WHEN MIXED WITH AIR. IGNITION MAY OCCUR AT
TEMPERATURES BELOW PUBLISHED AUTOIGNITION OR IGNITION TEMPERATURES.
IGNITION TEMPERATURES DECREASE WITH INCREASING VAPOR VOLUME AND
VAPOR/AIR CONTACT TIME AND ARE INFLUENCED BY PRESSURE CHANGES.
IGNITION MAY OCCUR AT TYPICAL ELEVATED TEMPERATURE PROCESS CONDI-
TIONS, ESPECIALLY IN PROCESS OPERATING UNDER VACUUM IF SUBJECTED TO
SUDDEN INGRESS OF AIR, OR OUTSIDE PROCESS EQUIPMENT OPERATING UNDER
ELEVATED PRESSURE IF SUDDEN ESCAPE OF VAPORS OR MISTS TO THE ATMOS-
PHERE OCCURS.

SECTION V - HEALTH HAZARD DATA (ACUTE AND CHRONIC)

ACGIH TLV/OSHA PEL (TWA).....: 400 PPM; 500 PPM STEL

TOXICITY DATA.....:

-ORL-HMN LDLO: 3570 MG/KG ORL-RAT LD50: 5045 MG/KG

IHL-RAT LC50: 16000 PPM/8H

SYMPTOMS OF EXPOSURE

EFFECTS OF INGESTION OR INHALATION: NAUSEA, INTOXICATION,
CENTRAL NERVOUS SYSTEM DEPRESSION, HEADACHE, DECREASED
BLOOD RATE, COMA.

HIGH VAPOR CONCENTRATIONS CAUSE IRRITATION OF EYES AND RESPIRATORY
SYSTEM.

CONTACT MAY CAUSE EYE INJURY, SKIN IRRITATION

MEDICAL COND. AGGRAVATED BY EXP: RESPIRATORY AND SKIN CONDITIONS.

ROUTES OF ENTRY.....: INHALATION, INGESTION OR SKIN CONTACT

CARCINOGENICITY.....:

THE MATERIAL IS NOT LISTED AS A CANCER CAUSING AGENT.

EMERGENCY FIRST AID.....:

GET MEDICAL ASSISTANCE FOR ALL CASES OF OVEREXPOSURE.

SKIN: WASH THOROUGHLY WITH SOAP AND WATER.

EYES: IMMEDIATELY FLUSH THOROUGHLY WITH WATER FOR AT LEAST 15 MINUTES

INHALATION: REMOVE TO FRESH AIR; GIVE ARTIFICIAL RESPIRATION IF
BREATHING HAS STOPPED.

INGESTION: IF CONSCIOUS, DRINK WATER AND INDUCE VOMITING IMMEDIATELY

REACTIVITY DATA

STABILITY Inert	UNSTABLE		CONDITIONS TO AVOID None
	STABLE	X	

INCOMPATIBILITY (Materials to avoid)
None

HAZARDOUS DECOMPOSITION PRODUCTS
None

HAZARDOUS POLYMERIZATION	MAY OCCUR		CONDITIONS TO AVOID None
	WILL NOT OCCUR	X	

SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED
Avoid contact of skin with liquid nitrogen or its cold boil-off gas. Flush liquid nitrogen spill with water to disperse. Ventilate enclosed areas to prevent formation of oxygen-deficient atmospheres caused by the evaporation of liquid nitrogen or the release of gaseous nitrogen.

WASTE DISPOSAL METHOD
Allow liquid nitrogen to evaporate in a well ventilated outdoor location remote from work areas. Vent nitrogen gas slowly to a well ventilated outdoor location remote from work areas. Do not attempt to dispose of residual nitrogen in compressed gas cylinders. Return cylinders to Air Products with residual pressure, the cylinder valve tightly closed and valve caps in place.

SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (Specify type)
Use self-contained breathing apparatus in oxygen-deficient atmospheres. Caution! Respirators will not function. Use may result in asphyxiation.

VENTILATION Natural or mechanical where gas is present.	LOCAL EXHAUST As necessary	SPECIAL As necessary
	MECHANICAL (General) As necessary	OTHER Vents should be situated to avoid higher than normal concentration of nitrogen in work areas.

PROTECTIVE GLOVES
(LIN) Loose-fitting gloves of impermeable materials such as leather. Leather work gloves are recommended when handling compressed gas cylinders.

EYE PROTECTION
(LIN) Chemical goggles or safety glasses. Safety glasses are recommended when handling high-pressure cylinders.

OTHER PROTECTIVE EQUIPMENT
None

SPECIAL PRECAUTIONS*

SPECIAL LABELING INFORMATION
DOT Shipping Name: Nitrogen or Nitrogen, Compressed; (LIN) Nitrogen, refrigerated liquid.
DOT Hazard Class: Nonflammable Gas.
DOT Shipping Label: Nonflammable Gas.
I.D. Number: UN 1066 (Nitrogen or Nitrogen, Compressed); UN 1977 (LIN).

SPECIAL HANDLING RECOMMENDATIONS
Prevent contact of liquid nitrogen or cold boil-off gas with exposed skin. Prevent entrapment of liquid in closed systems. Use only in well ventilated areas. Compressed gas cylinders contain nitrogen at extremely high pressure and should be handled with care. Use a pressure-reducing regulator and pressure relief devices when connecting to lower pressure piping systems. Secure cylinders when in use. Never use direct flame to heat a compressed gas cylinder. Use a check valve to prevent back flow into storage container. Avoid dragging, rolling, or sliding cylinders, even for a short distance. Use a suitable hand truck. For additional handling recommendations on compressed gas cylinders, consult Compressed Gas Association Pamphlet P-1.

SPECIAL STORAGE RECOMMENDATIONS
It is recommended that liquid cylinders be stored outside and the gas or liquid piped to the use point. However, if liquid cylinders are to be stored or transported in an enclosed area, it is essential that the area be well ventilated. In case of poor natural ventilation, forced ventilation should be installed. Keep cylinders away from sources of heat. Storage should not be in heavy traffic areas to prevent accidental knocking over or damage from passing or falling objects. Valve caps should remain on cylinders not connected for use. Segregate full and empty cylinders. Storage areas should be free of combustible material. Replace the cylinder cap when the cylinder is not in use. Avoid exposure to areas where salt or other corrosive chemicals are present. See Compressed Gas Association Pamphlet P-1 for additional storage recommendations.

SPECIAL PACKAGING RECOMMENDATIONS
Gaseous nitrogen containers meet DOT specifications or American Society of Mechanical Engineers (ASME) codes. Liquid nitrogen is stored in vacuum-insulated containers meeting DOT specifications or ASME codes.

OTHER RECOMMENDATIONS OR PRECAUTIONS
Liquid nitrogen is a cryogenic liquid. Materials of construction must be selected for compatibility with extremely low temperatures. Avoid use of carbon steel and other materials which become brittle at low temperatures. Compressed gas cylinders should not be refilled except by qualified producers of compressed gases. Shipment of a compressed gas cylinder filled without the written permission of the owner is a violation of Federal Law. If oxygen-deficient atmospheres are suspected or can occur, use oxygen monitoring equipment to test for oxygen deficient atmospheres.

* U.S. Government agencies (i.e., Department of Transportation, Occupational Safety and Health Administration, Food and Drug Administration and others) may have specific regulations concerning the transportation handling, storage or use of this product which will not be reflected in this data sheet. The customer should review these regulations to ensure that s/he is in full compliance.

Nitrogen Material Safety Data Sheet

Industrial Gas Division
Air Products and Chemicals, Inc.
Allentown, PA 18195
Tel. (215) 481-4911 · TWX 510-651-3686
Telecopy (215) 481-5900
CABLE-AIRPROD · TELEX 847416



EMERGENCY PHONE: 800—523-9374		IN PENNSYLVANIA: 800—322-9092	
ISSUE DATE	Issued: 13 April 1977	TRADE NAME AND SYNONYMS	CHEMICAL NAME AND SYNONYMS
REVISIONS	Rev: 1 June 1990	Nitrogen, or LIN (in cryogenic liquid state)	Nitrogen
		FORMULA	CHEMICAL FAMILY
		N ₂ MW: 28.01	Inert gas CAS #7727-37-9

HEALTH HAZARD DATA

EXPOSURE LIMITS

OSHA: None established. ACGIH: Simple Asphyxiant. Nitrogen is not listed as a carcinogen by NTP, IARC, or OSHA.

SYMPTOMS IF INGESTED, CONTACTED WITH SKIN, OR VAPOR INHALED

Nitrogen is odorless and nontoxic, but may produce suffocation by diluting the concentration of oxygen in air below levels necessary to support life. **PERSONNEL, INCLUDING RESCUE WORKERS, SHOULD NOT ENTER AREAS WHERE THE OXYGEN CONCENTRATION IS BELOW 19.5% UNLESS PROVIDED WITH A SELF-CONTAINED BREATHING APPARATUS OR AIRLINE RESPIRATOR.** Exposure to oxygen-deficient atmospheres may produce dizziness, nausea, vomiting, loss of consciousness, and death. Death may result from errors in judgement, confusion, or loss of consciousness which prevents self-rescue. At low oxygen concentrations unconsciousness and death may occur in seconds without warning. Extensive tissue damage or burns can result from exposure to liquid nitrogen or cold nitrogen vapors.

TOXICOLOGICAL PROPERTIES

Nitrogen is a simple asphyxiant and constitutes 78% of the air we breathe. Nitrogen does not support life and may produce immediately hazardous atmospheres through the displacement of oxygen. Nitrogen under high pressure can produce narcosis even though oxygen sufficient for life is present.

RECOMMENDED FIRST AID TREATMENT

Persons suffering from lack of oxygen should be moved to areas with normal atmospheres. **SELF-CONTAINED BREATHING APPARATUS MAY BE REQUIRED TO PREVENT ASPHYXIATION OF RESCUE WORKERS.** Assisted respiration and supplemental oxygen should be given if the victim is not breathing. If cryogenic liquid or cold boil-off gas contacts a worker's skin or eyes, frozen tissues should be flooded or soaked with tepid water (105-115F; 41-46C). **DO NOT USE HOT WATER.** Cryogenic burns which result in blistering or deeper tissue freezing should be seen promptly by a physician.

FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Method used)	AUTO IGNITION TEMP	FLAMMABLE LIMITS	LEL	UEL
N/A	N/A	Non-flammable	N/A	N/A
EXTINGUISHING MEDIA			ELECTRICAL CLASSIFICATION	
N/A			GROUP N/A	
SPECIAL FIRE FIGHTING PROCEDURES				
N/A				
UNUSUAL FIRE AND EXPLOSION HAZARDS				
Cylinders exposed to high heat or flame may vent rapidly.				

PHYSICAL DATA

BOILING POINT (°F.)	FREEZING POINT (°F)		
@ 1 atm -320.5F (-195.8C)	@ 1 atm -346.0F (-210.0C)		
VAPOR PRESSURE (psia)	SOLUBILITY IN WATER		
N/A	@ 68F (20C), 1 atm 1.52% by volume		
VAPOR DENSITY (lb/cu ft)	SPECIFIC GRAVITY (AIR = 1)	LIQUID DENSITY (lb/cu ft)	SPECIFIC GRAVITY (H ₂ O = 1)
@ 70F (21.1C), 1 atm 0.07245	@ 68F (20C), 1 atm 0.967	@ boiling point, 1 atm 50.47	@ boiling point, 1 atm 0.808

APPEARANCE AND ODOR

Both liquid and gaseous nitrogen are colorless and odorless.

REACTIVITY DATA

STABILITY	UNSTABLE	X	CONDITIONS TO AVOID Sources of ignition, sparks, flames, hot objects.
	STABLE		

INCOMPATIBILITY (Materials to avoid)
Oxidizing materials. Some steels are susceptible to hydrogen attack or embrittlement at high temperature and pressure.

HAZARDOUS DECOMPOSITION PRODUCTS
None

HAZARDOUS POLYMERIZATION	MAY OCCUR	X	CONDITIONS TO AVOID None
	WILL NOT OCCUR		

SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED
DO NOT ENTER areas containing flammable mixtures of hydrogen in air. Avoid contact of skin with liquid hydrogen or cold boil-off gas. Ventilate enclosed areas to prevent formation of flammable or oxygen-deficient atmospheres. See "VENTILATION" below. Eliminate all potential sources of ignition. Move a leaking compressed gas cylinder out of doors if leak is small. Consult Air Products for additional assistance.

WASTE DISPOSAL METHOD
Do not attempt to dispose of residual gaseous hydrogen in cylinders. Return cylinders to Air Products with positive residual pressure, cylinder valves tightly closed, and valve cap in place. Do not dispose of liquid hydrogen — contact Air Products for assistance.

SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (Specify type)

VENTILATION Natural or mechanical where gas or vapor is present.	LOCAL EXHAUST As necessary	SPECIAL Mechanical ventilation must meet National Electric Code (NEC) requirements for Class I, Group B
	MECHANICAL (General) As necessary	OTHER Only as necessary

PROTECTIVE GLOVES
(Liquid) Loose-fitting of impermeable materials, such as leather. Lether work gloves are recommended when handling compressed gas cylinders.

EYE PROTECTION
Safety glasses are recommended when handling compressed gas cylinders. Use safety glasses or goggles when handling liquid.

OTHER PROTECTIVE EQUIPMENT
None

SPECIAL PRECAUTIONS*

SPECIAL LABELING INFORMATION
DOT Shipping Name: Hydrogen, or Hydrogen, Compressed; (Liquid) Hydrogen, refrigerated liquid.
DOT Hazard Class: Flammable Gas.
DOT Shipping Label: Flammable Gas.
I.D. Number: UN 1049 (Hydrogen or Hydrogen, Compressed); UN 1966 (Liquid Hydrogen).

SPECIAL HANDLING RECOMMENDATIONS
Prevent contact of liquid hydrogen with exposed skin. Prevent entrapment of liquid in closed systems. Use only in well ventilated areas. Compressed gas cylinders contain hydrogen at extremely high pressure and should be handled with care. Use a pressure-reducing regulator when connecting to lower pressure piping systems. Secure cylinders when in use. Never use direct flame to heat a compressed gas cylinder. Use a check valve to prevent back flow into storage container. Avoid dragging, rolling, or sliding cylinders, even for a short distance. Use a suitable hand truck. For additional handling recommendations on compressed gas cylinders, consult Compressed Gas Association Pamphlet P-1.

SPECIAL STORAGE RECOMMENDATIONS
Store liquid containers and cylinders in well-ventilated areas. Keep cylinders away from sources of heat. Storage should not be in heavy traffic areas to prevent accidental knocking over or damage from passing or falling objects. Valve caps should remain on cylinders not connected for use. Segregate full and empty cylinders. Storage areas should be free of combustible material. Avoid exposure to areas where salt or other corrosive chemicals are present. Cylinder storage of hydrogen should be segregated from oxidizers such as oxygen, fluorine, etc. See Compressed Gas Association Pamphlet P-1 for additional storage recommendations.

SPECIAL PACKAGING RECOMMENDATIONS
Gaseous hydrogen containers meet DOT specifications or American Society of Mechanical Engineers (ASME) codes. Liquid hydrogen is stored in vacuum-insulated containers meeting DOT specifications or ASME codes.

OTHER RECOMMENDATIONS OR PRECAUTIONS
Liquid hydrogen in exposed piping can actually cause air to condense and liquefy. The nitrogen in this liquid can evaporate more rapidly, leaving an oxygen enriched liquid behind. Utilize oxygen-compatible insulating materials and minimize exposed piping surface areas. Use only metals and materials compatible with extremely low temperatures. Avoid use of carbon steel and other metals which become brittle at low temperatures. Compressed gas cylinders should not be refilled except by qualified producers of compressed gases. Shipment of a compressed gas cylinder filled without the written permission of the owner is a violation of Federal Law. The atmosphere in areas in which hydrogen gas may be vented and collect should be tested with a portable or continuous flammable gas analyzer.

* U.S. Government agencies (i.e., Department of Transportation, Occupational Safety and Health Administration, Food and Drug Administration and others) may have specific regulations concerning the transportation handling, storage or use of this product which will not be reflected in this data sheet. The customer should review these regulations to ensure that s/he is in full compliance.

Hydrogen Material Safety Data Sheet

Industrial Gas Division
Air Products and Chemicals, Inc.
Allentown, PA 18195
Tel. (215) 481-4911 · TWX 510-651-3686
Telecopy (215) 481-5900
CABLE-AIRPROD · TELEX 847416



EMERGENCY PHONE: 800—523-9374		IN PENNSYLVANIA: 800—322-9092	
ISSUE DATE	Issued: 13 April 1977	TRADE NAME AND SYNONYMS	CHEMICAL NAME AND SYNONYMS
REVISIONS	Rev: 1 March 1990	Hydrogen, or Liquid Hydrogen (in cryogenic liquid state)	Hydrogen
		FORMULA	CHEMICAL FAMILY
		H ₂ MW: 2.016	Flammable Gas CAS #1333-74-0

HEALTH HAZARD DATA

EXPOSURE LIMITS

Hydrogen is a simple asphyxiant and has no threshold limit value (TLV). Hydrogen is not listed as a carcinogen by NTP, IARC, or OSHA.

SYMPTOMS IF INGESTED, CONTACTED WITH SKIN, OR VAPOR INHALED

Hydrogen is nontoxic and classified as a simple asphyxiant. Symptoms of anoxia occur only when gas concentrations are within the flammable range and the mixture has not ignited. **DO NOT ENTER AREAS WITHIN THE FLAMMABLE RANGE DUE TO THE IMMEDIATE FIRE AND EXPLOSION HAZARD.** Contact of skin with liquid hydrogen or cold gas vapors can cause cryogenic (extreme low temperature) burns and freeze tissues.

TOXICOLOGICAL PROPERTIES

Hydrogen is nontoxic and classified as a simple asphyxiant, but is extremely flammable. The amount of hydrogen gas necessary to reduce oxygen concentrations below life support levels is well within the flammable range. Do not enter areas containing flammable mixtures due to the immediate fire and explosion hazard.

RECOMMENDED FIRST AID TREATMENT

If cryogenic liquid or cold boil-off gas contacts worker's skin or eyes, frozen tissues should be flooded or soaked with tepid water (105-115F; 41-46C). **DO NOT USE HOT WATER.** Cryogenic burns which result in blistering or deeper tissue freezing should be seen promptly by a physician. First degree burns (reddening only, as sunburn), or second degree burns (blistering) which are the result of fire exposure and are localized to a portion of an extremity or other small area of the body may be immersed in cool water for 10-20 minutes to relieve pain. Do NOT immerse the whole body in a cold bath. All thermal injuries except the most minor and localized burns should be referred promptly for medical care. Burned areas should be covered with the cleanest available material, such as a clean sheet, prior to transport. Do NOT use burn ointments or greasy materials on burns which show more than localized reddening. Persons suffering from lack of oxygen should be moved to areas with normal atmosphere. Assisted respiration and supplemental oxygen should be given if the victim is not breathing.

FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Method used)	AUTO IGNITION TEMP	FLAMMABLE LIMITS	LEL	UEL
N/A (gas at normal temperatures)	932F (500C)	In air @ 1 atm	4.0%	74.2%

EXTINGUISHING MEDIA	ELECTRICAL CLASSIFICATION
Dry chemical, carbon dioxide, or Halon	GROUP Class I, Group B

SPECIAL FIRE FIGHTING PROCEDURES

Shut off source of hydrogen. When possible, allow fire to burn itself out. Spray water on adjoining equipment to keep it cool.

UNUSUAL FIRE AND EXPLOSION HAZARDS

Hydrogen can burn with almost an invisible flame of low thermal radiation. People have unknowingly walked into hydrogen flames. Easily ignited; minimum ignition energy is low (0.2MJ) and flammable range is wide. Flame propagates at rapid rate. Potential explosion hazard from reignition if fire is extinguished without shutting off hydrogen source. Hydrogen gas is bouyant and can accumulate in the upper sections of enclosed spaces.

PHYSICAL DATA

BOILING POINT (°F.)	FREEZING POINT (°F)		
@ 1 atm -423.0F (-252.8C)	@ 1 atm -434.5F (-259.2C)		
VAPOR PRESSURE (psia)	SOLUBILITY IN WATER		
N/A	@ 68F (20C), 1 atm 1.82% by volume		
VAPOR DENSITY (lb/cu ft)	SPECIFIC GRAVITY (AIR = 1)	LIQUID DENSITY (lb/cu ft)	SPECIFIC GRAVITY (H ₂ O = 1)
@ 68F (20C), 1 atm 0.005229	@ 68F (20C), 1 atm 0.0696	@ boiling point, 1 atm 4.432	@ boiling point, 1 atm 0.0710

APPEARANCE AND ODOR

Both liquid and gaseous hydrogen are colorless and odorless.

Air Products and Chemicals, Inc.
7201 Hamilton Boulevard
Allentown, PA 18195-1501
Telephone (215) 481-4911



A7E430

SPECIALTY GAS
MATERIAL SAFETY DATA SHEET (MSDS)
DAILY MAILING PICK LIST / AUDIT REPORT

DATE: 13 MAY 93
PAGE: 1

ABB ENVIRONMENTAL SERVICES, IN
ATTN: ACCOUNTS PAYABLE
CHARLESTON 07545
2590 EXECUTIVE CTR CIRCLE EAST
TALLAHASSEE FL 32301-4

CUST # : T1022001
DISTRICT : 895
P.O. # :

SIGNATURE : *B. Blase*

COMMODITY CODE	REFERENCE NUMBER	DESCRIPTION COMPONENT(S)	VOLUME	WEIGHT
C02T390275B	2861	HYDROGEN IN NITROGEN		
		N2	60.0000 %	91.307
		H2	40.0000 %	8.692
C02U390275A	11817	HYDROGEN IN NITROGEN		
		N2	95.0000 %	99.253
		H2	5.0000 %	.746

Specialty Gas Department
Air Products and Chemicals, Inc.
Allentown, PA 18195
(215) 481-8257



SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (Specify type) Positive pressure air line with mask or self-contained breathing apparatus should be available for emergency use.

VENTILATION

Use a hood with forced ventilation and/or local exhaust to prevent accumulation above the LEL in accordance with electrical codes.

PROTECTIVE GLOVES

Plastic or rubber

EYE PROTECTION

Safety goggles or glasses

OTHER PROTECTIVE EQUIPMENT

Safety shoes, safety shower, eyewash "fountain"

SPECIAL PRECAUTIONS*

SPECIAL LABELING INFORMATION

DOT Shipping Name: Methane or Methane, Compressed; DOT Hazard Class: Flammable gas; DOT Shipping Label: Flammable gas; I.D. No.: UN 1971

SPECIAL HANDLING RECOMMENDATIONS

Use only in well-ventilated areas. Valve protection caps must remain in place unless cylinder is secured with valve outlet piped to use point. Do not drag, slide or roll cylinders. Use a suitable hand truck for cylinder movement. Use a pressure reducing regulator when connecting cylinder to lower pressure (< 3,000 psig) piping or systems. Do not heat cylinder by any means to increase the discharge rate of product from the cylinder. Use a check valve or trap in the discharge line to prevent hazardous backflow into the cylinder.

For additional handling recommendations consult the Air Products Specialty Gas Catalog Safety and Technical Information Section or Compressed Gas Association Pamphlet P-1.

SPECIAL STORAGE RECOMMENDATIONS

Protect cylinders from physical damage. Store in cool, dry, well-ventilated area of non-combustible construction away from heavily traveled areas and emergency exits. Do not allow the temperature where cylinders are stored to exceed 125°F (52°C). Cylinders should be stored upright and firmly secured to prevent falling or being knocked over. Full and empty cylinders should be segregated. Use a "first in - first out" inventory system to prevent full cylinders being stored for excessive periods of time. Post "No Smoking or Open Flames" signs in the storage or use area. There should be no sources of ignition in the storage or use area.

For additional storage recommendations, consult the Air Products Specialty Gas Catalog Safety and Technical Information Section or Compressed Gas Association Pamphlet P-1.

SPECIAL PACKAGING RECOMMENDATIONS

Methane is noncorrosive and may be used with any common structural material.

OTHER RECOMMENDATIONS OR PRECAUTIONS

Earth-ground and bond all lines and equipment associated with the methane system. Electrical equipment should be non-sparking or explosion proof. Compressed gas cylinders should not be refilled except by qualified producers of compressed gases. Shipment of a compressed gas cylinder which has not been filled by the owner or with his (written) consent is a violation of Federal Law (49CFR).

*Various Government agencies (i.e., Department of Transportation, Occupational Safety and Health Administration, Food and Drug Administration and others) may have specific regulations concerning the transportation, handling, storage or use of this product which will not be reflected in this data sheet. The customer should review these regulations to ensure that he is in full compliance.

HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES

Forms explosive or flammable mixtures with most oxidizers (oxygen, chlorine, fluorine, etc.), and is flammable over a wide range in air.

PHYSICAL DATA

BOILING POINT - 258.6°F (- 161.4°C)	LIQUID DENSITY AT BOILING POINT 26.4 lb/ft ³ (424.7 kg/m ³)
VAPOR PRESSURE @ 70°F (21.1°C) above the critical temp. of - 116.17°F (- 82.3°C)	GAS DENSITY AT 70°F, 1 atm 0.042 lb/ft ³ (.673 kg/m ³)
SOLUBILITY IN WATER Negligible	FREEZING POINT - 296.45°F (- 182.47°C)
APPEARANCE AND ODOR Colorless, odorless gas. Specific Gravity @ 70°F (Air = 1) = 0.555	

FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Method used) - 306°F (- 188°C) C.C.	AUTO IGNITION TEMPERATURE 1076°F (580°C)	FLAMMABLE LIMITS % BY VOLUME LEL 5 UEL 15
EXTINGUISHING MEDIA Water, carbon dioxide, dry chemical		ELECTRICAL CLASSIFICATION Class 1, Group D
SPECIAL FIRE FIGHTING PROCEDURES If possible without risk, stop the flow of methane. From a safe distance use water spray to cool surrounding containers until well after fire is out. If possible without risk, move cylinders from fire area.		
UNUSUAL FIRE AND EXPLOSION HAZARDS Should flame be extinguished and flow of gas continue, increase ventilation to prevent flammable or explosive mixture formation. Cylinders exposed to heat or flame may vent rapidly or explode.		

REACTIVITY DATA

STABILITY Unstable		CONDITIONS TO AVOID
Stable	X	None
INCOMPATIBILITY (Materials to avoid) Oxidizers		
HAZARDOUS DECOMPOSITION PRODUCTS None		
HAZARDOUS POLYMERIZATION May Occur		CONDITIONS TO AVOID
Will Not Occur	X	None

SPILL OR LEAK PROCEDURES**STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED**

Evacuate all personnel from affected area. Use appropriate protective equipment. If leak is in user's equipment, be certain to purge piping with an inert gas prior to attempting repairs. If leak is in cylinder or cylinder valve, call the "800" emergency phone number listed herein.

WASTE DISPOSAL METHOD

All Federal, State, and Local regulations regarding health and pollution should be followed in waste disposal. Contact Air Products for specific recommendations. Do not dispose of unused quantities.

Return the properly labeled shipping container to Air Products for disposal. For emergency disposal assistance, call the "800" emergency phone number listed herein.

EMERGENCY PHONE (800) 523-9374 IN PENNSYLVANIA (800) 322-9092	PRODUCT NAME METHANE		CAS NO.: 74-82-8
AIR PRODUCTS AND CHEMICALS, INC. 7201 HAMILTON BOULEVARD ALLENTOWN, PA 18195-1501 (215) 481-8257	TRADE NAME AND SYNONYMS Methane, Methyl Hydride, Marsh Gas		
	CHEMICAL NAME AND SYNONYMS Methane		
EFFECTIVE DATE February 1991 REVISION NUMBER 3	FORMULA CH_4	CHEMICAL FAMILY Aliphatic Hydrocarbon	

HEALTH HAZARD DATA

TIME WEIGHTED AVERAGE EXPOSURE LIMIT
 OSHA: None established ACGIH: Simple asphyxiant

SYMPTOMS OF EXPOSURE
 Inhalation: High concentrations of methane so as to exclude an adequate supply of oxygen to the lungs cause dizziness, deeper breathing due to air hunger, possible nausea and eventual unconsciousness.

TOXICOLOGICAL PROPERTIES
 Methane is inactive biologically and essentially nontoxic; therefore, the major hazard of overexposure is the exclusion of an adequate supply of oxygen to the lungs.
 Methane is not listed in the IARC, NTP, or OSHA Subpart Z as a carcinogen or potential carcinogen.

RECOMMENDED FIRST AID TREATMENT
 PROMPT MEDICAL ATTENTION IS REQUIRED IN ALL CASES OF OVEREXPOSURE TO METHANE. RESCUE PERSONNEL SHOULD BE EQUIPPED WITH APPROPRIATE PROTECTIVE EQUIPMENT (SELF-CONTAINED BREATHING APPARATUS, ETC.) TO PREVENT UNNECESSARY EXPOSURE AND BE AWARE OF EXTREME FIRE AND EXPLOSION HAZARD.

Inhalation: Conscious persons should be assisted to an uncontaminated area and inhale fresh air. Quick removal from the contaminated area is most important. Unconscious persons should be moved to an uncontaminated area, given mouth-to-mouth resuscitation and supplemental oxygen. Further treatment should be symptomatic and supportive.

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

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

"ISSUED 03/03/92"

MATERIAL SAFETY DATA SHEET
SHOULD BE USED TO COMPLY WITH
OSHA HAZARD COMMUNICATION STANDARD,
29 CFR 1910.1200. STANDARD MUST BE
CONSULTED FOR SPECIFIC REQUIREMENTS.

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

IDENTITY (AS USED ON LABEL AND LIST)

OSHA HAZARD COMMUNICATION STANDARD, 29 CFR 1910.1200, 21835-032, 21835-054, 21835-065, 21835-087, 21835-123, WLS19650-A
LS19650-B

SECTION I

MANUFACTURER'S NAME: EMERGENCY TELEPHONE NUMBER:
ALCONOX, INC. (212)-473-1300
ADDRESS: TELEPHONE NUMBER FOR INFORMATION:
215 PARK AVENUE SOUTH (212)-473-1300
NEW YORK, NEW YORK 10003 DATE PREPARED:
FEB. 1, 1991

SECTION II - HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

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

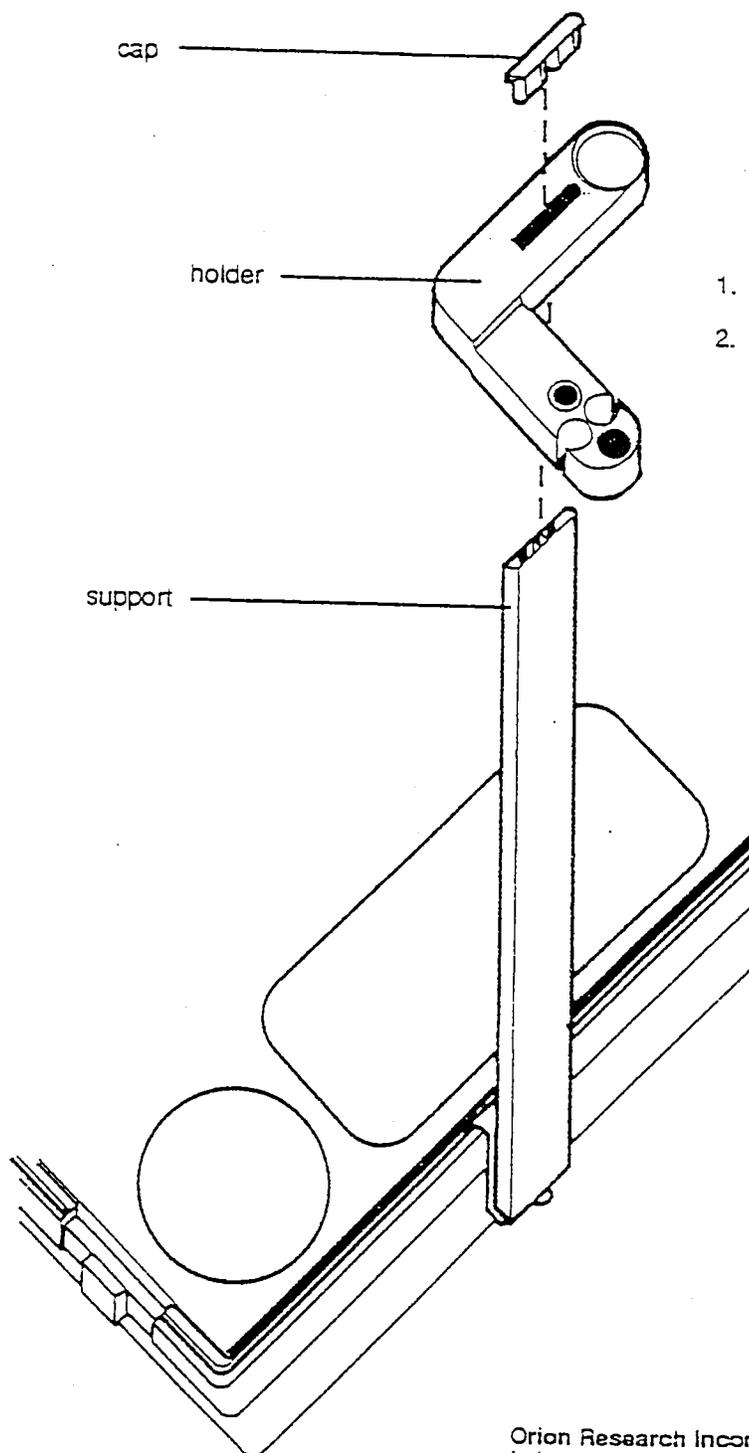
SECTION III - PHYSICAL/CHEMICAL CHARACTERISTICS

BILING POINT: N.A. SPECIFIC GRAVITY (H2O=1): N.A.
APOR PRESSURE (MMHG): N.A. MELTING POINT: N.A.
APOR DENSITY (AIR=1): N.A. EVAPORATION RATE: N.A.
(BUTYL ACETATE=1)
OLUBILITY IN WATER: APPRECIABLE (GREATER THAN 10 PERCENT)
PEARANCE AND ODOR: WHITE POWDER INTERSPERED WITH CREAM COLORED FLAKES-
ODORLESS

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (METHOD USED): NONE FLAMMABLE LIMITS:
LEL: N/A UEL: N/A
EXTINGUISHING MEDIA:
WATER, CO2, DRY CHEMICAL, FOAM, SAND/EARTH
SPECIAL FIRE FIGHTING PROCEDURES:
FOR FIRES INVOLVING THIS MATERIAL DO NOT ENTER WITHOUT PROTECTIVE
EQUIPMENT AND SELF CONTAINED BREATHING APPARATUS.
UNUSUAL FIRE AND EXPLOSION HAZARDS: NONE

Portable Meter Starter Kit (Orion Catalog No. OPBLSK)
Electrode Holder and Stand Assembly Instructions



1. Clip support to side of carrying case.
2. Assemble holder and cap as shown.

Orion Research Incorporated
Laboratory Products Group
The Schrafft Center
529 Main Street, Boston, MA 02129
TEL 617-242-3900, 300-225-1480/TLX 4430019

Part No. 213352-001 09/90

ORION MATERIAL SAFETY DATA SHEET

SHEET 2 OF 2

Orion Application Solution

PRODUCT NAME: pH 4.01 Buffer

CATALOG NO.: 910104 or 330004

V. REACTIVITY DATA

STABILITY:		CONDITIONS TO AVOID	
UNSTABLE <input type="radio"/>	STABLE <input checked="" type="checkbox"/>	None	
INCOMPATIBILITY (MATERIALS TO AVOID)		HNO ₃	
HAZARDOUS DECOMPOSITION PRODUCTS		None	
HAZARDOUS POLYMERIZATION:		CONDITION TO AVOID	
MAY OCCUR <input type="radio"/>	WILL NOT OCCUR <input checked="" type="checkbox"/>	None	

VI. HEALTH HAZARD DATA

ROUTE(S) OF ENTRY:	INHALATION?	SKIN?	INGESTION?
	No	Yes	Yes
HEALTH HAZARDS (ACUTE AND CHRONIC)			
Acute - low hazard for acute because of low concentration of salts. Chronic: possible skin irritant for prolonged exposure.			
CARCINOGENICITY:	NTP?	IARC MONOGRAPHS?	OSHA REGULATED?
	Amaranth is suspected/Not found	(animal positive)***	not found
SIGNS AND SYMPTOMS OF EXPOSURE			
Skin irritation			
MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE			
Could aggravate diseases of the skin.			
EMERGENCY AND FIRST AID PROCEDURES			
Wash off contact area with water. If Ingested, give large amounts of water. Contact physician.			

VII. PRECAUTIONS (SAFE HANDLING AND USE)

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED
Wash down drain with excess water if local law allows.
WASTE DISPOSAL METHOD
Consult with and observe all Federal, State, and local laws when disposing of this product.
PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING
Suitable for any general handling and storage. <u>NEPA Rating</u> : Scale (0-4); Health - 1, Fire - 0, Reactivity - 1, Specific - none.
OTHER PRECAUTIONS
This product is not regulated under <u>SARA TITLE III</u> . Not affected by <u>Cal Prop 65</u> .

VIII. CONTROL MEASURES

RESPIRATORY PROTECTION (SPECIFY TYPE)		
None		
VENTILATION	LOCAL EXHAUST	SPECIAL
	No	No
	MECHANICAL (GENERAL)	OTHER
	No	No
PROTECTIVE GLOVES	Yes	EYE PROTECTION
		Safety glasses
OTHER PROTECTIVE CLOTHING OR EQUIPMENT		
No		
WORK/HYGIENIC PRACTICES		
No eating or drinking while working with this product.		

ORION MATERIAL SAFETY DATA SHEET

SHEET 1 OF 2

Orion Research Incorporated
 THE SCHRAFFT CENTER
 529 MAIN STREET, BOSTON, MA 02129 USA
 TELEPHONE 617-242-3900

I. PRODUCT IDENTIFICATION

PRODUCT NAME Orion Application Solution pH 4.01 Buffer	CATALOG NO. 910104 or 330004	EFFECTIVE DATE 8/26/92
HAZARDOUS SHIPMENT LABELLING: DOT None	IATA None	
PREPARED BY <i>Thomas S. Silvers</i>	TITLE Quality Assurance Chemist	
APPROVED BY <i>John O'Leary</i>	TITLE Director Regulatory Matters	

II. HAZARDOUS INGREDIENTS (IDENTITY INFORMATION)

HAZARDOUS COMPONENTS* SPECIFIC CHEMICAL IDENTITY: COMMON NAMES	CAS NO.	%	OSHA PEL	ACGIH TLV	LD 50 mg/Kg
Potassium Hydrogen Phthalate (KHP)	877-24-7	1.01	None	None	NA*
Amaranth Red Dye (C ₂₀ H ₁₁ N ₂ O ₁₀ S ₂ •3Na)	915-67-3	0.0005	None	None	1,000 (IPR-MUS)
*Deionized Water (H ₂ O)	7732-18-5	98.99	NA	NA	190,000 (IPR-MUS)

III. PHYSICAL DATA

BOILING POINT 760 mm Hg 100°C	FREEZING POINT 0°C
SPECIFIC GRAVITY (H ₂ O = 1) 1.0	VAPOR PRESSURE • NA
pH @ 25°C 4.01	SOLUBILITY IN WATER, % BY WT. • Miscible
VOLATILES, % BY WT. NA	EVAPORATION RATE (BUTYL ACETATE = 1) NA
VAPOR DENSITY (AIR = 1) NA	
APPEARANCE AND ODOR Light red, odorless liquid	

IV. FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (TEST METHOD) Not flammable	AUTOIGNITION TEMPERATURE NA
FLAMMABLE LIMITS IN AIR, % BY VOLUME:	LOWER UPPER NA NA
EXTINGUISHING MEDIA Water, CO ₂ , Dry chemical, foam or spray	
SPECIAL FIRE-FIGHTING PROCEDURES None, non-flammable	
UNUSUAL FIRE AND EXPLOSION HAZARDS None	

* Chemicals which are not classified as hazardous per U.S. OSHA guidelines (29CFR Parts 1915.2 or 1916.2) or the Massachusetts Substance List (105CMR670.000 Appendix A) will not necessarily be listed on this form even though one or more may be a constituent of this product.

Liability is expressly disclaimed for any loss or injury arising out of the use of this information or the use of any materials designated. Safe use of the materials is the responsibility of the user.

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 Rev. D

- * Not available or not applicable.
- ** Non-hazardous component.
- *** Refers to Amaranth Red Dye

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ATI ORION MATERIAL SAFETY DATA SHEET

Sheet 2 of 2

PRODUCT NAME: Orion Application Solution pH 10.01 Buffer Catalog No.: 910110

V. REACTIVITY DATA

Stability:		Conditions to Avoid	
Unstable	Stable X	None	
Incompatibility (Materials to avoid) NaK alloy, NH ₄ H ₂ PO ₄ , AL, P ₂ O ₅ , H ₂ SO ₄			
Hazardous Decomposition Products			
CO ₂ Upon heating to decomposition			
Hazardous Polymerization:		Condition to Avoid	
May Occur	Will Not Occur X	None	

VI. HEALTH HAZARD DATA

Route(s) Of Entry:	Inhalation?	Skin?	Ingestion?	
	No		Yes	Yes
Health Hazards (acute and chronic)				
Acute: This solution is considered non-hazardous due to the low levels of salt present. Chronic: Possible irritation of skin upon prolonged exposure.				
Carcinogenicity:	NTP?	IARC Monographs? ***		OSHA regulated?
	Not found	(animal positive)		Not found
Signs and Symptoms of Exposure				
Skin irritation				
Medical Conditions Generally Aggravated By Exposure Could aggravate diseases of the skin.				
Emergency And First Aid Procedures				
Wash off contact area with water. If ingested, give large amounts of water. Contact physician.				

VII. PRECAUTIONS (SAFE HANDLING AND USE)

Steps To Be Taken In Case Material Is Released Or Spilled
Clean up and set aside for disposal.
Waste Disposal Method
Consult Federal, State and Local laws for proper disposal.
Precautions To Be Taken In Handling And Storing
Suitable for any general handling and storage. NFPA Rating: Scale (0-4); Health -1, Fire-0, Reactivity-0, Specific-none.
Other Precautions
FD&C Blue No. 1 is listed on CAL Prop 65

VIII. CONTROL MEASURES

Respiratory Protection (specify type)			
None			
Ventilation	Local Exhaust	Special	
	No	No	
Ventilation	Mechanical (General)	Other	
	No	No	
Protective Gloves	Yes	Eye Protection	Safety glasses
Other Protective Clothing Or Equipment			
No			
Work/Hygienic Practices			
No eating or drinking while working with this product			

ATI ORION MATERIAL SAFETY DATA SHEET

Sheet 1 of 2

Orion Research Incorporated
 THE SCHRAFFT CENTER
 529 Main Street, Boston, MA 02129 USA
 Telephone 617-242-3900

I. PRODUCT IDENTIFICATION

Product Name Orion Application Solution pH 10.01 Buffer	Catalog No. 910110	Effective Date 07/20/93
Hazardous Shipment Labelling:	DOT NA	IATA NA
Prepared By <i>[Signature]</i>	Title Quality Assurance Chemist	
Approved By <i>[Signature]</i>	Title Director Regulatory Matters	

II. HAZARDOUS INGREDIENTS (IDENTIFY INFORMATION)

Hazardous Components* Specific Chemical Identity: Common Name(s)	CAS NO.	%	OSHA PEL	ACGIH TLV	LD 50mg/Kg
Sodium Bicarbonate (NaHCO ₃)	144-55-8	0.209	None	None	4220 (ORL-RAT)
Sodium Carbonate (Na ₂ CO ₃)	497-19-8	0.264	None	None	117 (PR-MUS)
Methylparaben (C ₈ H ₈ O ₃)	99-76-3	0.001	None	None	NA
FD&C Blue (C ₃₇ H ₃₆ N ₂ O ₈ S ₃ *2Na)	384445-9	0.0005	None	None	5.5g/Kg (SEN-RAT)LD Lo
**Deionized Water (H ₂ O)	7732-18-5	99.526	None	None	190,000 (PR-MUS)

III. PHYSICAL DATA

Boiling Point 750 mm Hg 100°C	Freezing Point 0°C
Specific Gravity (H ₂ O=1) 1.0	Vapor Pressure @ NA
pH @ 25 °C 10.01	Solubility In Water, % By Wt @ Miscible
Volatiles, % By Wt. NA	Evaporation Rate (BUTYL ACETATE = 1) NA
Vapor Density (AIR = 1) NA	
Appearance and Odor Light blue, odorless liquid	

IV. FIRE AND EXPLOSION HAZARD DATA

Flash Point (test Method) Not flammable	Autoignition Temperature NA
Flammable Limits in air, % by volume: Lower NA Upper NA	
Extinguishing Media Water, CO ₂ , Dry chemical, foam or spray	
Special Fire-Fighting Procedures None, non-flammable	
Unusual Fire and Explosion Hazards None	

- * Chemicals which are not classified as hazardous per U.S. OSHA guidelines (29CFR Parts 1915.2 or 1916.2) or the Massachusetts Substance List (105CMR670.000 Appendix A) will not necessarily be listed on this form even though one or more may be a constituent of this product
- * NA Not available/not applicable
- ** Non-hazardous component

Liability is expressly disclaimed for any loss or injury arising out of the use of this information or the use of any materials designated. Safe use of the materials is the responsibility of the user.

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 Rev. E

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ORION MATERIAL SAFETY DATA SHEET

SHEET 2 OF 2 Orion Application Solution

PRODUCT NAME: pH 7.00 Buffer

CATALOG NO.: 910107 or 330007

V. REACTIVITY DATA

STABILITY:		CONDITIONS TO AVOID	
UNSTABLE <input type="checkbox"/>	STABLE <input checked="" type="checkbox"/>	None	
INCOMPATIBILITY (MATERIALS TO AVOID)		Mg and Na ⁺ Metals	
HAZARDOUS DECOMPOSITION PRODUCTS		When heated, phosphates can emit highly toxic fumes; but, for the amount of phosphates present in this solution, it can be considered non-hazardous.	
HAZARDOUS POLYMERIZATION:		CONDITION TO AVOID	
MAY OCCUR <input type="checkbox"/>	WILL NOT OCCUR <input checked="" type="checkbox"/>	None	

VI. HEALTH HAZARD DATA

ROUTE(S) OF ENTRY:	INHALATION?	SKIN?	INGESTION?
	No	No	Yes
HEALTH HAZARDS (ACUTE AND CHRONIC)			
Low hazard for acute and chronic because of low concentration of salts.			
CARCINOGENICITY:	NTP?	IARC MONOGRAPHS?	OSHA REGULATED?
	Not found on these lists		
SIGNS AND SYMPTOMS OF EXPOSURE			
Skin irritation			
MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE			
Could aggravate diseases of the skin.			
EMERGENCY AND FIRST AID PROCEDURES			
Wash off contact area with water. If ingested, give large amounts of water. Contact physician.			

VII. PRECAUTIONS (SAFE HANDLING AND USE)

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED
Wash down drain with excess water if local law allows.
WASTE DISPOSAL METHOD
Consult with and observe all Federal, State, and local laws when disposing of this product.
PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING
Suitable for any general handling and storage. NEPA Rating: Scale (0-4); Health - 0, Fire - 0, Reactivity - 0, Specific - none.
OTHER PRECAUTIONS
SARA TITLE III: Releases of (Na ₂ HPO ₄) are subject to reporting under Section 304 of this Act and CERCLA. Not affected by CAL Prop. 65.

VIII. CONTROL MEASURES

RESPIRATORY PROTECTION (SPECIFY TYPE)		
None		
VENTILATION	LOCAL EXHAUST	SPECIAL
	No	No
	MECHANICAL (GENERAL)	OTHER
	No	No
PROTECTIVE GLOVES	No	EYE PROTECTION
		Safety glasses
OTHER PROTECTIVE CLOTHING OR EQUIPMENT		
No		
WORK/HYGIENIC PRACTICES		
No eating or drinking while working with this product.		

ORION MATERIAL SAFETY DATA SHEET

SHEET 1 OF 2

Orion Research Incorporated
 THE SCHRAFFT CENTER
 529 MAIN STREET, BOSTON, MA 02129 USA
 TELEPHONE 617-242-3900

I. PRODUCT IDENTIFICATION

PRODUCT NAME Orion Application Solution pH 7.00 Buffer	CATALOG NO. 910107 or 330007	EFFECTIVE DATE 6/1/91
HAZARDOUS SHIPMENT LABELLING: DOT NA	IATA NA	
PREPARED BY <i>Thomas F. Lynch</i>	TITLE Quality Assurance Chemist	
APPROVED BY <i>Myron Orlovitz</i>	TITLE Director Regulatory Matters	

II. HAZARDOUS INGREDIENTS (IDENTITY INFORMATION)

HAZARDOUS COMPONENTS* SPECIFIC CHEMICAL IDENTITY: COMMON NAME(S)	CAS NO.	%	OSHA PEL	ACGIH TLV	LD 50 mg/Kg
Potassium Phosphate (KH ₂ PO ₄)	7778-77-0	0.284	None	None	None listed
Sodium Phosphate (Na ₂ HPO ₄)	7558-79-4	0.413	None	None	298 (IVN-DOG)
Sodium Chromate (Na ₂ CrO ₄)	7775-11-3	0.013	50 µg/m ³	50 µg/m ³	57 (IPR-RAT)
Potassium Dichromate (K ₂ CrO ₇)	778-50-9	.00305	50 µg/m ³	50 µg/m ³	37 (IPR-RAT)
**Deionized Water (H ₂ O)	7732-18-5	99.28645	None	None*	190,000 (IPR-MUS)

III. PHYSICAL DATA

BOILING POINT 760 mm Hg 100 °C	FREEZING POINT 0 °C
SPECIFIC GRAVITY (H ₂ O = 1) 1.0	VAPOR PRESSURE @ NA***
pH @ °C 25 7.00	SOLUBILITY IN WATER, % BY WT. @ Miscible
VOLATILES, % BY WT. N A	EVAPORATION RATE (BUTYL ACETATE = 1) N A
VAPOR DENSITY (AIR = 1) NA	
APPEARANCE AND ODOR Light yellow, odorless liquid	

IV. FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (TEST METHOD) Not flammable	AUTOIGNITION TEMPERATURE NA
FLAMMABLE LIMITS IN AIR, % BY VOLUME:	LOWER NA UPPER N A
EXTINGUISHING MEDIA Water, CO ₂ , Dry chemical, foam, or spray	
SPECIAL FIRE-FIGHTING PROCEDURES None, non-flammable	
UNUSUAL FIRE AND EXPLOSION HAZARDS None	

* Chemicals which are not classified as hazardous per U.S. OSHA guidelines (29CFR Parts 1915.2 or 1918.2) or the Massachusetts Substance List (105CMR670.000 Appendix A) will not necessarily be listed on this form even though one or more may be a constituent of this product.

Liability is expressly disclaimed for any loss or injury arising out of the use of this information or the use of any materials designated. Safe use of the materials is the responsibility of the user.

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Rev. C

- LD Lo.
- • Non-hazardous component
- • • Not applicable.

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ORION MATERIAL SAFETY DATA SHEET

SHEET 1 OF 2

Orion Research Incorporated
 THE SCHRAFFT CENTER
 529 MAIN STREET, BOSTON, MA 02129 USA
 TELEPHONE 617-242-3900

I. PRODUCT IDENTIFICATION

PRODUCT NAME Orion Application Solution - pH Electrode Storage Solution		CATALOG NO. 910001	EFFECTIVE DATE 8/25/91
HAZARDOUS SHIPMENT LABELLING: DOT None	IATA None		
PREPARED BY <i>Thomas E. Brown</i>	TITLE Quality Assurance Chemist		
APPROVED BY <i>Lynn Orlowicz</i>	TITLE Director Regulatory Matters		

II. HAZARDOUS INGREDIENTS (IDENTITY INFORMATION)

HAZARDOUS COMPONENTS* SPECIFIC CHEMICAL IDENTITY: COMMON NAME(S)	CAS NO.	%	OSHA PEL	ACGIH TLV	LD 50 mg/Kg
Potassium Chloride (KCl)**	7447-40-7	11.1	None	None	938 (ORL-INF)
Potassium Phosphate Monobasic (KH ₂ PO ₄)	7778-77-0	0.17	None	None	NA*
Sodium Phosphate Dibasic (Na ₂ HPO ₄)	7558-79-4	0.18	None	None	1,070 (IVN-RBT)
**Deionized Water (H ₂ O)	7732-18-5	88.55	None	None	629,000 (ORL-DCG)

III. PHYSICAL DATA

BOILING POINT ^{760 mm Hg} 100 °C	FREEZING POINT -3 °C
SPECIFIC GRAVITY (H ₂ O = 1) 1.05	VAPOR PRESSURE @ NA*
pH @ 25 °C 6.3 - 6.9	SOLUBILITY IN WATER, % BY WT. @ Miscible
VOLATILES, % BY WT. NA	EVAPORATION RATE (BUTYL ACETATE = 1) NA
VAPOR DENSITY (AIR = 1) NA	
APPEARANCE AND ODOR Clear, colorless, odorless liquid	

IV. FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (TEST METHOD) NA	AUTOIGNITION TEMPERATURE NA	
FLAMMABLE LIMITS IN AIR, % BY VOLUME:	LOWER NA	UPPER NA
EXTINGUISHING MEDIA Any		
SPECIAL FIRE-FIGHTING PROCEDURES None, this solution is non-flammable.		
UNUSUAL FIRE AND EXPLOSION HAZARDS None		

* Chemicals which are not classified as hazardous per U.S. OSHA guidelines (29CFR Parts 1915.2 or 1916.2) or the Massachusetts Substance List (105CMR670.000 Appendix A) will not necessarily be listed on this form even though one or more may be a constituent of this product.

Liability is expressly disclaimed for any loss or injury arising out of the use of this information or the use of any materials designated. Safe use of the materials is the responsibility of the user.

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 Rev. B

*NA Not available/not applicable
 * * Non-hazardous component.

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 Form MSDS/0891

ORION MATERIAL SAFETY DATA SHEET

SHEET 2 OF 2 Orion Application Solution
 PRODUCT NAME: pH Electrode Storage Solution

CATALOG NO.: 910001

V. REACTIVITY DATA

STABILITY: UNSTABLE <input type="checkbox"/>		CONDITIONS TO AVOID	
STABLE <input checked="" type="checkbox"/>		None	
INCOMPATIBILITY (MATERIALS TO AVOID)		Magnesium and sodium metals	
HAZARDOUS DECOMPOSITION PRODUCTS May emit toxic POx fumes if heated to decomposition.			
HAZARDOUS POLYMERIZATION: MAY OCCUR <input type="checkbox"/>		CONDITION TO AVOID	
WILL NOT OCCUR <input checked="" type="checkbox"/>		Heating to decomposition	

VI. HEALTH HAZARD DATA

ROUTE(S) OF ENTRY:	INHALATION? No	SKIN? No	INGESTION? No
HEALTH HAZARDS (ACUTE AND CHRONIC) Low hazard for both acute and chronic because of low concentration of phosphate salts. This composition is also used as a buffer in pharmaceuticals.			
CARCINOGENICITY: Not found on these lists.	NTP?	IARC MONOGRAPHS?	OSHA REGULATED?
SIGNS AND SYMPTOMS OF EXPOSURE Irritation of skin.			
MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE Could aggravate diseases of the skin.			
EMERGENCY AND FIRST AID PROCEDURES Wash off contact area with soap and water. Internal: dilute with water and consult physician.			

VII. PRECAUTIONS (SAFE HANDLING AND USE)

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED Clean up and wash down drain if local law allows.
WASTE DISPOSAL METHOD Wash down drain. Observe all Federal, State, and local laws when disposing of this product.
PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING NFPA Rating: Scale (0-4); Health - 1, Fire - 0, Reactivity - 0, Specific - None.
OTHER PRECAUTIONS SARA TITLE III Na ₂ HPO ₄ is a CERCLA hazard and releases are subject to Section 304 of Title III. Not found on CAL Prop. 65. Reported in EPA TSCA inventory.

VIII. CONTROL MEASURES

RESPIRATORY PROTECTION (SPECIFY TYPE) None		
VENTILATION	LOCAL EXHAUST None	SPECIAL None
	MECHANICAL (GENERAL) None	OTHER None
PROTECTIVE GLOVES None	EYE PROTECTION Safety glasses	
OTHER PROTECTIVE CLOTHING OR EQUIPMENT Eye wash station should be available.		
WORK/HYGIENIC PRACTICES No eating or drinking in work area.		

**PRODUCT SAFETY DATA SUMMARY**

WILSON GREATBATCH LTD.
10000 Wehrle Drive
Clarence, NY 14031 U.S.A.

Telephone: 716/759-6901
Fax: 716/759-8579

Issue Date: 19 January 1993
Supercoding Sheet Dated:
13 December 1990

This product is classified as an Article under OSHA regulation 1910-1200, ¶ (c).

NOT DESIGNED FOR CHARGING OR RECHARGING

PRODUCT NAME: Lithium Oxysulfide Primary Battery (8CX)
CHEMISTRY SYSTEM: Lithium/Bromine Chloride in Thionyl Chloride
CHEMICAL FORMULAS: Li BrCl in SOCl₂

I TOXIC, CAUSTIC OR IRRITANT CONTENT

Important Note: The battery container should not be opened or incinerated since the following ingredients contained within could be harmful under some circumstances if exposed. In case of accidental ingestion of a cell or its contents, obtain prompt medical advice.

MATERIALS

Lithium is included in this section due to its vigorous reaction with water forming a caustic hydroxide.

Lithium (Li)	(CAS # 7439-93-2)
Thionyl Chloride (SOCl ₂)	(CAS # 7719-09-7)
Bromine (Br ₂)	(CAS # 7726-95-6)
Chlorine (Cl ₂)	(CAS # 7782-50-5)

II STORAGE AND DISPOSAL TIPS

STORAGE: Store in a cool place but prevent condensation on cells or batteries. Elevated temperatures can result in shortened battery life.

FIRE: If cells are directly involved in a fire, **DO NOT USE WATER, CO₂, DRY CHEMICAL OR HALOGEN EXTINGUISHERS.** A Lith-X (graphite base) fire extinguisher or material is the only recommended extinguishing media for fires involving lithium metal or cells. If a fire is in an adjacent area, and cells are packed in their original containers, the fire can be fought based on fueling material, e.g., paper and plastic products. Avoid fume inhalation.

DISPOSAL: DO NOT INCINERATE or subject cells to temperatures in excess of 212°F (100°C). Such abuse can result in loss of seal, leakage, and/or cell explosion. Dispose of in accordance with appropriate Federal, State, and Local regulations.

III HANDLING AND USE PRECAUTIONS

MECHANICAL CONTAINMENT: Encapsulation (potting of these cells will not allow cell venting at low pressure. Such enclosure can result in high pressure explosion from inadvertent charging or high temperature environments (i.e., in excess of 100°C)

SHORT-CIRCUIT: Batteries should always be packaged and transported in such a manner as to prevent direct contact with each other. Short-circuiting will cause heat and reduce cell capacity. Jewelry, such as rings and bracelets, should be removed or insulated before handling the batteries to prevent inadvertent short-circuiting through contact with the battery terminals. Burns to the skin may result from the heat generated by a short-circuit.

CHARGING: This cell is a primary cell and is not designed to be charged or recharged. To do so may cause the cell to leak or explode.

OTHER: If soldering or welding to the terminals or case of the cell (battery) is required, exercise proper precautions to prevent damage to the cell which may result in loss of cell capacity, seal, leakage, and/or cell explosion. DO NOT SOLDER to the case. Cells should not be subjected to excessive mechanical shock & vibration.

MSDS

Lithium Oxide Primary Battery
HCL

pH Electrode Storage Solution

4.01 Buffer

7.00 Buffer

10.01 Buffer

H₂ ~~in~~ N₂

CH₄

Alconox

N₂

IPA

HNO₃

BTEX Mixture

Need

H₂SO₄ HYDROGEN SULFIDE
Called QAL 9/14/95

NaOH SODIUM HYDROXIDE

ZnAc ZINC ACETATE

METALS

NITROGEN

HYDROGEN