03.07- 1/1/94-00358

SITE SPECIFIC
HEALTH AND SAFETY PLAN
FOR
REMOVAL ACTION, SITE #6, OPERABLE UNIT NO. 2
MARINE CORPS BASE
CAMP LEJEUNE, NORTH CAROLINA

Submitted to:

Commanding Officer
Atlantic Division
Naval Facilities Engineering Command
Norfolk, VA 33511-2699

Submitted by:

OHM Remediation Services Corp.
Norcross, GA 30092

J. Angelo Liberatore, CIH, CSP
Regional Health and Safety Manager

January 1994

Project No. 15226

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1.0 SITE SPECIFIC HEALTH AND SAFETY PLAN

OHM has developed this site health and safety plan specifically for drum and soil removal operations at Site #6, Marine Corps Base, Camp Lejeune, North Carolina. This site health and safety plan (SHSP) establishes the policies and procedures which protect workers and the public from potential hazards posed by work at this site. The health and safety procedures contained in this SHSP are a part of OHM's Corporate Health and Safety Program, which complies with 29 CFR 1910.120(b)(1) through (b)(4). OHM considers safety the highest priority during work at a site containing potentially hazardous materials and has established a standard policy of zero exposure which must be upheld on all projects. All project activities will be conducted in a manner that minimizes the probability of injury, accident or incident occurrence.

Although the plan focuses on the specific work activities planned for this site, it must remain flexible because of the nature of this work. Conditions may change and unforeseen situations may arise that require deviations from the original plan. This flexibility allows modification by the OHM supervisors and health and safety officials.

This SHSP has been prepared in accordance with OSHA's "Hazardous Waste Operations and Emergency Response" standard contained in 29 CFR 1910.120.

1.1 SCOPE OF WORK

The Scope of work for remediation of Site #6, Marine Corps Base, Camp Lejeune, North Carolina is to remove and properly dispose of hazardous wastes present both above and below the ground surface. These wastes include various containers (i.e., drums, tanks, pails) of unidentified liquids, and contaminated soil resulting from both container spills/leaks and from the presence of buried waste. Miscellaneous materials are also reportedly buried at the site.

The removal action to be implemented will divided into a phased approach with the major tasks consisting of the following:

- Mobilization and site preparation
- Trench excavation
- Drum/material removal and staging
- Liquid removal/transfer from tanks
- Collection and staging of surface drums and tanks
- Remote opening of drums
- Sampling of drums
- Rinsing empty tanks and drums
- Demolition of tanks and drum crushing
- Confirmation soil sampling
- Load out of Materials
- Vehicle and heavy equipment decontamination
- Backfill and site restoration

2.0 KEY PERSONNEL AND MANAGEMENT

OHM maintains a policy of providing its employees, subcontractors, and authorized visitors with information and procedures in order to protect them and the adjacent community from any adverse effects that might result from work at a job site involving potentially hazardous substances. All personnel involved with this project will follow the health and safety procedures set forth in this plan. Visitors will not be given entry unless they read and agree to comply with this plan. The site safety plan acknowledgement will be signed by all personnel required to enter contaminated work areas.

2.1 SITE SAFETY OFFICER

OHM designates a site safety officer (SSO) who defines, implements and enforces the project safety program and procedures. The SSO will conduct the daily safety meetings and will interface as required with other site representatives. The SSO takes the following action(s) when appropriate:

- Orders the immediate shut-down of site activities in the case of a medical emergency or unsafe practice.
- Ensures protective clothing and equipment are properly stored and maintained.
- Ensures that the environmental and personnel monitoring operations are on-going and in accordance with this SHSP.
- Restricts visitors from areas of potential exposure to harmful substances.

A safety log will be kept for all OHM activities. This log will include daily safety meeting topics, training given, air monitoring information, first aid administered, visits of all outside personnel and any incidents of a health and safety nature.

The SSO has responsibility for implementing and enforcing the site safety program and procedures. He will oversee any personnel monitoring and will decide when action levels have been reached which require more stringent personnel protection. The SSO establishes and enforces the protective equipment to be used for various site activities. The SSO will maintain contact with OHM Regional and Corporate Certified Industrial Hygienists (CIH).

2.2 SITE SUPERVISOR

The site supervisor (SS) has responsibility for all field activities and enforces safe work practices by all crew members. He watches for any ill effects on any of the crew members, especially those symptoms caused by heat stress or chemical exposure. The SS oversees the safety of any visitors who enter the site. The SS maintains communication with OHM project manager and client representative(s).

2.3 EQUIPMENT OPERATORS

Equipment operators will be responsible for the maintenance, inspection, and safe operation of their equipment. Operators are responsible for daily inspection of their equipment and assuring it is in safe operating condition.

2.4 EMPLOYEE SAFETY RESPONSIBILITY

Each employee is responsible for his own safety as well as the safety of those around him. The employee shall use all equipment provided in a safe and responsible manner as directed by his supervisor. All OHM personnel will follow the policies set forth in OHM's Health and Safety Procedures Manual and the OHM Health and Safety Procedures. Health and Safety Procedures relevant to site operations are attached to this SHSP.

2.5 RESPONSIBLE OHM HEALTH AND SAFETY PERSONNEL

The following personnel are responsible for health and safety on site:

Construction Manager:	Kent Geis (919) 467-2349
Site Supervisor:	To be Determined (TBD) (on-site)
Site Safety Officer:	TBD (on-site)
Regional Health and Safety Manager:	J. Angelo Liberatore, CIH, CSP (404-729-3900, Ext. 271)
Regional Manager:	Mike Szomjassy (404-729-3900)

3.0 JOB HAZARD ANALYSIS

This section discusses concerns to workers on the site.

3.1 CHEMICAL HAZARDS

The site has a long history of use which includes the disposal and storage of waste and supplies. Usage as a disposal area dates back to the 1940s on a portion of the site, and there is little documentation relative to disposal activities. Although the site is no longer used as a storage or disposal area, the ground surface is littered with debris, drums, and spent ammunition casings. It is reported that portions of the site were also used for storage and disposal of the following materials:

- Radio and communication parts
- Shredded tires
- Lubricants
- Petroleum products
- Corrosives
- Explosive ordinance

Personnel exposure to contaminants on site may occur if inhaled (dust, mists, vapors), ingested, or if these materials contact the skin or eyes. Explosive ordinance primarily is a proximity hazard. Uncontrolled detonation of ordinance can cause devastating impact on site personnel, to include, dismemberment and death.

The following is a summary of health hazards posed to site personnel from overexposure to these materials.

Overexposure to petroleum products and fuels may cause central nervous system (CNS) effects, dermatitis, and blistering of the skin. Symptoms of overexposure include dizziness; headache; nausea and vomiting; blurred vision; intoxication; and irritation of the eyes, nose, and throat. Benzene, a volatile organic constituent (VOC) found in gasoline has an OSHA Permissible Exposure

Limit (PEL) of 1.0 parts per million (ppm), and may cause leukemia with chronic overexposure. Toxic metals such as organic lead were used in leaded gasoline. Organic lead (tetraethyl lead) is a powerful poison with an OSHA PEL of 0.1 mg/m^3. Since it is readily absorbed through intact skin it can cause intoxication, as well as allowing for a significant lead exposure via dermal contact. Waste fuels are also flammable and combustible liquids, posing fire and explosion hazards to site personnel during activities.

Overexposure to corrosives may cause eye, nose, throat, and respiratory irritation. Symptoms of overexposure include irritation of the eyes, nose, and throat; blistering of skin; and difficulty in breathing, strong acids can cause long term health effects or death. Individual corrosive materials have set exposure limits with some as low as an OSHA Permissible Exposure Limit (PEL) of 1.0 milligrams per cubic meter (mg/m^3) of air. Commonly found corrosives and their respective exposure limits are as follows:

- Sulfuric Acid – 1 mg/m^3
- Phosphoric Acid – 1 mg/m^3
- Nitric Acid – 5 Mg/m^3
- Hydrochloric Acid – 7 mg/m^3

Material Safety Data Sheets (MSDSs) are provided in Appendix A for the following chemicals which are suspected to be encountered during site activities:

- Kerosene heating oil
- Gasoline
- Petroleum distillate fuels
- Lead inorganic
- Tetraethyl lead
- Diesel fuel
- Sulfuric acid
- Phosphoric acid

- Nitric acid
- Hydrochloric acid

3.2 HAZARD COMMUNICATION

The purpose of hazard communication (Employee Right-to-Know) is to ensure that the hazards of all chemicals located at this field project site are transmitted (communicated) according to 29 CFR 1926.59 to all OHM personnel and OHM subcontractors. Hazard communication will include the following:

- **Container Labeling**
  OHM personnel will ensure that all drums and containers are labeled according to contents. These drums and containers will include those from manufacturers and those produced on site by operations. All incoming and outgoing labels shall be checked for identity, hazard warning, and name and address of responsible party.

- **MSDSs**
  There will be an MSDS located on site for each hazardous chemical known to be or used on site. All MSDSs will be located in Appendix A of the site safety plan. The site safety plan can be found in the project office trailer.

- **Employee Information and Training**
  Training employees on chemical hazards is accomplished through on ongoing corporate training program. Additionally, chemical hazards are communicated to employees through daily safety meetings held at OHM field projects and by an initial site orientation program.

At a minimum, OHM and related subcontractor employees will be instructed on the following:

- Chemicals and their hazards in the work area
- How to prevent exposure to these hazardous chemicals

- What the company has done to prevent workers' exposure to these chemicals
- Procedures to follow if they are exposed to these chemicals.
- How to read and interpret labels and MSDSs for hazardous substances found on OHM sites
- Emergency spill procedures
- Proper storage and labeling

Before any new hazardous chemical is introduced on site, each OHM and related subcontractor employee will be given information in the same manner as during the safety class. The site supervisor will be responsible for seeing that the MSDS on the new chemical is available for review by on site personnel. The information pertinent to the chemical hazards will be communicated to project personnel.

Morning safety meetings will be held and the hazardous materials used on site will be discussed. Attendance is mandatory for all on site employees.

The following is a list of hazardous chemicals anticipated to be brought to the site. Refer to Appendix A of the site safety plan to find MSDSs for these chemicals.

Alconox
Anti-Fog
Bleach
Comet cleanser
Compressed air
Diesel fuel
Dish soap
Dry ice (CO_2)
Fire extinguishers
Gasoline
Gear lube
Grease
Hand cleaner
Insect repellent
Isobutylene (calibration standard)
Isopropyl alcohol
Methane (calibration standard)
Oil (2-cycle oil)
Oil (hydraulic)
Oil (motor)
Pentane (calibration standard)
Starting fluid

3.3 PHYSICAL HAZARDS

There are numerous physical hazards associated with this project which, if not identified and addressed, could present operational problems as well as cause accidents and personal injury to the work force. Hazard identification and mitigation, training, adherence to work rules and careful housekeeping can prevent many problems or accidents arising from physical hazards. The following will outline the major physical hazards and the suggested preventative measures to be followed during this project:

- **Heavy and Bulky Loads**
  Intelligent thought shall be exercised before heavy and bulky loads are lifted or handled manually by personnel. Mechanical equipment such as fork-lifts, wheel barrows, hand-trucks, loaders, and cranes shall be utilized when possible and needed. **Note: Back injuries are real, debilitating, unproductive, and costly to both employees and employers, and sometimes permanent. Back injury prevention must be given high priority on all project sites. If you think the load you are about to lift is too heavy or bulky, it probably is! Get help or utilize mechanical equipment.**

- **Explosion Hazard**
  Flammable materials in confined spaces (i.e., excavation areas) can produce an explosive atmosphere which can be triggered by a spark or other energy source. To prevent this type of accident, the concentration of flammable material in air will be carefully monitored and confined space entry procedure will be followed.

- **Hoisting Accidents**
  Employees can have suspended loads dropped on them, be caught behind a load and a stationary object, or be crushed or struck by the counterweight. All hoisting will be done by qualified personnel only after safety checks are made of chokes and cables. In addition, no hoisting will take place without a designed signal man present.

- **Heavy Equipment**
  Heavy construction equipment operators present construction safety hazards to operating and ground personnel. OHM has safe operating procedures (SOPs) for the use of heavy construction equipment. Only trained and qualified operators are authorized to operate heavy construction equipment. The operator is responsible for performing daily equipment inspections on their equipment to identify, take out of service, and correct any equipment defects of non-functioning safety devices that would render the equipment unsafe to operate. Standard safety devices and equipment required to be inspected and functional during use includes:

  - Seat belts,
  - Safety glass in enclosed cab,
  - Braking system,
  - Back-up alarms,
  - Portable fire extinguisher,
  - Horn, tires, and
  - Steering and hydraulic systems.

  Operators are required to wear seatbelts when operating equipment and are responsible for the location of ground personnel in their work area. The turning radius of trackhoes is guarded to prevent contact between the equipment counterweight and ground personnel.

- **Bulk Fuel Storage**
  A bulk fuel storage area will be designated for storage of bulk fuels and other flammable materials. The bulk fuel vessels will be grounded and have bonding cables attached. The area will be prominently posted as a flammable fuels area and no smoking signs erected. At least one 20-pound dry chemical, ABC-type fire extinguisher will be positioned in this area.

- **Flame, Heat or Spark Producing Operations**
  Because of the possibilities of flammable materials being present at this site, flame, heat, or spark producing operations will be limited. If a case

arises where hot work is necessary, OHM will follow the hot work procedures and permit detailed in the appendix.

- **High Pressure Washing**
  Washing or cleaning certain pieces of equipment may require the use of high pressure washers referred to as lasers. These devices can be hazardous if not used properly. Refer to Appendix B for specific laser safety instructions.

- **Small Quantity Flammable Liquids**
  Small quantities of flammable liquids will be stored in "safety"cans and labeled according to contents.

- **Electrical Hazards**
  Overhead power lines, downed electrical wires, and buried cables all pose a danger of shock or electrocution if workers contact or sever them during site operations. Electrical equipment used on-site may also pose a hazard to the workers. To help minimize this hazard, low-voltage equipment with ground-fault interrupters and water-tight, corrosion-resistant, connecting cables should be used on-site. In addition, lightning is a hazard during outdoor operations, particularly for workers handling metal containers or equipment. To eliminate this hazard, weather conditions should be monitored and work should be suspended during electrical storms. An additional electrical hazard involves capacitors that may retain a charge. All such items should be properly grounded before handling. OSHA's standard 29 CFR Part 1910.137 describes clothing and equipment for protection against electrical hazards.

  Electrical devices and equipment must be de-energized prior to working near them. All extension cords must be kept out of water, protected from crushing, and inspected regularly to ensure structural integrity. Temporary electrical circuits must be protected with ground fault interrupters. Only qualified electricians are authorized to work on electrical circuits.

- **Slip/Trip/Fall Hazards**
  Some areas may have wet surfaces which will greatly increase the possibility of inadvertent slips. Caution must be exercised when using steps and stairs due to slippery surfaces in conjunction with the fall hazard. Good housekeeping practices is essential to minimize the trip hazards.

- **Tank/Drum Opening**
  Accessing tanks presents the potential of contacting buried utilities, igniting explosive atmospheres and other hazards. OHM will follow guidelines established in the standard safety procedure, Underground Tank Removal. See appendix for more information.

- **Ground Personnel**
  All ground personnel should be constantly aware of the possibility of slips, trips, and falls due to poor and possibly slippery footing in the work areas. Before crossing either in front of or behind a piece of heavy equipment, the ground personnel will signal the equipment operator and receive confirmation before moving.

- **Excavations and Trenching**
  Excavations and trenching present a special risk to workers from hazard of trench wall collapse. If any OHM personnel must enter excavations 5 feet in depth or greater, the sides of the excavation will be sloped 1-1/2:1 (horizontal:vertical) or shored in accordance with 29 CFR 1926.650 through 652.

- **Pumping Equipment**
  Various types of pumps may be used for the removal of materials from ditches, ponds, lagoons, etc. The handling of pressurized hoses that could rupture and violently release liquid materials to the work will be controlled by inspecting all hose fittings for secure connections [all OPW (camlock) and fittings must be secured with the wire]. All employees must wear splash gear including splash shields when moving or disconnecting pumps and hoses.

- **Noise**
  Work around large equipment often creates excessive noise. The effects of noise can include:

  - Workers being startled, annoyed, or distracted.

  - Physical damage to the ear, pain, or temporary and/or permanent hearing loss.

  - Communication interference that may increase potential hazards due to the inability to warn of danger and the proper safety precautions to be taken.

    If employees are not able to hear normal conversation without shouting, noise levels exceeding 85 dBA are likely and hearing protection is required to be worn. The use of portable power tools and the operation of certain heavy construction equipment (i.e. bulldozers), requires mandatory use of hearing protection. OHM maintains an effective hearing conservation program as described in OSHA Regulation 29 CFR Part 1910.95.

- **Drum Handling and Opening**
  The chemical hazard shall be minimized by having personnel wear full Level B protection. To minimize other hazards, drums shall be inspected and their integrity assured prior to moving or opening. Unlabeled drums shall be considered to contain hazardous substances and handled accordingly until the contents are identified. Drum and container movement shall be minimized throughout the duration of the project.

  Prior to the movement of drums and containers, all employees involved in the drum handling activity shall be warned of these potential hazards. USDOT specified salvage drums and absorbent materials shall be readily available for use in case of spills, leaks, or ruptures. Where major spills may occur, a spill containment program shall be implemented. Drums and containers that cannot be moved without rupture, leakage, or spillage

shall be emptied into a sound container. If buried drums are suspected, ground penetrating detection systems shall be used in lieu of exploratory excavation and soil or covering materials shall be removed with caution. Fire extinguishers shall be on hand and ready for use to control small fires. All equipment shall be such to prevent sources of ignition. Respirator airlines and air supply systems shall be protected from contamination and physical damage. Extraneous personnel shall not be present near the drum opening operation. A suitable shield shall be placed between personnel and the drums being opened. Controls for drum opening, monitoring equipment, and fire suppression equipment shall be located behind the explosion resistant shield. Excess interior drum pressure shall be relieved safely by the use of remote equipment and/or appropriate shielding.

All OHM personnel are familiar with the field activities which will be conducted at the site. They are trained to work safely under various field conditions. In addition, the SS will observe the general work practices of each crew member and equipment operator, and enforce safe procedures to minimize physical hazards. Also, hard hats, safety glasses, and safety boots will be required in all areas of the site. Specific health and safety standard operating procedures that apply to site remedial operations procedures are included in Appendix B.

3.4 ENVIRONMENTAL HAZARDS

3.4.1 Weather and Heat Stress

The combination of warm ambient temperature and use of protective clothing anticipated during site operations, the potential for heat stress is a concern. The potential exists for:

- Heat rash
- Heat cramps
- Heat exhaustion
- Heat stroke

Heat stroke, heat cramps, and heat exhaustion are covered in detail during OHM's 40-hour OSHA 29 CFR 1910. 120 approved pre-employment course. In

addition, this information is discussed during a safety "tailgate" meeting before each work day. Workers are encouraged to increase consumption of water and electrolyte-containing beverages such as Gatorade during warm weather. Water and electrolyte-containing beverages will be provided on-site and will be available for consumption during work breaks.

An action level for heat stress has been established at 75°F ambient temperature when site personnel are wearing chemical protective clothing during the performance of field activities. The following work/rest schedule is recommended, with personnel drinking fluids (tepid water and/or electrolyte) at rest periods consistent with their fluid loss:

Ambient Temperature (degrees F)	Work Period (minutes)	Rest Period (minutes)
75 - 80 F	120	15
80 - 85 F	90	15
85 - 90 F	60	15
90 - 95 F	30	15
95 - 100 F	15	15

The above work/rest schedule is only a guideline for use during field activities when personnel are wearing protective clothing. The actual work/rest schedule will be determined by conducting pulse monitoring before and after the work period and by performing daily pre/post work shift body weights. The action level for adjusting the work/rest schedule would be 110 beats per minute (bpm), obtained immediately after the work period in a seated, shaded position. When a person's pulse exceeds 110 bpm, that person is undergoing heat stress, which will require the work period to be reduced in 15 minute intervals, while maintaining the same rest period, until post work period pulse monitoring is maintained below 110 bpm. In addition, should a person's body weight change at the end of the work day by more than 1.5%, the work period must be reduced in 15 minute intervals, while maintaining the same rest period; until no daily body weight changes greater than 1.5% are observed.

Field activities, in which site personnel are required to wear chemical protective clothing at ambient temperatures higher than 95 degrees F, will be avoided, whenever feasible, by scheduling these activities during the work day to avoid peak ambient temperatures (10 a.m. – 2 p.m.). Site personnel who have experienced a heat-related illness (heat cramps, heat exhaustion) will be restricted to Level D tasks for a minimum of one day after illness occurrence and will return to tasks requiring chemical protective clothing only with the concurrence of the attending physician. Site personnel will follow OHM's Standard Operating Procedure (SOP) for heat stress prevention.

3.5.2 Cold Extremes

On days with low temperatures, high winds, and humidity, any one can suffer from cold stress. Even during moderate temperatures when personnel when personnel are performing strenuous work and perspiring; removing chemical protective clothing in cold ambient temperatures may induce symptoms. The potential exists for frostbite and hypothermia.

The signs and symptoms of hypothermia include shivering, dizziness, numbness, confusion, weakness, impaired judgement, impaired vision, and drowsiness. Hypothermia follows the following progression:

- Shivering
- Apathy
- Loss of consciousness
- Decreasing pulse rate and breathing rate
- Death

Seek immediate professional medical care for the victim. Get the victim out of the cold and into dry clothing and warm the body slowly.

Frostbite is the most common injury caused by cold exposure. It happens when ice crystals form in body tissues, usually the nose, ears, chin, cheeks, fingers, or toes. This restricts blood flow to the injured parts. The effect is worse if the frost bitten parts are thawed and refrozen.

The first sign of frostbite may be that the skin is slightly flushed. The skin color of the frostbitten area then changes to white or grayish-yellow and finally grayish-blue,

as the frostbite develops. Pain is sometimes felt early on, but later goes away. The frostbitten part feels very cold and numb. The victim may not be aware of the injury. First aid for frostbite would begin with moving the victim to a warm place. Place the frozen part in warm (100 to 105 degrees) but not hot water. Do not rub or massage. If parts have been thawed and refrozen, rewarm them at room temperature. Seek medical attention for the victim as soon as possible.

3.5 TASK SPECIFIC RISK ASSESSMENT

Task No. 1:	Mobilization and site preparation
Hazards:	Slip, Trip, and Fall; Heavy Equipment; Manual Lifting; Material Handling; Unknown Drums/Containers; Fire/Explosion; Chains Saw/Clearing Activities; Noise; Flying Debris; Contact with overhead/buried utilities; Electrical Hazards
Control Procedures:	Ensure personnel awareness of secure footing; Follow safe material handling and manual lifting procedures; Comply with OHM SOP for vehicle and equipment operation; Conduct air monitoring in areas where drums are located prior to conducting activities and conform to prescribed action limits, Use real time air monitoring to determine work zones; Observe hearing conservation program; Wear chain saw chaps, hard hat, face shield and leather gloves while conducting manual clearing activities; Locate and mark all utilities prior to any excavation and grading; Maintain a 15-foot buffer from bucket swing radius of all heavy equipment or de-energize lines if unable to maintain the 15-foot buffer; Only qualified electricians are to install/connect electrical service to site trailers
Task No. 2:	Trench excavation and soil stockpiling
Hazards:	Inhalation, dermal contact with waste; Explosive ordinance; Fire/Explosion; Heavy equipment; Contact with overhead and buried utilities; Material handling

Control Procedures:	Wear level "B" protection with saranex; Perform real time air monitoring with an LEL/O^2 meter and PID/OVA; Implement air monitoring action limits; Follow OHM SOP for heavy equipment operation; Utilize lexan blast shield on excavator; Locate all buried utilities and/or pipelines prior to initiating excavation operation in each location; Perform inspection on all overhead line in the work area to ensure that a minimum of 15 feet clearance can be maintained while excavating/backfilling, ensure lines are de-energized if 15 feet clearance is not feasible for completion of the excavation; Provide ground spotter/ordinance lookout with high visibility vests, to assist equipment operator during excavation; Spotter/lookout and operators must maintain visual contact with operator; Do not allow personnel to enter the excavation
Task No. 3:	Drum/material removal and staging
Hazards:	The same as those associated with Task 2; and, Cave-in hazards; Material handling; Suspended loads; spill, splash, and leaks; Uncontrolled reaction
Control Procedures:	The same as those associated with Task 2; and ground personnel shall wear splash shield over respirator face pieces; Do not suspend loads over ground personnel when excavating/segregating material; Overpack all drums that are excavated; Perform real-time air monitoring in accordance with the air monitoring plan; Stage spill cleanup and containment equipment in excavation area; Stage fire extinguisher on excavator and additional fire protection equipment near excavation operations; Do not allow personnel entry into excavation area; Use heavy equipment for all drum excavation, handling, and staging

Task No. 4:	Collection and Staging of Surface Drums and Tanks
Hazards:	Inhalation, dermal contact; Splash, spill, and leak hazard; Fire/Explosion; Manual lifting and material handling; Vehicle and heavy equipment operation
Control Procedures:	Wear level "B" protection with saranex and splash shield; Perform real time air monitoring in accordance with air monitoring plan; Practice safe material handling procedures; Follow operating procedures for drum and tank handling/opening; Overpack all leaking or rusted drums; Use equipment with drum grappler to collect and stage all drums; Transfer the contents from tanks prior to moving; Stage spill control equipment and fire protection equipment in the immediate work areas, as well as, fire extinguishers; Use only non-sparking tools when opening tanks and drums; Purge flammable atmospheres in the tank utilizing CO_2 (dry ice) at a minimum of 3 pounds per 100-gallon capacity and wait at least 24 hours, or inject liquid nitrogen, prior to moving or cold cutting; Wear leather gloves to protect against dermal contact with dry ice; Monitor with an LEL/O_2 meter to ensure less than 8% O_2 remains in tank prior to initiating operations; Perform additional inerting if required; Follow OHM SOP for vehicle and heavy equipment operation
Task No. 5:	Drum Opening
Hazards:	Fire/Explosion; Spill, Splash and Leaks; Material handling; Inhalation, dermal contact hazard
Control Procedures:	Stage spill containment and fire extinguisher in the work area; Heavy equipment shall be fitted with a blast shield and ground personnel shall be restricted from the area; Practice safe material handling procedures; Wear level "B" protection with saranex; Use brass finish drum punch attached to heavy equipment to open drums remotely; Perform real-time air monitoring in accordance with air monitoring requirements

Task No. 6:	Sampling
Hazards:	Inhalation, dermal contact hazards; Spill, Splash and Leaks; Fire/Explosion; Material handling; Slip, trip, and fall
Control Procedures:	Wear level "B" protection with saranex and splash shield; Stage spill containment and fire extinguisher in the work area; Practice safe materials handling procedures; Ensure personnel are awareness of secure footing; Perform real-time air monitoring in accordance with air monitoring requirements
Task No. 7:	Liquid removal/transfer operations (oil and fuel from 500-gallon tanks)
Hazards:	Inhalation, dermal contact; Splash, spill, and leak hazard; Fire/explosion; Hose rupture; Vacuum truck operations
Control Procedures:	Wear level "B" protection with saranex and splash shield during pumping/transfer operation; Perform real time air monitoring with an LEL/O_2 meter and PID/OVA prior to downgrading to Level C protection using specific action levels in Section 7.0; Use only air driven, intrinsically safe pumping equipment; Bond and ground each type of transfer system employed, stage vacuum truck up wind and outside of probable vapor travel; Stage fire protection equipment in immediate work area; Stage spill control and containment equipment in immediate work area; Use only non- sparking tools
Task No. 8:	Rinsing empty tanks and drums
Hazards:	Inhalation, dermal contact hazards; Operation of high pressure washer; Material handling; Manual lifting; Splash and spill; Slip, trip, and fall
Control Procedures:	Wear specified level of protection with splash shield; Follow OHM SOP for high pressure washing; Practice safe materials handling and manual lifting procedures; Provide spill containment equipment in work area;

	Ensure personnel are aware of potentially slippery conditions; Rinse tank interiors from outside the tank
Task No. 9:	Tank cutting and drum crushing operations
Hazards:	Inhalation, dermal contact hazards; Operation of heavy equipment; Fire/explosion; Flying debris; Material handling; Manual lifting; Slip, trip, and fall
Control Procedures:	Wear specified level of protection (level C); Follow OHM SOP for heavy equipment operations; Cold cut tank with hydraulic shears; Purge flammable atmospheres in the tank utilizing CO_2 (dry ice) at a minimum of 3 pounds. per 100 gallon capacity and wait at least 24 hours prior to moving or cold cutting; Wear leather gloves to protect dermal contact with dry ice, monitor with an LEL/O_2 meter to ensure less than 8% O_2 remains in tank prior to initiating operations; Perform additional inerting if required; Ground personnel shall be restricted from work area during cold cutting and drum crushing operations; Practice safe materials handling and manual lifting procedures; Ensure personnel awareness of secure footing
Task No. 10:	Confirmation soil sampling
Hazards:	Inhalation and dermal contact; Slip, trip, and fall; Material handling; Manual lifting; Heavy equipment operation; Open excavations and cave-in hazards
Control Procedures:	Wear specified level of protection; Ensure personnel awareness of secure footing; Follow safe material handling and manual lifting procedures; Comply with OHM SOP for equipment operation and ground personnel shall wear high visibility vest if equipment is operating in the same area; Sample sides and bottom of the tank hold excavation remotely; Excavation sides must be sloped 1-1/2:1 if personnel must enter excavation;

Task No. 11:	Load out of wastes
Hazards:	Inhalation, dermal contact hazards; Heavy equipment operation; Vehicular traffic
Control Procedures:	Wear level C; Follow OHM SOP for heavy equipment operation; Delineate vehicle traffic areas; Post and enforce speed limits; Ground personnel shall wear high visibility vests; Institute dust control measures when airborne dust is visible
Task No. 12:	Backfill and site restoration
Hazards:	Slip, trip, fall; Material handling; Manual lifting; Vehicle and heavy equipment operation; Excavation cave-in hazards
Control Procedures:	Ensure personnel awareness of secure footing; Follow safe material handling and manual lifting procedures; Comply with OHM SOP for vehicle and equipment operations; Delineate vehicle traffic areas; Ground personnel shall wear high visibility vests; No personnel or equipment shall enter the excavation; Use a hydraulic tamp or equivalent for remote compaction if required during backfill operations
Task No. 13:	Vehicle/heavy equipment decontamination
Hazards:	Operation of high pressure washer; Splash hazards; Inhalation, dermal contact hazards; Vehicular traffic
Control Procedures:	Follow OHM SOP for high pressure washing; Wear level C with saranex and faceshield; Delineate vehicle traffic areas and ground personnel shall wear high visibility vests

4.0 WORK AND SUPPORT AREAS

To prevent migration of contamination caused through tracking by personnel or equipment, work areas and personal protective equipment are clearly specified prior to beginning operations. OHM has designated work areas or zones as suggested by the NIOSH/OSHA/USCG/EPA'S document titled, "Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities". Each work area will be divided into three zones: an exclusion or "hot" zone, a contamination reduction zone (CRZ), and a support zone.

4.1 EXCLUSION ZONE

The exclusion zone will consist of areas where inhalation, oral contact, or dermal contact with contaminants will be possible. The boundaries of the site exclusion will be marked with flagging, tape, and/or fencing before site operations commence. The location of the site exclusion zone will also be marked on the site map.

4.2 CONTAMINATION-REDUCTION ZONE

The CRZ or transition zone will be established between the exclusion zone and support zone. In this area, personnel will begin the sequential decontamination process required to exit the exclusion zone. To prevent off-site migration of contamination and for personnel accountability, all personnel will enter and exit the exclusion zone through the CRZ. Personnel and equipment decontamination facilities will be located in the CRZ and marked on the site map.

4.3 SUPPORT ZONE

The support zone will consist of a clearly marked area where the office and decontamination trailer are located. Smoking and drinking will be allowed only in designated areas. Eating will be allowed in the breakroom only.

4.4 ACCESS CONTROLS

The SSO and the SS shall establish the physical boundaries of each zone and shall instruct all workers and visitors on the limits of the restricted areas. No one shall be allowed to enter the restricted area without the required protective equipment for that area. The SS shall ensure compliance with all restricted area entry and exit procedures.

The SS shall also designate a decontamination point for personnel to exit from the contaminated area and enter into the clean area where personnel may rest and drink.

Visitors should check in immediately upon arrival. Only authorized visitors will be allowed access to the contaminated areas. Each visitor will be required to provide the necessary protective equipment for use during the visits and shall be escorted by the SS while on site. All visitors who seek access to the exclusion zone and/or contamination reduction zone, will be required to show proof of completion, as a minimum, the 24-hour training required by OSHA for occasional visits to hazardous waste sites. 24-hour OSHA training is only applicable when visitors are unlikely to be exposed over the permissible exposure limit and published exposure limits and are not required to wear respirators, otherwise 40-hour OSHA training will be required prior to granting access to these site zones.

All visitors, subcontractors and personnel will be required to sign a safety plan acknowledgement sheet to certify that they have read and will comply with the site health and safety plan. Failure to comply with this site entry procedure will result in expulsion from the site.

5.0 PROTECTIVE EQUIPMENT

This section details the personal protective equipment (PPE) that will be provided and worn by site personnel to protect them against dermal contact and inhalation exposure to hazardous chemicals present on site.

5.1 LEVELS OF PROTECTION

The following levels of protection and accompanying PPE will be used during site operations.

Level B Protection

- Supplied-air respirators - self-contained breathing apparatus (SCBA) or 5-minute egress system with airline hose
- Saran-coated tyvek coveralls
- Inner latex and outer nitrile/butyl gloves
- Steel toe/shank boots with latex/PVC overboots
- Tape overboots and outer gloves to tyvek
- Hard hat
- Splash protection - as required by task
- Hearing protection - as required by task

Level C Protection

- Full facepiece air-purifying respirator with combination organic vapor/HEPA cartridges
- Tyvek or saran-coated tyvek coveralls

- Inner latex and outer nitrile/butyl gloves
- Steel toe/shank boots with latex overboots
- Tape overboots and outer gloves to Tyvek
- Hard hat
- Splash protection - as required by task
- Hearing protection - as required by task

Modified Level D Protection

- Tyvek or saran-coated tyvek
- Inner latex and outer nitrile/butyl gloves
- Steel toe/shank boots with latex overboots
- Tape overboots outer gloves to Tyvek
- Hard hat
- Safety glasses with side shields
- Splash protection - as required by task
- Hearing protection - as required by task

Level D Protection

- Coveralls
- Steel toe/shank boots
- Safety glasses with side shield

- Work gloves - as required by task
- Splash protection - as required by task
- Hearing protection - as required by task

5.2 TASK-SPECIFIC LEVELS OF PROTECTION

The following minimum levels of protection are specified for tasks performed during site operations. Upgrades/ downgrades will be based on air monitoring results when compared to the appropriate action level, as detailed in Section 7.0 Air Monitoring.

Task No. 1: Site Preparation and Mobilization
Level of Protection: Level D

Task No. 2: Trench excavation
Level of Protection: Operator: Level B with Tyvek
Ground Personnel: Level B, Saranex, Splash Shield

Task No. 3: Drum/material removal and staging
Level of Protection: Operator: Level B with Tyvek
Ground Personnel: Level B, Saranex, Splash Shield

Task No. 4: Collection and staging of surface drums and tanks
Level of Protection: Operator: Level B with tyvek
Ground Personnel: Level B, Saranex, Splash Shield

Task No. 5: Drum opening
Level of Protection: Level B, Saranex

Task No. 6: Drum Sampling
Level of Protection: Level B, Saranex, Splash Shield

Task No. 7:	Liquid removal/transfer from tanks operations
Level of Protection:	Level B/C, Saranex, Splash Shield
Task No. 8:	Rinsing empty tanks and drums
Level of Protection:	Level C, Saranex, Splash Shield
Task No. 9:	Demolition of tanks and drum crushing
Level of Protection:	Modified Level D with tyvek
Task No. 10:	Confirmation Soil Sampling
Level of Protection:	Level C, Tyvek
Task No. 11:	Load out of wastes
Level of Protection:	Level C, Tyvek
Task No. 12:	Backfill and Site Restoration
Level of Protection:	Level D
Task No. 13:	Vehicle and heavy equipment decontamination
Level of Protection:	Level C, Saranex, Splash Shields

5.3 RESPIRATOR CARTRIDGES

The crew members working in Level C will wear respirators equipped with Mine Safety Appliance (MSA) GMC-H air purifying cartridges. The GMC-H cartridge holds approval for:

- Organic vapors <1,000 ppm
- Chlorine gas <10 ppm
- Hydrogen chloride <50 ppm
- Sulfur dioxide <50 ppm
- Dusts, fumes and mists with a TWA <0.05 mg/m3
- Asbestos containing dusts and mists
- Radon daughters

- Radionnuclides
- Pesticides

5.4 AIR-PURIFYING RESPIRATORS

OHM's air-purifying respirators for this project will be MSA's ultratwin full facepiece respirator with nose cups. OHM's Respirator Protection Program for air purifying respirators is adhered to on site.

5.5 CARTRIDGE CHANGES

All cartridges will be changed a minimum of once daily. However, water saturation of the HEPA filter or dusty conditions may necessitate more frequent changes. Changes will occur when personnel begin to experience increased inhalation resistance, or breakthrough of a chemical warning property.

5.6 SUPPLIED-AIR RESPIRATORS

In the event that air quality data shows that respiratory protection must be upgraded, then OHM personnel will wear Survivair 9881-02 Hippack Airline respirators with 5-minute egress bottles. Personnel requiring Level B protection and high mobility will wear Survivair Mark 2 SCBA units.

Airline respirator wearers will be connected to a bank of breathing air cylinders with the total length of airline hose to each wearer no greater than 250 feet. The breathing air cylinder bank (six-pack) will be equipped with a pressure gauge/regulator and alarm.

5.7 BREATHING-AIR QUALITY

Code of Federal Regulations 29 1910.134 states breathing air shall meet the requirement of the specification for Grade "D" breathing air as described in the Compressed Gas Association Specification G 7.-1966. OHM requires a certificate of analysis from vendors of breathing air in order to show that the air meets this standard.

The preferred method for creating breathing air shall be to mix liquid oxygen and liquid nitrogen. Air compressors located at project sites are not acceptable because of possible contamination at the intake of the pump and excessive analytical costs of sampling the air.

5.8 INSPECTION AND CLEANING

Respirators are checked periodically by a qualified individual and inspected before each use by the wearer. All respirators and associated equipment will be decontaminated and hygienically cleaned after use.

5.9 FIT TESTING

Annual respirator fit tests are required of all personnel wearing negative pressure respirators. The test will utilize isoamyl acetate or irritant smoke. The fit test must be for the style and size of the respirator to be used.

5.10 FACIAL HAIR

No personnel who have facial hair which interferes with the respirator's sealing surface will be permitted to wear a respirator.

5.11 CORRECTIVE LENSES

Normal eyeglasses cannot be worn under full-face respirators because the temple bars interfere with the respirator's sealing surfaces. For workers requiring corrective lenses, special spectacles designed for use with respirators will be provided.

5.12 CONTACT LENSES

Contact lenses shall not be worn with any type of respirator.

5.13 MEDICAL CERTIFICATION

Only workers who have been certified by a physician as being physically capable of respirator usage will be issued a respirator.

6.0 DECONTAMINATION PROCEDURES

This section describes the procedures necessary to ensure that both personnel and equipment are free from contamination when they leave the work site.

6.1 PERSONNEL DECONTAMINATION

Decontamination of personnel shall be accomplished to ensure that any material, which personnel may have contacted in the hot zone, is removed in the contamination-reduction zone. Decontamination of personnel exiting the exclusion zone will utilize the following steps for Level B/C/Modified Level D personnel decontamination:

- Step 1: Equipment/backpack/egress system drop
- Step 2: Scrub outer boots and gloves with a detergent-water solution.
- Step 3: Remove tape and discard.
- Step 4: Remove and discard outer boots and gloves.
- Step 5: Remove hard hat and wipe clean.
- Step 6: Remove chemical protective clothing (Tyvek/sarans) and discard into 55-gallon drum.
- Step 7: Remove respirator/facepiece (Levels B/C only) and suitably store while on breaks and during lunch. At the end of shift, discard the cartridges into 55-gallon drum, then clean, disinfect, rinse and air dry the respirator.
- Step 8: Discard inner gloves into 55-gallon trash drum.
- Step 9: Depart transition zone in work clothes and boots.

- Step 10: Wash hands, face and neck before breaks and lunch.

6.2 SUSPECTED CONTAMINATION

Any employee suspected of sustaining skin contact with chemical materials will first use the emergency shower. Following a thorough drenching, the worker will proceed to the decontamination facility. Here the worker will remove clothing, shower, don clean clothing, and immediately be taken to the First Aid Station.

6.3 PERSONAL HYGIENE

Before any eating, smoking, or drinking, personnel will wash hands, arms, neck and face. To promote personal hygiene and to control personnel contamination, project-issued work coveralls worn under chemical protective clothing must remain at the job site and must be laundered at regular intervals during the course of the project.

6.4 OTHER DECONTAMINATION PROCEDURES

All disposable items (i.e., protective clothing) or other items which cannot be adequately decontaminated (i.e., miscellaneous sampling equipment) will be disposed of in accordance with EPA requirements.

6.5 HEAVY EQUIPMENT DECONTAMINATION

Gross contamination (soil, mud) will be removed from the heavy equipment exiting the exclusion zone with a high pressure washer. Heavy equipment will be decontaminated using the high-pressure washer until all visible contamination is removed. Those parts of the equipment that come into direct contact with contaminated materials (i.e., buckets, tires, tracks) will receive special attention.

Decontamination solutions, soil, mud, etc., removed with the high pressure washer will be collected, placed into containers and disposed of according to EPA requirements.

7.0 AIR MONITORING

Air monitoring will be conducted in order to determine airborne contamination levels. This ensures that respiratory protection is adequate to protect personnel against the chemicals that are encountered. The following air monitoring efforts will be used at this site. Additional air monitoring may be conducted at the discretion of the SSO.

The following chart describes the air monitoring required and appropriate action levels.

Monitoring Device	Monitoring Frequency	Action Level	Action
LEL	At start-up and periodic daily/ during excavation and drum and tank activities	>10% LEL or 20.8% 0_2	Stop operations and allow vapors to dissipate
OVA/PID	At start-up and periodic daily/ during excavation and tank and drum activities	>1 ppm for 5 min. >5 ppm for 5 min. >500 ppm for 5 min.	Upgrade to Level C Upgrade to Level B Stop operations and allow vapors to dissipate
HCN/H_2S Meter (Breathing Zone)	At start-up and periodic daily when excavating and drum/tank handling, and sampling	>5.0 ppm for 5 min. >20 ppm for 5 min.	Level B Shut down operations to allow vapors to dissipate to <5.0 ppm before continuing
Radiation Survey Meter	At start-up and periodic daily when excavating and drum/tank handling, and sampling	Any sustained readings above background	Stop operations and notify regional health and safety manager

The above LEL action level only applies to LEL readings obtained in an area where flammable/explosive vapors may be present, but personnel entry into the area will not occur.

7.1 LOWER EXPLOSIVE LIMIT/OXYGEN METER

Prior to entering a confined space area or hot work involving welding, cutting, or other high heat-producing operations where flammable or combustible vapors may be present, LEL/O2 measurements must be obtained. LEL monitoring will be conducted at each borehole when drilling in suspected contaminated areas on site.

7.2 ORGANIC VAPOR ANALYZER (OVA)/PHOTOIONIZATION DETECTOR (PID)/

An OVA and/or a 10.2eV PID will be used to monitor total organic contaminants in ambient air. A PID will prove useful as a direct reading instrument which will aid in determining if respiratory protection needs to be worn (Level C) or upgraded to Level B and to indicate if the exclusion zone encompasses the required areas. OVA/PID monitoring will be performed in personnel breathing zone during site operations to document that the proper level of protection is worn by site personnel.

The SSO will take measurements before operations begin in an area to determine the amount of volatile organic compounds (VOCs) naturally occurring in the air. This is referred to as a background level. The PID/OVA breathing zone action level only applies to PID/OVA readings above background (i.e. 1 ppm for 10 minutes above background).

7.3 HYDROGEN CYANIDE/HYDROGEN SULFIDE METER

A hydrogen cyanide (HCN) and hydrogen sulfide (H_2S) meter will be used to monitor HCN/H_2S during excavation and drum opening/sampling/handling operations. The limited characterization data available on the site did not identify cyanides or sulfides but unknown drums are anticipated to be encountered when excavating. An action level of 5 ppm has been designated for Level B with a maximum use concentration for Level B set at 20 ppm. HCN/H_2S concentrations greater than 20 ppm in the breathing zone require operations shut down.

7.4 RADIATION SURVEY METER

A radiation survey meter will be used to monitor excavation and drum opening/sampling operations to identify the potential radiation hazard posed by unknown drums. There is no information available on the types of wastes disposed at the site that would indicate that radioactive materials were involved. As a precautionary measure, radiation surveys will be performed periodically during excavation and in each unknown drum removed from the excavation. Each day, background radiation will be documented (normally 0.01-0.02 mrem/hr) at the support zone. Any sustained readings above background observed on the radiation survey meter during these operations, will require operation shut down and notification of the Regional H&S Manager.

7.5 AIR SAMPLING AND ANALYSIS

Personal air samples may be collected in personnel breathing zones to document that the appropriate level of protection was worn during remedial actions on-site. Air samples will be collected on personnel with the greatest potential for exposure during each major project phase. Air samples will be analyzed by an AIHA accredited laboratory. Air samples will be collected and analyzed in accordance with the specified NIOSH method for the contaminant(s) of interest at the site.

7.6 AIR MONITORING LOG

The SSO will ensure that all air-monitoring data is logged into a monitoring notebook. Data will include instrument used, instrument reading, location, type of reading (breathing zone or work area) and site operations being performed. The Regional and Corporate OHM CIH will periodically review this data.

7.7 CALIBRATION REQUIREMENTS

The PID/OVA, LEL/O2 meter, HCN and H2S monitors, radiation meter and air sampling pumps will be calibrated daily prior to use, in accordance with the

manufacturer's procedures. A separate log will be kept detailing date, time span, gas, or other standard, and name of person performing the calibration.

7.8 AIR MONITORING RESULTS

Air monitoring results will be posted for personnel inspection, and will be discussed during morning safety meetings.

8.0 EMERGENCY RESPONSE

Prior to field activities, the SS shall plan emergency egress routes and discuss them with all personnel who will be conducting the field work. Initial planning includes establishing emergency warning signals and evacuation routes in case of an emergency.

8.1 EMERGENCY SERVICES

A tested system shall exist for rapid and clear distress communication. All personnel shall be provided concise and clear directions and accessible transportation to local emergency services. A map outlining directions to the nearest hospital will be posted on site.

The following emergency equipment shall be present on the site:

- Fire extinguishers (minimum 20-A/B/C)
- Industrial first aid kit
- Portable eye wash/emergency shower

8.2 EMERGENCY EVACUATION FROM EXCLUSION AND CONTAMINATION-REDUCTION ZONES

Any personnel requiring emergency medical attention shall be evacuated immediately from exclusion and contamination-reduction zones. Personnel shall not enter the area to attempt a rescue if their own lives would be threatened. The decision whether or not to decontaminate a victim prior to evacuation is based on the type and severity of the illness or injury an the nature of the contaminant. For some emergency victims, immediate decontamination may be an essential part of life saving first aid. For others, decontamination may aggravate the injury or delay life saving treatment. If decontamination does not interfere with essential treatment, it should be performed.

If decontamination can be performed:

- Wash external clothing and cut it away.

If decontamination cannot be performed:

- Wrap the victim in blankets or plastic to reduce contamination of other personnel.
- Alert emergency and off-site medical personnel to potential contamination; instruct them about specific decontamination procedures.
- Send along site personnel familiar with the incident.

8.3 FIRST AID

Qualified personnel only shall give first aid and stabilize an individual needing assistance. At least two people trained and certified in First Aid/CPR will be present on-site at all times during remedial actions. Life support techniques such as CPR and treatment of life threatening problems such as airway obstruction, and shock will be given top priority. Professional medical assistance shall be obtained at the earliest possible opportunity.

To provide first-line assistance to field personnel in the case of sickness or injury, the following items will be immediately available:

- First aid kit
- Portable emergency eye wash
- Supply of clean water

8.4 EMERGENCY ACTIONS

If actual or suspected serious injury occurs, these steps shall be followed:

- Remove the exposed or injured person(s) from immediate danger.

- Render first aid if necessary. Decontaminate affected personnel after critical first aid given.

- Obtain paramedic services or ambulance transport to local hospital. This procedure shall be followed even if there is no visible injury.

- Other personnel in the work area shall be evacuated to a safe distance until the site supervisor determines that it is safe for work to resume. If there is any doubt regarding the condition of the area, work shall not commence until all hazard control issues are resolved.

- Notify client of incident.

8.5 GENERAL EVACUATION PLAN

In the general case of a large fire, explosion, or toxic vapor release, a site evacuation shall be ordered and shall follow these steps:

- Sound the applicable alarm and advise client representative.

- Evaluate the immediate situation and downwind direction. All personnel will evacuate in the upwind direction.

- All personnel will assemble in an upwind area when the situation permits, a head count will be taken.

- Determine the extent of the problem. Dispatch a response team in protective clothing and self-contained breathing apparatus on site to evacuate any missing personnel or to correct the problem.

8.6 SPILL CONTROL

Spill control throughout the project will be achieved on an ongoing basis through the processing plan of operation and the design of facilities and

equipment. Spill control measures will be in effect in all areas of ongoing operations.

Primary spill control operations will include a system of temporary dikes and sand bag berms in all areas of operation. The containment dikes will be erected around those operations where a spill potential exists. The containment dikes will be set up to avert run-on from work areas as well as contain any materials released inside the work area.

Gasoline and diesel fuels, bulk lubricants, and waste oils will be stored in clearly marked areas dedicated for this purpose. Storage will be skid-mounted above-ground steel tanks or 55-gallon drums as appropriate. Storage units will be located in areas away from routine traffic patterns to prevent accidental damage. Each storage area will be underlined with an impermeable liner and surrounded by a containment berm.

8.7 HAZARDOUS WEATHER CONTINGENCY MEASURES

The SSO will be responsible for assessing hazardous weather conditions (i.e., hurricane, etc.) and notifying personnel of specific contingency measures. Notifications will include:

- OHM employees and subcontractors
- On-site client representative
- Base emergency response coordinator

Operations will not be started or continued when the following hazardous weather conditions are present:

- Lightning
- Heavy rains/snow
- High winds

The response to these conditions includes the following actions:

- Excavation/soil stockpiles will be covered with visqueen
- All equipment will be shut down and secured to prevent damage
- Personnel will be moved to safe refuge, initially crew trailers. The Emergency Coordinator will determine when it is necessary to evacuate personnel to off-site locations.

(Completed on site during project start-up)

Ambulance Phone Number: 911 or 451-4641

Hospital: information: 451-4300

Hospital Phone Number: emergency room: 451-4840, 451-4841, 451-4840

Fire Department: 911 or 451-5856

Police: 911 or 451-3855

Poison Control: 800-382-9097

Insert route to hospital below:

1) Travel north on Holcomb Blvd.
2) Turn left onto Brewster Blvd. at first stop light
3) Travel west on Brewster Blvd. until hospital entrance appears on right.
4) Follow signs to the emergency room.

9.0 TRAINING REQUIREMENTS

As a prerequisite to employment at OHM, all field employees are required to take a 40-hour training class and pass a written examination. This training is comprehensive and covers all forms of personal protective equipment. In addition, this course covers the toxicological effects of various chemicals including nerve agents, handling of unknown tanks, drums and confined space entering procedures and electrical safety. This course is in full compliance with OSHA requirements in 29 CFR 1910.120(e).

All personnel entering the exclusion zone will be trained in the provisions of this site safety plan and be required to sign the Site Safety Plan, acknowledgement which is included as Appendix C. OHM has a full-time training department which, in addition to providing in-house training, has assisted Federal OSHA and USEPA in developing training program requirements.

OHM subcontractors, who will be working in the site exclusion zone, will be required to certify, in writing, that their employees have been trained in accordance with 29 CFR 1910.120(e).

10.0 MEDICAL SURVEILLANCE PROGRAM

All OHM personnel participate in a medical and health monitoring program that meets the requirements of 29CFR1910.120 and ANSI Z-88.2. This program is initiated when the employee starts work with a complete physical and medical history and is continued on a regular basis. A listing of OHM's worker medical profile is shown below. There are no additional medical testing anticipated to be performed on project personnel. This program was developed in conjunction with a licensed physician who is certified in Occupational Medicine by the American Board of Preventive Medicine and consultant toxicologist. Other medical consultants are retained when additional expertise is required.

OHM subcontractors, who will be working site exclusion in the zone, will be required to certify, in writing, that their employees have been medically qualified to perform hazardous waste operations in accordance with 29CFR1910.120(f).

Table 10.1
Worker Medical Profile

Item	Initial	Annual
Medical History	√	√
Work History	√	√
Visual Acuity and Tonometry	√	√
Pulmonary Function Tests	√	√
Physical Examination	√	√
Audiometry Tests	√	√
Chest X-ray	√	√
Electrocardiogram/Stress Test (based on age)	√	√
Complete Blood Counts	√	√
Blood Chemistry (SMAC-23)	√	√
Complete Urinalysis	√	√
Dermatology Examination	√	√

APPENDIX A

MATERIAL SAFETY DATA SHEETS

Genium Publishing Corporation
1145 Catalyn Street
Schenectady, NY 12303-1836 USA
(518) 377-8854

Material Safety Data Sheets Collection:

Sheet No. 467
Automotive Gasoline, Lead-free

Issued: 10/81 Revision: A, 9/91

Section 1. Material Identification

Automotive Gasoline, Lead-free, Description: A mixture of volatile hydrocarbons composed mainly of branched-chain paraffins, cycloparaffins, olefins, naphthenes, and aromatics. In general, gasoline is produced from petroleum, shale oil, Athabasca tar sands, and coal. Motor gasolines are made chiefly by cracking processes, which convert heavier petroleum fractions into more volatile fractions by thermal or catalytic decomposition. Widely used as fuel in internal combustion engines of the spark-ignited, reciprocating type. Automotive gasoline has an octane number of approximately 90. A high content of aromatic hydrocarbons and a consequent high toxicity are also associated with a high octane rating. Some gasolines sold in the US contain a minor proportion of tetraethyllead, which is added in concentrations not exceeding 3 ml per gallon to prevent engine "knock." However, methyl-tert-butyl ether (MTBE) has almost completely replaced tetraethyllead.

Other Designations: CAS No. 8006-61-9, benzin, gasoline, gasolene, motor spirits, natural gasoline, petrol.

Manufacturer: Contact your supplier or distributor. Consult latest *Chemical Week Buyers' Guide*(73) for a suppliers list.

R 1
I 2
S 2*
K 4
* Skin absorption

NFPA

HMIS
H 2
F 3
R 1
PPG†
† Sec. 8

Cautions: Inhalation of automotive gasoline vapors can cause intense burning in throat and lungs, central nervous system (CNS) depression, and possible fatal pulmonary edema. Gasoline is a dangerous fire and explosion hazard when exposed to heat and flames.

Section 2. Ingredients and Occupational Exposure Limits

Automotive gasoline, lead-free*

1990 OSHA PELs
8-hr TWA: 300 ppm, 900 mg/m³
15-min STEL: 500 ppm, 1500 mg/m³

1990-91 ACGIH TLVs
TWA: 300 ppm, 890 mg/m³
STEL: 500 ppm, 1480 mg/m³

1990 NIOSH REL
None established

1985-86 Toxicity Data*
Man, inhalation, TC_{Lo}: 900 ppm/1 hr; toxic effects include sense organs and special senses (conjunctiva irritation), behavioral (hallucinations, distorted perceptions), lungs, thorax, or respiration (cough)
Human, eye: 140 ppm/8 hr; toxic effects include mild irritation
Rat, inhalation, LC_{50}: 300 g/m³/5 min

* A typical modern gasoline composition is 80% paraffins, 14% aromatics, and 6% olefins. The mean benzene content is approximately 1%. Other additives include sulfur, phosphorus, and MTBE.
† See NIOSH, *RTECS* (LX3300000), for additional toxicity data.

Section 3. Physical Data

Boiling Point: Initially, 102 °F (39 °C); after 10% distilled, 140 °F (60 °C); after 50% distilled, 230 °F (110 °C); after 90% distilled, 338 °F (170 °C); final boiling point, 399 °F (204 °C)

Vapor Density (air = 1): 3.0 to 4.0

Density/Specific Gravity: 0.72 to 0.76 at 60 °F (15.6 °C)

Water Solubility: Insoluble

Appearance and Odor: A clear (gasoline may be colored with dye), mobile liquid with a characteristic odor recognizable at about 10 ppm in air.

Section 4. Fire and Explosion Data

Flash Point: -45 °F (-43 °C)	Autoignition Temperature: 536 to 853 °F (280 to 456 °C)	LEL: 1.3% v/v	UEL: 6.0% v/v

Extinguishing Media: Use dry chemical, carbon dioxide, or alcohol foam as extinguishing media. Use of water may be ineffective to extinguish fire, but use water spray to knock down vapors and to cool fire-exposed drums and tanks to prevent pressure rupture. Do not use a solid stream of water since it may spread the fuel.

Unusual Fire or Explosion Hazards: Automobile gasoline is an OSHA Class IB flammable liquid and a dangerous fire and explosion hazard when exposed to heat and flames. Vapors can flow to an ignition source and flash back. Automobile gasoline can also react violently with oxidizing agents.

Special Fire-fighting Procedures: Isolate hazard area and deny entry. Since fire may produce toxic fumes, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode, and full protective clothing. When the fire is extinguished, use nonsparking tools for cleanup. Be aware of runoff from fire control methods. Do not release to sewers or waterways.

Section 5. Reactivity Data

Stability/Polymerization: Automotive gasoline is stable at room temperature in closed containers under normal storage and handling conditions. Hazardous polymerization cannot occur.

Chemical Incompatibilities: Automotive gasoline can react with oxidizing materials such as peroxides, nitric acid, and perchlorates.

Conditions to Avoid: Avoid heat and ignition sources.

Hazardous Products of Decomposition: Thermal oxidative decomposition of automotive gasoline can produce oxides of carbon and partially oxidized hydrocarbons.

Section 6. Health Hazard Data

Carcinogenicity: In 1990 reports, the IARC list gasoline as a possible human carcinogen (Group 2B). Although the IARC has assigned an overall evaluation to gasoline, it has not assigned an overall evaluation to specific substances within this group (inadequate human evidence).
Summary of Risks: Gasoline vapors are considered moderately poisonous. Vapor inhalation can cause central nervous system (CNS) depression and mucous membrane and respiratory tract irritation. Brief inhalations of high concentrations can cause a fatal pulmonary edema. Reported responses to gasoline vapor concentrations are: 160 to 270 ppm causes eye and throat irritation in several hours; 500 to 900 ppm causes eye, nose, and throat irritation, and dizziness in 1 hr; and 2000 ppm produces mild anesthesia in 30 min. Higher concentrations are intoxicating in 4 to 10 minutes. If large areas of skin are exposed to gasoline, toxic amounts may be absorbed. Repeated or prolonged skin exposure causes dermatitis. Certain individuals may develop hypersensitivity. Ingestion can cause CNS depression. Pulmonary aspiration after ingestion can cause severe pneumonitis. In adults, ingestion of 20 to 50 g gasoline may produce severe symptoms of poisoning.
Medical Conditions Aggravated by Long-Term Exposure: None reported.
Target Organs: Skin, eye, respiratory and central nervous systems.
Primary Entry Routes: Inhalation, ingestion, skin contact.
Acute Effects: Acute inhalation produces intense nose, throat, and lung irritation; headaches; blurred vision; conjunctivitis; flushing of the face; mental confusion; staggering gait; slurred speech; and unconsciousness, sometimes with convulsions. Ingestion causes inebriation (drunkenness), vomiting, dizziness, fever, drowsiness, confusion, and cyanosis (a blue to dark purplish coloration of skin and mucous membrane caused by lack of oxygen). Aspiration causes choking, cough, shortness of breath, increased rate of respiration, excessively rapid heartbeat, fever, bronchitis, and pneumonitis. Other symptoms following acute exposure include acute hemorrhage of the pancreas, fatty degeneration of the liver and kidneys, and passive congestion of spleen.
Chronic Effects: Chronic inhalation results in appetite loss, nausea, weight loss, insomnia, and unusual sensitivity (hyperesthesia) of the distal extremities followed by motor weakness, muscular degeneration, and diminished tendon reflexes and coordination. Repeated skin exposure can cause blistering, drying, and lesions.
FIRST AID
Eyes: Gently lift the eyelids and flush immediately and continuously with flooding amounts of water until transported to an emergency medical facility. Consult a physician immediately.
Skin: *Quickly* remove contaminated clothing. Rinse with flooding amounts of water for at least 15 min. For reddened or blistered skin, consult a physician. Wash affected area with soap and water.
Inhalation: Remove exposed person to fresh air and support breathing as needed.
Ingestion: Never give anything by mouth to an unconscious or convulsing person. If ingested, *do not induce vomiting* due to aspiration hazard. Give conscious victim a mixture of 2 tablespoons of activated charcoal mixed in 8 oz of water to drink. Consult a physician immediately.
After first aid, get appropriate in-plant, paramedic, or community medical support.

Section 7. Spill, Leak, and Disposal Procedures

Spill/Leak: Notify safety personnel, evacuate all unnecessary personnel, remove heat and ignition sources, and provide maximum explosion-proof ventilation. Cleanup personnel should protect against vapor inhalation and liquid contact. Use nonsparking tools. Take up small spills with sand or other noncombustible adsorbent. Dike storage areas to control leaks and spills. Follow applicable OSHA regulations (29 CFR 1910.120).
Aquatic Toxicity: Bluegill, freshwater, LC_{50}, 8 ppm/96 hr.
Disposal: Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.
EPA Designations
RCRA Hazardous Waste (40 CFR 261.21): Characteristic of ignitability
CERCLA Hazardous Substance (40 CFR 302.4): Not listed
SARA Extremely Hazardous Substance (40 CFR 355): Not listed
SARA Toxic Chemical (40 CFR 372.65): Not listed
OSHA Designations
Listed as an Air Contaminant (29 CFR 1910.1000, Table Z-1-A)

Section 8. Special Protection Data

Goggles: Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Since contact lens use in industry is controversial, establish your own policy.
Respirator: Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a NIOSH-approved respirator. There are no specific NIOSH recommendations. However, for vapor concentrations not immediately dangerous to life or health, use chemical cartridge respirator equipped with organic vapor cartridge(s), or a supplied-air respirator. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.*
Other: Wear impervious gloves, boots, aprons, and gauntlets to prevent prolonged or repeated skin contact. Materials such as neoprene or polyvinyl alcohol provide excellent/good resistance for protective clothing. Note: Resistance of specific materials can vary from product to product.
Ventilation: Provide general and local explosion-proof exhaust ventilation systems to maintain airborne concentrations below the OSHA PELs (Sec. 2). Local exhaust ventilation is preferred since it prevents contaminant dispersion into the work area by controlling it at its source.[109]
Safety Stations: Make available in the work area emergency eyewash stations, safety/quick-drench showers, and washing facilities.
Contaminated Equipment: Remove this material from your shoes and equipment. Launder contaminated clothing before wearing.
Comments: Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

Section 9. Special Precautions and Comments

Storage Requirements: Store in closed containers in a cool, dry, well-ventilated area away from heat and ignition sources and strong oxidizing agents. Protect containers from physical damage. Avoid direct sunlight. Storage must meet requirements of OSHA Class IB liquid. Outside or detached storage preferred.
Engineering Controls: Avoid vapor inhalation and skin or eye contact. Consider a respiratory protection program that includes regular training, maintenance, inspection, and evaluation. Indoor use of this material requires explosion-proof exhaust ventilation to remove vapors. Only use gasoline as a fuel source due to its volatility and flammable/explosive nature. Practice good personal hygiene and housekeeping procedures. Wear clean work clothing daily.

Transportation Data (49 CFR 172.101, .102)

DOT Shipping Name: Gasoline (*including casing-head and natural*)
DOT Hazard Class: Flammable liquid
ID No.: UN1203
DOT Label: Flammable liquid
DOT Packaging Exceptions: 173.118
DOT Packaging Requirements: 173.119

IMO Shipping Name: Gasoline
IMO Hazard Class: 3.1
ID No.: UN1203
IMO Label: Flammable liquid
IMDG Packaging Group: II

MSDS Collection References: 26, 73, 89, 100, 101, 103, 124, 126, 127, 132, 133, 136, 138, 140, 143, 146, 153, 159
Prepared by: M Allison, BS; Industrial Hygiene Review: DJ Wilson, CIH; Medical Review: W Silverman, MD; Edited by: JR Stuart, MS

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Schenectady, NY 12303-1836 USA
(518) 377-8854

Material Safety Data Sheets Collection:

Sheet No. 488
Kerosine Burner Fuel

Issued: 11/82 Revision: A, 3/92

Section 1. Material Identification

Kerosine Burner Fuel (molecular formula varies according to method of manufacture)* Description: A mixture of *distilled* petroleum hydrocarbons, mainly of the methane series with 10 to 16 carbon atoms per molecule. Used as fuel for kerosine lamps, flares, stoves, jet engines, rockets, diesels, and tractors; a degreaser, cleaner, mold-releasing agent, solvent for asphalt coatings, enamels, paints, polishes, thinners and varnishes; and by veterinarians for decontamination. A deodorized and decolorized version called Deobase was formerly used as a solvent for cosmetics and fly spray.

R 2
I 2
S 2
K 2

NFPA†

HMIS
H 1
F 2
R 0
PPG‡
‡ Sec. 8

Other Designations: CAS No. 8008-20-6, coal oil, Deobase, home heating oil no. 1, kerosene, mineral colza, mineral seal, range oil.

Manufacturer: Contact your supplier or distributor. Consult latest *Chemical Week Buyers' Guide*(73) for a suppliers list.

Cautions: Avoid skin contact with kerosine burner fuel because it causes defatting of the skin, leading to irritation and possible dermatitis. Kerosine burner fuel is combustible and may be ignited by heat, sparks, or flames.

* The ASTM and ACS prefer the spelling "kerosine". See also Kerosine Solvent (*MSDS Collection*, No. 387).
† Although the NFPA gives kerosine burner fuel a "0" health rating, many references agree that it is moderately toxic when ingested, when in contact with skin, and when its liquid is aspirated. A health rating of "1" may be more appropriate.

Section 2. Ingredients and Occupational Exposure Limits

Kerosine burner fuel (hydrocarbon mixtures, paraffins, naphthenes, olefins, and aromatics + 0.04 to 0.3% sulfur), ca >98%

1990 OSHA PEL
None established

1991-92 ACGIH TLV
None established

1990 NIOSH REL
TWA: 14 ppm (100 mg/m³)

1990 DFG (Germany) MAK
None established

1985-86 Toxicity Data*
Man, intravenous, TD_{Lo}: 403 mg/kg caused distorted perceptions and hallucinations
Man, oral, TD_{Lo}: 3570 mg/kg produced coughing, vomiting, and increased body temperature
Rat, oral, LD_{Lo}: 800 mg/kg; no toxic effects noted

* See NIOSH, *RTECS* (OA5500000), for additional toxicity data.

Section 3. Physical Data

Boiling Point Range: 347 to 617 °F (175 to 325 °C)
Freezing Point: <-22 °F (<-30 °C)
Vapor Pressure: 5 mm Hg at 68 °F (20 °C)
Vapor Density (air = 1): 4.5
Viscosity: 32
Odor Threshold: 1 ppm
Molecular Weight: Variable
Density: 0.80 at 68 °F (20 °C)
Water Solubility: Insoluble
Other Solubilities: Miscible with other petroleum solvents

Appearance and Odor: Pale yellow or water-white, mobile, oily liquid with a characteristic strong petroleum odor.

Section 4. Fire and Explosion Data

Flash Point: 100 to 162 °F (43 to 72 °C) | **Autoignition Temperature:** 444 °F (228 °C) | **LEL:** 0.7% v/v | **UEL:** 5% v/v

Extinguishing Media: For small fires, use dry chemical, carbon dioxide (CO_2), water spray, or regular foam. For large fires, use water spray, fog, or regular foam. Use a "smothering" technique. *Caution! Forced stream of water could scatter flames of burning kerosine.*
Unusual Fire or Explosion Hazards: If spilled, and in the absence of ventilation and good air mixing, vapors may travel to an ignition source and flash back. Container may explode in heat of fire. Kerosine burner fuel poses a vapor explosion hazard indoors, outdoors, and in sewers.
Special Fire-fighting Procedures: Since fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode. Also wear fully protective clothing. If possible without risk, remove container from fire area. Apply cooling water to sides of container until fire is well out. Stay away from ends of tanks. For massive fire in cargo area use monitor nozzles or unmanned hose holders; if impossible, withdraw from area and let fire burn. Withdraw from area immediately if you hear a rising sound from venting safety device or notice any tank discoloration due to fire. Isolate area for 1/2 mile in all directions if fire involves tank truck or rail car. Be aware of runoff from fire control methods. Do not release to sewers or waterways.

Section 5. Reactivity Data

Stability/Polymerization: Kerosine burner fuel is stable at room temperature in closed containers under normal storage and handling conditions. Hazardous polymerization cannot occur. Any increase in temperature could lead to increasing instability.
Chemical Incompatibilities: Kerosine burner fuel is incompatible with oxidizing materials.
Conditions to Avoid: Excessive heat generation and contact with oxidizing materials.
Hazardous Products of Decomposition: Thermal oxidative decomposition of kerosine burner fuel can produce carbon dioxide (CO_2), carbon monoxide (CO), hydrocarbons, and small amounts of sulfur dioxide (SO_2), depending on sulfur content.

Section 6. Health Hazard Data

Carcinogenicity: In 1990 reports, the IARC lists kerosine as Class 7 (substance not assigned an overall evaluation), although *occupational exposures in petroleum refining* are listed as Class 5 (carcinogenic, animal evidence limited). Since kerosine is obtained during petroleum refining, consider these data.
Summary of Risks: Kerosine burner fuel toxicity varies widely with methods of manufacure and use. The deodorized and refined kerosines are least toxic. Those containing benzenes can cause hematopoietic (formative of red blood cells) problems and exposure to large amounts can lead to renal (kidney) injury. Minor exposures to kerosine can cause irritation and headache.
Medical Conditions Aggravated by Long-Term Exposure: None reported.
Target Organs: Respiratory tract, skin, blood, and kidneys.
Primary Entry Routes: Inhalation, skin contact, ingestion.
Acute Effects: Inhalation of kerosine mists can cause mucous membrane irritation, headache, and drowsiness. High concentrations can lead to suffocation, coma, and death by respiratory arrest. Aspiration of vomitus (after ingestion) can lead to serious pneumonitis (inflammation of lungs) and pulmonary hemorrhage (bleeding in lungs). Ingestion can cause gastrointestinal (GI) tract irritation, vomiting, and diarrhea. Skin contact with kerosine causes immediate defatting of skin, leaving it dry and cracked.
Chronic Effects: Chronic skin contact leaves skin dry and cracked, easily irritated, and prone to infection from other agents. Chronic dermatitis may result from long-term skin exposure. Chronic overexposure to hydrocarbon vapors may cause neurological impairment.
FIRST AID
Eyes: Gently lift eyelids and flush immediately and continuously with flooding amounts of water until transported to an emergency medical facility. *Do not* allow victim to rub or keep eyes tightly shut. Consult a physician immediately.
Skin: *Quickly* remove contaminated clothing. Rinse with flooding amounts of water for at least 15 min. For reddened or blistered skin, consult a physician. Wash affected area with soap and water.
Inhalation: Remove exposed person to fresh air and support breathing as needed.
Ingestion: Never give anything by mouth to an unconscious or convulsing person. Consult a poison control center. Unless otherwise advised, *do not* induce vomiting since aspiration of vomitus can lead to severe pneumonitis. If spontaneous vomiting occurs, hold the victim's head lower than the hips to prevent pulmonary aspiration.
After first aid, get appropriate in-plant, paramedic, or community medical support.
Note to Physicians: Observe pulmonary function and treat accordingly.

Section 7. Spill, Leak, and Disposal Procedures

Spill/Leak: Immediately notify safety personnel, isolate and ventilate area, deny entry, and stay upwind. Shut off all sources of ignition—no flares, flames, or smoking in hazard area. Cleanup personnel should prevent against contamination. Water spray may reduce vapor, but it may not prevent ignition in closed spaces. For small spills, using nonsparking tools, take up with earth, sand, vermiculite, or other absorbent, noncombustible material and place in suitable containers for later disposal. For large spills, dike far ahead of liquid spills for later disposal. Follow applicable OSHA regulations (29 CFR 1910.120).
Disposal: Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.
EPA Designations
Listed as a RCRA Hazardous Waste (40 CFR 261.21): No. D001, Characteristic of ignitability
CERCLA Hazardous Substance (40 CFR 302.4): Not listed
SARA Extremely Hazardous Substance (40 CFR 355): Not listed
SARA Toxic Chemical (40 CFR 372.65): Not listed
OSHA Designations
Air Contaminant (29 CFR 1910.1000, Subpart Z): Not listed

Section 8. Special Protection Data

Goggles: Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Since contact lens use in industry is controversial, establish your own policy.
Respirator: Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a MSHA/NIOSH-approved respirator. Select respirator based upon its suitability to provide adequate worker protection for given working conditions, level of airborne contamination, and presence of sufficient oxygen. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.* If respirators are used, OSHA requires a respiratory protection program that includes at least: training, fit-testing, periodic environmental monitoring, maintenance, inspection, cleaning, and convenient, sanitary storage areas.
Other: Wear chemically protective gloves, boots, aprons, and gauntlets to prevent repeated and prolonged skin contact. Barrier creams may also be useful.
Ventilation: Provide general and local explosion-proof exhaust ventilation systems to maintain airborne concentrations below the NIOSH REL (Sec. 2). Local exhaust ventilation is preferred since it prevents contaminant dispersion into the work area by controlling it at its source.[103]
Safety Stations: Make available in the work area emergency eyewash stations, safety/quick-drench showers, and washing facilities.
Contaminated Equipment: Separate contaminated work clothes from street clothes. Launder contaminated work clothing before wearing. Remove this material from your shoes and clean personal protective equipment.
Comments: Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

Section 9. Special Precautions and Comments

Storage Requirements: Avoid physical damage to containers. Store in cool, dry, well-ventilated area away from ignition sources, direct sunlight, and oxidizing materials. Outdoor or detached storage is recommended for large amounts. Electrically ground all equipment used in the manufacture, use, and storage of kerosine burner fuel. During maintenance use only nonsparking tools. Periodically inspect storage conditions.
Engineering Controls: To reduce potential health hazards, use sufficient dilution or local exhaust ventilation to control the airborne contaminants and to maintain concentrations at the lowest practical level.
Administrative Controls: Consider preplacement and periodic medical examinations of exposed workers that emphasize respiratory function.

Transportation Data (49 CFR 172.101, .102)

DOT Shipping Name: Kerosene	**IMO Shipping Name:** Kerosene
DOT Hazard Class: Combustible liquid	**IMO Hazard Class:** 3.3
ID No.: UN1223	**ID No.:** UN1223
DOT Label: None	**IMO Label:** Flammable liquid
DOT Packaging Exceptions: 173.118a	**IMDG Packaging Group:** II
DOT Packaging Requirements: None	

MSDS Collection **References:** 26, 73, 100, 101, 103, 124, 127, 132, 133, 136, 143, 153, 159, 163
Prepared by: M Gannon, BA; **Industrial Hygiene Review:** PA Roy, MPH, CIH; **Medical Review:** AC Darlington, MPH, MD; **Edited by:** JR Stuart, MS 101

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1145 Catalyn Street
Schenectady, NY 12303-1836 USA
(518) 377-8854

Sheet No. 470
Diesel Fuel Oil No. 2-D

Issued: 10/81 Revision: A, 11/90

Section 1. Material Identification

Diesel Fuel Oil No. 2-D Description: Diesel fuel is obtained from the middle distillate in petroleum separation; a distillate oil of low sulfur content. It is composed chiefly of unbranched paraffins. Diesel fuel is available in various grades, one of which is synonymous with fuel oil No. 2-D. This diesel fuel oil requires a minimum Cetane No. (efficiency rating for diesel fuel comparable to octane number ratings for gasoline) of 40 (ASTM D613). Used as a fuel for trucks, ships, and other automotive engines; as mosquito control (coating on breeding waters); and for drilling muds.

Other Designations: CAS No. 68334-30-5, diesel fuel.

Manufacturer: Contact your supplier or distributor. Consult the latest *Chemicalweek Buyers' Guide*[73] for a suppliers list.

Cautions: Diesel fuel oil No. 2-D is a skin irritant and central nervous depressant with high mist concentrations. It is an environmental hazard and moderate fire risk.

R	1
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K	2

NFPA

HMIS
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F 2
R 0
PPG*
* Sec. 8

Section 2. Ingredients and Occupational Exposure Limits

Diesel fuel oil No. 2-D*

1989 OSHA PEL	1990-91 ACGIH TLV	1988 NIOSH REL	1985-86 Toxicity Data‡
None established	Mineral Oil Mist TWA: 5 mg/m³† STEL: 10 mg/m³	None established	Rat, oral, LD_{50}: 9 g/kg produces gastrointestinal (hypermotility, diarrhea) effects

* Diesel fuel No. 2-D tends to be low in aromatics and high in paraffinics. This fuel oil is complex mixture of: 1) >95% paraffinic, olefinic, naphthenic, and aromatic hydrocarbons, 2) sulfur (<0.5%), and 3) benzene (<100 ppm). [A low benzene level reduces carcinogenic risk. Fuel oils can be exempted under the benzene standard (29 CFR 1910.1028)]. Although low in the fuel itself, benzene concentrations are likely to be much higher in processing areas.

† As sampled by nonvapor-collecting method.

‡ Monitor NIOSH, *RTECS* (HZ1800000), for future toxicity data.

Section 3. Physical Data

Boiling Point Range: 340 to 675 °F (171 to 358 °C)

Viscosity: 1.9 to 4.1 centistoke at 104 °F (40 °C)

Specific Gravity: <0.86

Water Solubility: Insoluble

Appearance and Odor: Brown, slightly viscous liquid.

Section 4. Fire and Explosion Data

Flash Point: 125 °F (52 °C) min.	Autoignition Temperature: >500 °F (932 °C)	LEL: 0.6% v/v	UEL: 7.5% v/v

Extinguishing Media: Use dry chemical, carbon dioxide, or foam to fight fire. Use a water spray to cool fire exposed containers. Do not use a forced water spray directly on burning oil since this will scatter the fire. Use a smothering technique for extinguishing fire.

Unusual Fire or Explosion Hazards: Diesel fuel oil No. 2-D is a OSHA Class II combustible liquid. Its volatility is similar to that of gas oil. Vapors may travel to a source of ignition and flash back.

Special Fire-fighting Procedures: Isolate hazard area and deny entry. Since fire may produce toxic fumes, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in the pressure-demand or positive-pressure mode and full protective clothing. If feasible, remove containers from fire. Be aware of runoff from fire control methods. Do not release to sewers or waterways due to pollution and fire or explosion hazard.

Section 5. Reactivity Data

Stability/Polymerization: Diesel fuel oil No. 2-D is stable at room temperature in closed containers under normal storage and handling conditions. Hazardous polymerization cannot occur.

Chemical Incompatibilities: It is incompatible with strong oxidizing agents; heating greatly increases the fire hazard.

Conditions to Avoid: Avoid heat and ignition sources.

Hazardous Products of Decomposition: Thermal oxidative decomposition of diesel fuel oil No. 2-D can produce various hydrocarbons and hydrocarbon derivatives, and other partial oxidation products such as carbon dioxide, carbon monoxide, and sulfur dioxide.

Section 6. Health Hazard Data

Carcinogenicity: Although the IARC has not assigned an overall evaluation to diesel fuels as a group, it has evaluated occupational exposures in petroleum refining as an IARC probable human carcinogen (Group 2A). It has evaluated distillate (light) diesel oils as not classifiable as human carcinogens (Group 3).
Summary of Risks: Although diesel fuel's toxicologic effects should resemble kerosine's, they are somewhat more pronounced due to additives such as sulfurized esters. Excessive inhalation of aerosol or mist can cause respiratory tract irritation, headache, dizziness, nausea, vomiting, and loss of coordination, depending on concentration and exposure time. When removed from exposure area, affected persons usually recover completely. If vomiting occurs after ingestion and if oil is aspirated into the lungs, hemorrhaging and pulmonary edema, progressing to renal involvement and chemical pneumonitis, may result. A comparative ratio of oral to aspirated lethal doses may be 1 pt vs. 5 ml. Aspiration may also result in transient CNS depression or excitement. Secondary effects may include hypoxia (insufficient oxygen in body cells), infection, pneumatocele formation, and chronic lung dysfunction. Inhalation may result in euphoria, cardiac dysrhythmias, respiratory arrest, and CNS toxicity. Prolonged or repeated skin contact may irritate hair follicles and block sebaceous glands, producing a rash of acne pimples and spots, usually on arms and legs.
Medical Conditions Aggravated by Long-Term Exposure: None reported.
Target Organs: Central nervous system, skin, and mucous membranes.
Primary Entry Routes: Inhalation, ingestion.
Acute Effects: Systemic effects from ingestion include gastrointestinal irritation, vomiting, diarrhea, and in severe cases central nervous system depression, progressing to coma or death. Inhalation of aerosols or mists may result in increased rate of respiration, tachycardia (excessively rapid heart beat), and cyanosis (dark purplish discoloration of the skin and mucous membranes caused by deficient blood oxygenation).
Chronic Effects: Repeated contact with the skin causes dermatitis.
FIRST AID
Eyes: Gently lift the eyelids and flush immediately and continuously with flooding amounts of water until transported to an emergency medical facility. Consult a physician immediately.
Skin: *Quickly remove contaminated clothing. Rinse with flooding amounts of water for at least 15 min. If large areas of the body have been* exposed or if irritation persists, get medical help immediately. Wash affected area with soap and water.
Inhalation: Remove exposed person to fresh air and support breathing as needed.
Ingestion: Never give anything by mouth to an unconscious or convulsing person. If ingested, *do not induce vomiting* due to aspiration hazard. Contact a physician immediately. Position to avoid aspiration.
After first aid, get appropriate in-plant, paramedic, or community medical support.
Note to Physicians: Gastric lavage is contraindicated due to aspiration hazard. Preferred antidotes are charcoal and milk. In cases of severe aspiration pneumonitis, consider monitoring arterial blood gases to ensure adequate ventilation. Observe the patient for 6 hr. If vital signs become abnormal or symptoms develop, obtain a chest x-ray.

Section 7. Spill, Leak, and Disposal Procedures

Spill/Leak: Notify safety personnel, evacuate area for large spills, remove all heat and ignition sources, and provide maximum explosion-proof ventilation. Cleanup personnel should protect against vapor inhalation and liquid contact. Clean up spills promptly to reduce fire or vapor hazards. Use a noncombustible absorbent material to pick up small spills or residues. For large spills, dike far ahead to contain. Pick up liquid for reclamation or disposal. Do not release to sewers or waterways due to health and fire and/or explosion hazard. Follow applicable OSHA regulations (29 CFR 1910.120). Diesel fuel oil No. 2-D spills may be environmental hazards. Report large spills.
Disposal: Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.
EPA Designations
RCRA Hazardous Waste (40 CFR 261.21): Ignitable waste
CERCLA Hazardous Substance (40 CFR 302.4): Not listed
SARA Extremely Hazardous Substance (40 CFR 355): Not listed
SARA Toxic Chemical (40 CFR 372.65): Not listed
OSHA Designations
Air Contaminant (29 CFR 1910.1000, Subpart Z): Not listed

Section 8. Special Protection Data

Goggles: Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133).
Respirator: Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, use a NIOSH-approved respirator with a mist filter and organic vapor cartridge. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA.*Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.*
Other: Wear impervious gloves, boots, aprons, and gauntlets to prevent skin contact.
Ventilation: Provide general and local explosion-proof ventilation systems to maintain airborne concentrations that promote worker safety and productivity. Local exhaust ventilation is preferred since it prevents contaminant dispersion into the work area by controlling it at its source.[103]
Safety Stations: Make available in the work area emergency eyewash stations, safety/quick-drench showers, and washing facilities.
Contaminated Equipment: Never wear contact lenses in the work area: soft lenses may absorb, and all lenses concentrate, irritants. Remove this material from your shoes and equipment. Launder contaminated clothing before wearing.
Comments: Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

Section 9. Special Precautions and Comments

Storage Requirements: Use and storage conditions should be suitable for a OSHA Class II combustible liquid. Store in closed containers in a well-ventilated area away from heat and ignition sources and strong oxidizing agents. Protect containers from physical damage. To prevent static sparks, electrically ground and bond all containers and equipment used in shipping, receiving, or transferring operations. Use nonsparking tools and explosion-proof electrical equipment. No smoking in storage or use areas.
Engineering Controls: Avoid vapor or mist inhalation and prolonged skin contact. Wear protective rubber gloves and chemical safety glasses where contact with liquid or high mist concentration may occur. Additional suitable protective clothing may be required depending on working conditions. Institute a respiratory protection program that includes regular training, maintenance, inspection, and evaluation. Practice good personal hygiene and housekeeping procedures. Do not wear oil contaminated clothing. At least weekly laundering of work clothes is recommended. Do not put oily rags in pockets. When working with this material, wear gloves or use barrier cream.
Transportation Data (49 CFR 172.101)
DOT Shipping Name: Fuel oil
DOT Hazard Class: Combustible liquid
ID No.: NA1993
DOT Label: None
DOT Packaging Exceptions: 173.118a
DOT Packaging Requirements: None

MSDS Collection **References:** 1, 6, 7, 12, 73, 84, 101, 103, 126, 127, 132, 133, 136, 143, 146
Prepared by: MJ Allison, BS; **Industrial Hygiene Review:** DJ Wilson, CIH; **Medical Review:** AC Darlington, MD; **Edited by:** JR Stuart, MS

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1145 Catalyn Street
Schenectady, NY 12303-1836 USA
(518) 377-8854

Material Safety Data Sheets Collection:

Sheet No. 518
Petroleum "Ether", *low boiling*

Issued: 10/83 Revision: A, 6/92

Section 1. Material Identification

38

Petroleum "ether" ***low boiling*** **(varies) Description:** Technically, "ether" is a misnomer since it is not an ether in the chemical sense. A petroleum fractional distillate from coal oil. The low boiling distillate is generally referred to as benzin and consists mostly of hexanes and pentane. In its purest form it is available with less than 8% aromatic content. Used as a universal solvent; extractant for chemicals, fats, waxes, paints, varnishes and furniture polishes; in photography, and as a detergent. Also the source of (by various cracking processes) gasoline, special naphthas, and petro-chemicals such as ethylene. The terminology of the various forms of fractional distillates is confusing since the same name is often used to describe different fractions. Generally, before 1950 the ASTM linked low boiling and high boiling petroleum ethers and all their synonyms as one compound. Methods have since been developed to distinguish between them but today many references still erroneously use the names interchangeably and add to continuing confusion. Toxicologically, the low and high boiling point petroleum ethers are the same and the differences lie in the physical characteristics. Low boiling petroleum "ether" has a lower density, boiling point range, and flash point than its *higher* relative.

R 1
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*chronic effects
† Sec. 8

Other Designations: CAS No. 8030-30-6, Amsco H-J, benzin, benzine, petroleum benzin, petroleum distillates (naphtha, petroleum naphtha).

Manufacturer: Contact your supplier or distributor. Consult latest *Chemical Week Buyers' Guide*[73] for a suppliers list.

Cautions: Benzin is an extremely flammable liquid, take great care when handling this product to avoid a fire situation. Vapor inhalation causes varying degrees of central nervous system (CNS) depression and skin contact with the liquid is irritating.

Section 2. Ingredients and Occupational Exposure Limits

Petroleum "ether" *low boiling*, ca 100%

1991 OSHA PEL
8-hr TWA: 400 ppm (1600 mg/m^3)
as petroleum distillates

1990 NIOSH REL
10 hr TWA: 350 mg/m^3
Ceiling: 1800 mg/m^3
as petroleum distillates

1991-92 ACGIH TLV
None established

1990 DFG (Germany) MAK
None established

1985-86 Toxicity Data*
Human, inhalation: saturated air concentration; produced reversible cerebral edema.[133]
Human, inhalation: 445 to 1250 ppm produced blurred vision, headache, and fatty degeneration of muscle and nerve fibers.[133]
Human, inhalation: 1000 to 2500 ppm/day produced polyneuropathy in 6 to 9 months.[133]
Human, inhalation, LC_{Lo}: 3 pph/5 min; no toxic effects noted
Rat, inhalation, LC_{Lo}: 1600 ppm/6 hr; toxic effects not yet reviewed

* See NIOSH, *RTECS* (DE3030000), for additional toxicity data.

Section 3. Physical Data

Boiling Point Range: 95 to 176 °F (35 to 80 °C)
Melting Point: -99.4 °F (-73 °C)
Molecular Weight: ~77
% Volatile by Volume: 100%
Density: 0.625 to 0.660
Water Solubility: Insoluble
Other Solubilities: Miscible with absolute alcohol, benzene, chloroform, carbon disulfide, carbon tetrachloride, ether, and oils (except castor oil).
Appearance and Odor: Clear, colorless, volatile, nonfluorescent liquid with a characteristic odor.

* Exact values depend on the particular petroleum "ether" cut used. Narrower distillation cuts within this distillation range are frequently used.

Section 4. Fire and Explosion Data

Flash Point: -40 to -50 °F (-40 to -58 °C)	**Autoignition Temperature:** 550 °F (287 °C)	**LEL:** 1.1% v/v	**UEL:** 5.9% v/v

Extinguishing Media: For small fires, use dry chemical, carbon dioxide (CO_2), or "alcohol-resistant" foam. For large fires, use fog, or "alcohol-resistant" foam. Water may be ineffective in fighting fire, use only in absence of other agents.
Unusual Fire or Explosion Hazards: Benzin has a burning rate of 4 mm/min. Container may explode in heat of fire. Vapors may travel to an ignition source and flash back. Vapors pose an explosion hazard indoors, outdoors, and in sewers.
Special Fire-fighting Procedures: Because fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode. Structural firefighters' protective clothing provides only limited protection. If possible without risk, remove container from fire area. Apply cooling water to sides of container until well after fire is out. Stay away from ends of tanks. For massive fire in cargo area, use monitor nozzles or unmanned hose holders; if this is impossible, withdraw from area and let fire burn. Withdraw immediately if you hear a rising sound from venting safety device or notice any tank discoloration due to fire. Do not release runoff from fire control methods to sewers or waterways (explosion hazard).

Section 5. Reactivity Data

Stability/Polymerization: Benzin is stable at room temperature in closed containers under normal storage and handling conditions. It is peroxidizable and may form crystals capable of exploding after 11 months. This liquid is volatile so keep containers tightly closed. Hazardous polymerization cannot occur.
Chemical Incompatibilities: May explode with nitrogen tetroxide; potential violent reaction with strong oxidizers.
Conditions to Avoid: Exposure to heat and ignition sources and contact with incompatibles.
Hazardous Products of Decomposition: Thermal oxidative decomposition of petroleum "ether" *low boiling*, can produce carbon dioxide (CO_2).

Section 6. Health Hazard Data

Carcinogenicity: The IARC,[164] NTP,[142] and OSHA[164] do not list petroleum "ether" as a carcinogen.
Summary of Risks: Petroleum "ether" causes varying degrees of CNS depression depending on concentration and duration of exposure as well as peripheral nerve disorders and skin and respiratory irritation.
Medical Conditions Aggravated by Long-term Exposure: None reported.
Target Organs: CNS, respiratory system, skin and eyes.
Primary Entry Routes: Inhalation, skin and eye contact.

Continue on next page

Section 6. Health Hazard Data, *continued*

Acute Effects: Vapor inhalation can cause rapid breathing, excitability, staggering, headache, fatigue, nausea and vomiting, dizziness, drowsiness, narcosis, and in very high exposures, unconsciousness, convulsions, coma, and death. Aspiration of mists or fine droplets may cause coughing, difficulty breathing, bluish face and lips, nausea and vomiting, potential chemical bronchitis or pneumonia and pulmonary edema (fluid in lungs). Skin contact with the liquid removes oils leading to dryness, irritation, and cracking. Vapors are slightly irritating to the eyes and the liquid is very irritating, causing stinging, watering, and inflammation of lids. Although unlikely, if ingestion occurs, symptoms include gastrointestinal irritation, dizziness, fatigue, loss of consciousness, coma, and death. Hydrocarbon exposures may result in an increased sensitivity of the heart muscle to epinephrine (adrenaline) in the body. This may cause heart rhythm disturbances which could be life threatening.
Chronic Effects: Possible polyneuropathy (abnormal and usually degenerative state of the nerves involving pain, and/or lack of sensation) due to the hexane portion of benzin.
FIRST AID
Eyes: Gently lift eyelids and flush immediately and continuously with flooding amounts of water until transported to an emergency medical facility. Do *not* allow victim to rub or keep eyes tightly shut. Immediately consult a physician.
Skin: *Quickly* remove contaminated clothing. Benzin is volatile and presents an inhalation hazard as well. Rinse with flooding amounts of water for at least 15 min. Wash exposed area with soap and water. For reddened or blistered skin, consult a physician.
Inhalation: Remove exposed person to fresh air and support breathing as needed.
Ingestion: Never give anything by mouth to an unconscious or convulsing person. Contact a poison control center. Unless the poison control center advises otherwise, have that *conscious and alert* person drink 1 to 2 glasses of water to dilute. *Do not induce vomiting!* If vomiting occurs, position head to avoid aspiration of vomitus. If aspirated, benzin should vaporize quickly, thus pneumonitus is less likely than with other petroleum distillates such as kerosine.
After first aid, get appropriate in-plant, paramedic, or community medical support.
Note to Physicians: Significant toxic exposure should warrant cardiac monitoring until fully recovered. A chest x-ray and arterial blood gas monitoring should also be obtained.

Section 7. Spill, Leak, and Disposal Procedures

Spill/Leak: Immediately notify safety personnel, isolate area, deny entry, and stay upwind. Shut off all ignition sources. Cleanup personnel should protect against inhalation and skin contact. For small spills, take up with earth, sand, vermiculite or other absorbent, noncombustible material and place into suitable container. For large spills, dike far ahead of liquid spill for disposal or reclamation. Follow applicable OSHA regulations (29 CFR 1910.120). **Disposal:** Large amounts can be collected and atomized in a suitable combustion chamber. Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.
EPA Designations
Listed as a RCRA Hazardous Waste (40 CFR 261.21): Characteristic of ignitability
Listed as a CERCLA Hazardous Substance* (40 CFR 302.4, "Unlisted Hazardous Waste", Characteristic of ignitability): Final Reportable Quantity (RQ), 100 lb (45.4 kg) [* per RCRA, Sec. 3001]
SARA Extremely Hazardous Substance (40 CFR 355): Not listed
SARA Toxic Chemical (40 CFR 372.65): Not listed
OSHA Designations
Listed as an Air Contaminant (29 CFR 1910.1000, Table Z-1-A, *as Petroleum Distillates*)

Section 8. Special Protection Data

Goggles: Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Because contact lens use in industry is controversial, establish your own policy.
Respirator: Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a NIOSH/MSHA-approved respirator. Select respirator based on its suitability to provide adequate worker protection for given working conditions, level of airborne contamination, and presence of sufficient oxygen. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.* If respirators are used, OSHA requires a respiratory protection program that includes at least: training, fit-testing, periodic environmental monitoring, maintenance, inspection, cleaning, and convenient, sanitary storage areas.
Other: Wear chemically protective gloves, boots, aprons, and gauntlets to prevent repeated and prolonged skin contact. Butyl rubber and polyvinyl chloride *are not* recommended materials. Nitrile rubber and polyvinyl alcohol with breakthrough times of >8 and >4 hr respectively *are* recommended materials for PPG.
Ventilation: Provide general and local exhaust ventilation systems to maintain airborne concentrations below the OSHA PEL (Sec. 2). Local exhaust ventilation is preferred because it prevents contaminant dispersion into the work area by controlling it at its source.[103]
Safety Stations: Make available in the work area emergency eyewash stations, safety/quick-drench showers, and washing facilities.
Contaminated Equipment: Separate contaminated work clothes from street clothes. Launder contaminated work clothing before wearing. Thoroughly decontaminate personal protective equipment.
Comments: Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

Section 9. Special Precautions and Comments

Storage Requirements: Prevent physical damage to containers. Store in cool, dry, well-ventilated area away from heat and incompatibles (Sec. 5). Keep containers tightly closed. Install venting (open flame arrestor or pressure vacuum) during transportation.
Engineering Controls: To reduce potential health hazards, use sufficient dilution or local exhaust ventilation to control airborne contaminants and to maintain concentrations at the lowest practical level.
Administrative Controls: Consider preplacement and periodic medical examinations of exposed workers that emphasize the skin and CNS.

Transportation Data (49 CFR 172.101, .102)
DOT Shipping Name: Naphtha
DOT Hazard Class: Flammable liquid
ID No.: UN2553
DOT Label: Flammable liquid
DOT Packaging Exceptions: 173.118
DOT Packaging Requirements: 173.119

IMO Shipping Name: Naphtha, petroleum; Naphtha, solvent
IMO Hazard Class: 3.2
ID No.: UN1255, UN1256
IMO Label: Flammable Liquid
IMDG Packaging Group: II

***MSDS Collection* References:** 73, 101, 103, 124, 126, 127, 132, 133, 136, 140, 153, 159, 163, 168
Prepared by: M Gannon, BA; **Industrial Hygiene Review:** PA Roy, MPH, CIH; **Medical Review:** W Silverman, MD

Genium Publishing Corporation
One Genium Plaza
Schenectady, NY 12304-4690 USA
(518) 377-8854

Material Safety Data Sheets Collection:
Sheet No. 664
Tetraethyl Lead
Issued: 8/88 Revision: A, 9/92

Section 1. Material Identification

Tetraethyl Lead [$(C_2H_5)_4Pb$] Description: Derived by alkylation of lead-sodium alloy with excess ethyl chloride in a nitrogen atmosphere or electrolysis of an ethyl Grignard reagent with an anode of lead pellets. Used as anti-knock agent in gasoline aviation fuel. Formerly used in organomercury fungicides and in the manufacture of other metal alkyls such as ethyl mercury compounds. Since 1974 its use in gasoline was largely replaced by methyl tert butyl ether [(MTBE), see *Genium* MSDS No. 735] after the USEPA issued regulations requiring its gradual reduction in gasoline. Du Pont was the last known company to produce TEL in the US and stopped production in 1990. There are still US companies with branches in Canada that continue to manufacture tetraethyl lead since it is still widely used in gasoline there and in Europe.

R 3
I 4
S -*
K 1
* Skin absorption

NFPA: 2 / 3 / 3 / –

HMIS
H 3†
F 2
R 3
PPE-Sec. 8
† Chronic effects

Other Designations: CAS No. 78-00-2, TEL, NCI-C54988, tetraethyl plumbane.
Manufacturer: Contact your supplier or distributor. Consult latest *Chemical Week Buyers' Guide*(73) for a suppliers list.
Cautions: Tetraethyl lead is highly toxic to the central nervous system (CNS). The liquid and vapor are easily absorbed through the skin because of TEL's lipid solubility. It is a combustible liquid and can decompose explosively if exposed to air.

Section 2. Ingredients and Occupational Exposure Limits

Tetraethyl lead, ca 98%. Impurities include ethylene dibromide, ethylene dichloride, dye (red, blue, orange), and kerosene.

1991 OSHA PEL (Skin)
8-hr TWA: 0.075 mg/m³

1990 IDLH Level
40 mg/m³

1990 NIOSH REL (Skin)
10-hr TWA: 0.075 mg/m³

1992-93 ACGIH TLV* (Skin)
TWA: 0.1 mg/m³

1990 DFG (Germany) MAK (Skin)
TWA: 0.01 ppm (0.075 mg/m³)
Category II: substances with systemic effects
Half-Life: < 2 hr
Peak Exposure Limit: 0.02 ppm, 30 min average value, 4/shift

1985-86 Toxicity Data†
Human, unreported route, TD_{Lo}: 1.47 mg/kg; toxic effects not yet reviewed.
Rat, oral, LD_{50}: 12.3 mg/kg caused aggression, altered sleep time, and convulsions or effect on seizure threshold.
Rat, inhalation, LC_{50}: 850 mg/m³/1 hr; toxic effects not yet reviewed
Rat, oral, TD_{Lo}: 7.5 mg/kg administered from 12 to 14 days of pregnancy caused post-implantation mortality or effects on the developing fetus.

* Biologic monitoring is essential for personnel control.
† See NIOSH, *RTECS* (TP4550000), for additional reproductive, tumorigenic, and toxicity data.

Section 3. Physical Data

Boiling Point: – 392 °F (200 °C); decomposes
Freezing Point: -214.2 °F (-136.8 °C)
Molecular Weight: 323.45
Specific Gravity: 1.59 at 51.8 °F (11 °C)
Ionization Potential: 11.10 eV
Surface Tension: 28.5 dyne/cm
Viscosity: 0.864 mPa.s at 68 °F (20 °C)
Water Solubility: Insoluble, 0.29 mg/L at 77 °F (25 °C)
Other Solubilities: Soluble in benzene, diethyl ether, gasoline, and petroleum ether. Slightly soluble in alcohol.
Vapor Pressure: 0.2 mm Hg at 68 °F (20 °C); 1 mm Hg at 101.12 °F (38.4 °C)
Saturated Vapor Density (Air = 1.2 kg/m³): – same as air
Relative Evaporation Rate: 0.032 g/m² at 68 °F (20 °C) and wind speed of 4.5 meter /second
Refraction Index: 1.5198 at 68 °F (20 °C/D)

Appearance and Odor: Colorless liquid which may be dyed orange, red, blue or other color and has a slight musty odor.

Section 4. Fire and Explosion Data

Flash Point: 200 °F (93.3 °C), CC; 185 °F (85 °C), OC	**Autoignition Temperature:** None reported	**LEL:** 1.8% v/v	**UEL:** None reported

Extinguishing Media: A Class III B combustible liquid. For small fires, use dry chemical, carbon dioxide, water spray, or regular foam. For large fires, use water spray, fog, or regular foam.
Unusual Fire or Explosion Hazards: Container may explode in heat of fire (> 80 °C). Tetraethyl lead burns as an orange flame with a green margin and gives off extremely poisonous lead fumes.
Special Fire-fighting Procedures: Because fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode. Structural firefighters' protective clothing is not effective for tetraethyl lead fires. Use clothing specifically recommended by manufacturer (be aware that these may or may not provide *thermal* protection). Apply cooling water to sides of fire-exposed containers until well after fire is out. Stay away from ends of tanks. For massive fire in cargo area, use monitor nozzles or unmanned hose holders; if this is impossible, withdraw and let fire burn. Do not release runoff from fire control methods to sewers or waterways. Evacuate 1/3 mile radius if fire becomes uncontrollable.

Section 5. Reactivity Data

Stability/Polymerization: TEL decomposes slowly at room temperature and rapidly at 125 to 150 °C. It also decomposes when exposed to sun or allowed to evaporate in air. Exposure to air for several days can cause explosive decomposition. Hazardous polymerization cannot occur.
Chemical Incompatibilities: TEL solubilizes fatty materials and has solvent action on rubber. It is incompatible with strong oxidizers, sulfuryl chloride, potassium permanganate, and rust.
Conditions to Avoid: Exposure to heat, ignition sources, sunlight, air, strong oxidizers, and other incompatibles.
Hazardous Products of Decomposition: Thermal oxidative decomposition of TEL can produce carbon dioxide (CO_2) and toxic lead (Pb) fumes.

Section 6. Health Hazard Data

Carcinogenicity: The IARC,(164) NTP,(169) and OSHA(164) do not list tetraethyl lead as a carcinogen. One study showed liver and blood tumors (Hodgkins disease) in mice, termed unreliable because these tumors tend to occur spontaneously at times in this particular strain of mice.
Summary of Risks: *Do not* confuse the effects of tetraethyl lead (TEL) with those caused by inorganic lead exposure. TEL is organic and while both are water insoluble, TEL is lipid soluble and easily enters the as brain while inorganic lead compounds can't. Neurologic symptoms are more prevalent than any others. Tetraethyl lead has a latency period from exposure time to onset of symptoms as it must first be metabolized to triethyl lead before toxicity results. The greater the exposure concentration, the faster symptoms develop. TEL's ability to produce chronic toxicity has been debated for years as is the efficacy of chelation therapy. Chronic toxicity was thought not to occur with organic lead compounds because they did not accumulate in the bone like inorganic lead.

Continue on next page

Section 6. Health Hazard Data

Recently, studies showed that TEL is first metabolized to triethyl lead, then over a period of months, converted to inorganic lead which is then deposited in bone. At this point chronic effects could resemble those caused by direct exposure to inorganic lead. If victim survives an acute exposure, recovery may take weeks to months. It is questionable whether all changes are reversible following heavy or long-term exposures. Teratogenic effects may occur; 'a syndrome with severe mental retardation has been seen among children of heavy gasoline sniffers'.[136] **Medical Conditions Aggravated by Long-Term Exposure:** Mental disorders and hypertension. **Target Organs:** CNS, cardiovascular system, eyes, liver, kidneys. **Primary Entry Routes:** Eye, skin, inhalation, ingestion. **Acute Effects:** The primary target organ is the brain, and CNS effects occur in three categories; mild, moderate, and severe. Mild effects include anxiety, irritability, insomnia, lurid dreams, vomiting, metallic taste, paleness, cerebellar ataxia, and diarrhea. Moderate effects are disorientation, hyperexcitability, tremors, chorea (involuntary incoordination of face and limbs), bradycardia (slow heart action), hypotension (abnormally low blood pressure), and hypothermia (lowered body temperature). Severe symptoms include delusions, hallucinations, mania, convulsions, cerebellar edema (fluid in the brain), coma, and death. Ringing in the ears, impaired vision (due to weakening of the eye muscles), elevated liver enzymes, and anemia may also occur. **Chronic Effects:** May occur once TEL is metabolized to inorganic lead. Symptoms include anemia, appetite loss, weakness, insomnia, muscle and joint pain, and colic accompanied by severe abdominal pain. See *Genium* MSDS No. 713.

FIRST AID **Eyes:** *Do not* allow victim to rub or keep eyes tightly shut. Gently lift eyelids and flush immediately and continuously with flooding amounts of water until transported to an emergency medical facility. Consult a physician immediately. **Skin:** *Quickly* remove contaminated clothing. Rinse with flooding amounts of water for at least 15 min. Wash exposed area with soap and water. For reddened or blistered skin, consult a physician. **Inhalation:** Remove exposed person to fresh air and support breathing as needed. **Ingestion:** Never give anything by mouth to an unconscious or convulsing person. Contact a poison control center an unless otherwise advised, have that *conscious and alert* person drink 1 to 2 glasses of water to dilute. Induce vomiting *only* if large amounts are ingested. **Note to Physicians:** Urine lead levels are better indicators of exposure than blood lead levels. Blood lead levels may not reflect exposure until toxicity is severe where as urine directly reflects amount of exposure. In severe acute toxicity, urine lead levels are usually > 350 µg/L but blood levels are < 50 µg/L. Chelation therapy can be useful for chronic exposure but not for acute. If blood levels are greater than 50 µg/dL begin chelation therapy with BAL, calcium EDTA, or D-penicillamine

Section 7. Spill, Leak, and Disposal Procedures

Spill/Leak: Notify safety personnel, isolate and ventilate area, deny entry, and stay upwind. Shut off ignition sources. For small spills, take up with earth, sand, vermiculite or charcoal absorbent (decreases evaporation) and place in suitable containers. Dike far ahead of large spill, neutralize with agricultural (slaked) lime, sodium bicarbonate, or crushed limestone and adjust to pH 7. Investigate reclamation or disposal. Follow applicable OSHA regulations (29 CFR 1910.120). **Ecotoxicity Values:** Bluegill, TLm = 2, 1.4, and 0.2 mg/L at 24, 48, and 96 hr, respectively. **Environmental Degradation:** In the atmosphere, TEL rapidly degrades by reaction with photochemically produced hydroxyl radicals and ozone molecules. The half-life is ~ 1.5 to 5 hr depending on solar intensity. In water, volatilization is expected. Half-life from a model river is 5.3 hr and 3 days in a model pond. It is also subject to hydrolysis and direct photolysis. Some TEL may degrade into dialkyl and trialkyl lead which may be more resistant in water than TEL itself. Bioaccumulation may occur in aquatic organisms. If released to soil, some TEL is expected to degrade to water soluble compounds and leach, although some may volatilize or undergo direct photolysis if exposed to sunlight. **Disposal:** Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.

EPA Designations
Listed (*as lead compounds*) as a SARA Toxic Chemical (40 CFR 372.65)
Listed as a SARA Extremely Hazardous Substance (40 CFR 355), TPQ: 100 lbs
Listed as a RCRA Hazardous Waste (40 CFR 261.33): P110
Listed as a CERCLA Hazardous Substance* (40 CFR 302.4): Final Reportable Quantity (RQ), 10 lb (4.54 kg) [* per RCRA, Sec. 3001 & CWA, Sec. 311 (b)(4)]

OSHA Designations
Listed as an Air Contaminant (29 CFR 1910.1000, Table Z-1-A)

Section 8. Special Protection Data

Goggles: Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Because contact lens use in industry is controversial, establish your own policy. **Respirator:** Seek professional advice *prior to respirator selection and use.* Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a MSHA/NIOSH-approved respirator. For < 0.75 mg/m^3, use any supplied-air respirator (SAR) or SCBA. For <1.875 mg/m^3, use any SAR operated in continuous-flow mode. For <3.75 mg/m^3, use any SCBA or SAR with a full facepiece or a SAR with a tight fitting facepiece operated in continuous-flow mode. For <40 mg/m^3, use any SAR operated in pressure-demand or other positive pressure mode. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.* If respirators are used, OSHA requires a respiratory protection program that includes at least: medical certification, training, fit-testing, periodic environmental monitoring, maintenance, inspection, cleaning, and convenient, sanitary storage areas. **Other:** Wear chemically protective gloves, boots, aprons, and gauntlets to prevent skin contact. *Do not* use rubber as material for PPE (TEL may degrade rubber). **Ventilation:** Provide general and local exhaust ventilation systems to maintain airborne concentrations below OSHA PEL (Sec. 2). Local exhaust ventilation is preferred because it prevents contaminant dispersion into work area by controlling it at the source.[103] **Safety Stations:** Make available in the work area emergency eyewash stations, safety/quick-drench showers, and washing facilities. **Contaminated Equipment:** Separate contaminated work clothes from street clothes and launder before reuse. Remove this material from your shoes and clean PPE. **Comments:** Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

Section 9. Special Precautions and Comments

Storage Requirements: Store in a cool, dry, dark, well-ventilated area (equipped with an automatic sprinkler system) away from heat, ignition sources, and incompatibles (Sec. 5). Keep containers tightly closed; exposure to air can lead to explosive decomposition. **Engineering Controls:** To reduce potential health hazards, use sufficient dilution or local exhaust ventilation to control airborne contaminants and to maintain concentrations at the lowest practical level. Use nonsparking tool for any maintenance procedures. **Administrative Controls:** Consider preplacement and periodic medical exams of exposed workers with emphasis on the CNS, including personality changes. For greater assurance of individual protection, monitor urinary output of exposed workers.

Transportation Data (49 CFR 172.101)

DOT Shipping Name: Tetraethyl lead, liquid
DOT Hazard Class: 6.1
ID No.: NA1649
DOT Packing Group: I
DOT Label: Poison, Flammable liquid
Special Provisions (172.102): —

Packaging Authorizations
a) **Exceptions:** None
b) **Non-bulk Packaging:** 173.201
c) **Bulk Packaging:** None

Quantity Limitations
a) **Passenger Aircraft or Railcar:** Forbidden
b) **Cargo Aircraft Only:** Forbidden

Vessel Stowage Requirements
a) **Vessel Stowage:** E
b) **Other:** 40

MSDS Collection **References:** 23, 73, 89, 101, 103, 124, 126, 127, 132, 136, 140, 148, 149, 153, 159, 162, 163, 164, 167, 174, 175
Prepared by: M Gannon, BA; **Industrial Hygiene Review:** PA Roy, MPH, CIH; **Medical Review:** AC Darlington, MPH, MD

Genium Publishing Corporation
One Genium Plaza
Schenectady, NY 12304-4690 USA
(518) 377-8854

Sheet No. 9
Sulfuric Acid, Concentrated

Issued: 10/77 Revision: D, 9/92

Section 1. Material Identification

Sulfuric Acid Concentrated (H_2SO_4) Description: Prepared by the "Cat-Ox" process; by the contact process (vanadium pentoxide catalyst) with sulfur, pyrite (FeS_2), hydrogen sulfide, or sulfur-containing smelter gases; and from gypsum (calcium sulfate). Sulfuric acid is by far the most widely used industrial chemical. Its uses include: in the manufacture of fertilizers, chemicals, nitrate explosives, parchment paper, glue, dyes and pigments; as an etchant, a lab reagent, an electrolyte in lead/acid batteries, a dehydrating agent in the manufacture of ethers and esters, and an alkylation catalyst; in the purification of petroleum, the refining of mineral and vegetable oils, the leather industry, the carbonization of wool fabrics, the recuperation of fatty acids from soapworks waste water, the production of rayon and film, the extraction of uranium from pitchblende, and pickling of metal; in electroplating baths, gas drying and nonferrous metallurgy; and to obtain glucose by the hydrolysis of cellulose.

R 1
I 3
S 4
K 0

NFPA

HMIS
H 3*
F 0
R 2
PPE†
* Chronic effects
† Sec. 8

Other Designations: CAS No. 7664-93-9, battery acid, BOV, Caswell No 815, dipping acid, electrolyte acid, hydrogen sulfate, matting acid, oil of vitriol, sulphuric acid, vitriol brown oil.

Manufacturer: Contact your supplier or distributor. Consult latest *Chemical Week Buyers' Guide*[73] for a suppliers list.

Cautions: Handle concentrated sulfuric acid with extreme caution because it is corrosive to all body tissues. Vapor inhalation can cause severe lung damage. Skin or eye contact can produce severe burns; blindness may result.

Section 2. Ingredients and Occupational Exposure Limits

Sulfuric acid concentrated, 93-98% sulfuric acid; remainder is water. Impurities include nonvolatiles, 0.02-0.03 ppm; SO_2, 40-80 ppm; iron, 50-100 ppm; nitrate, 5-20 ppm.

1991 OSHA PEL
8-hr TWA: 1 mg/m³

1990 IDLH Level
80 mg/m³

1990 NIOSH REL
TWA: 1 mg/m³

1992-93 ACGIH TLVs
TWA: 1 mg/m³
STEL: 3 mg/m³

1990 DFG (Germany) MAK
TWA: 1 mg/m³
Category: Local irritants
Peak: 2 mg/m³, 5 min, momentary value †, 8 peaks per shift

1985-86 Toxicity Data*
Human, inhalation, TC_{Lo}: 3 mg/m³ for 24 weeks; toxic effects not yet reviewed.
Man, unreported route, LD_{Lo}: 135 mg/kg; toxic effects not yet reviewed.
Rat, oral, LD_{50}: 2140 mg/kg; toxic effects not yet reviewed.
Rabbit, eye: 100 mg rinse produced severe irritation.

* See NIOSH, *RTECS* (WS5600000), for additional toxicity data.
† The momentary value is a level which the concentration should never exceed.

Section 3. Physical Data

Boiling Point: 554 °F (290 °C); decomposes at 644 °F (340 °C) into sulfur trioxide and water.
Melting Point (100%): 50.65 °F (10.36 °C)
Vapor Pressure: <0.001 mm Hg at 20 °C
Saturated Vapor Density (air = 1.2 kg/m³): 1.2 kg/m³, 0.075 lbs/ft³
pH: 1 N sol = 0.3, 0.1 N sol = 1.2, 0.01 N sol = 2.1

Molecular Weight: 98.08
Density/Specific Gravity (96-98%): 1.841
Water Solubility: Soluble; reacts!*
Other Solubilities: Ethyl alcohol
Odor Threshold: 0.150 ppm

Appearance and Odor: Colorless (pure) to dark brown (impure), odorless, dense, oily liquid. Pure compound is a solid below 51 °F (11 °C).

* Sulfuric acid reacts violently with water with the evolution of heat. *Always add the acid to water or other diluent, not the water to acid!*

Section 4. Fire and Explosion Data

Flash Point: Not combustible	Autoignition Temperature: None reported	LEL: None reported	UEL: None reported

Extinguishing Media: Use extinguishing media appropriate to surrounding fire. Only use water if absolutely necessary and use with great caution. Water applied directly to sulfuric acid results in violent heat liberation and splattering of the material. Use water spray only to keep fire-exposed containers cool. **Unusual Fire or Explosion Hazards:** Sulfuric acid, a strong dehydrating agent, reacts with organic materials and produces enough heat ignition, chars wood, and may cause ignition of finely divided materials on contact. Reaction with metals may produce highly flammable, hydrogen gas. **Special Fire-fighting Procedures:** Because fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode. Structural firefighter's protective clothing is *not* effective. Stay away from ends of tanks. Do not release runoff from fire control methods to sewers or waterways.

Section 5. Reactivity Data

Stability/Polymerization: Sulfuric acid is stable at room temperature in closed containers under normal storage and handling conditions. Hazardous polymerization cannot occur. **Chemical Incompatibilities:** Include acetic acid; acetone cyanohydrin; (acetone + nitric acid); (acetone + potassium dichromate); acetonitrile; acrolein; acrylonitrile; acrylonitrile + water; (alcohol + hydrogen peroxide); allyl alcohol; allyl chloride; ammonium hydroxide; 2-amino ethanol; ammonium; triperchromate; aniline; (bromates + metals); bromine pentafluoride; *n*-butyraldehyde; carbides; cesium acetylene carbide; chlorates; (chlorates + metals); chlorine trifluoride; chlorosulfonic acid; cuprous nitride; diisobutylene; (dimethylbenzylcarbinol + hydrogen peroxide); epichlorohydrin; ethylene cyanohydrin; ethylene diamine; ethylene glycol; ethylene imine; fulminates; hydrochloric acid; hydrogen; iodine heptafluoride; (indene + nitric acid); iron; isoprene; lithium silicide; mercuric nitride; mesityl oxide; powdered metals; (nitric acid + glycerides); *p*-nitrotoluene; pentasilver trihydroxydiaminophosphate; perchlorates; perchloric acid; (permanganates + benzene); (1-phenyl-2-methylpropryl alcohol + hydrogen peroxide); phosphorus; phosphorus isocyanate; picrates; potassium *tert*-butoxide; potassium chlorate; (potassium permanganate + potassium chloride); (potassium permanganate + water); beta-propiolactone; propylene oxide; pyridine; rubidium acetylene carbide; silver permanganate; sodium; sodium carbonate; sodium chlorate; sodium hydroxide; steel; styrene monomer; (toluene + nitric acid); vinyl acetate; and water. **Conditions to Avoid:** Water, combustibles, heat, ignition sources, and other incompatibles. **Hazardous Products of Decomposition:** Thermal oxidative decomposition of sulfuric acid can produce sulfur oxides.

Section 6. Health Hazard Data

Carcinogenicity: The IARC,[164] NTP,[169] and OSHA[164] do not list sulfuric acid as a carcinogen. However, a number of studies have associated exposures to sulfuric acid or to acid mists in general with laryngeal cancer. In 50 confirmed cases there was an approximately four-fold increased risk among highly exposed individuals relative to matched controls. It is not known if sulfuric acid can act as a direct carcinogen, as a promoter, or in combination with other substances.[167] **Summary of Risks:** Concentrated sulfuric acid is a severe respiratory tract, skin, and eye irritant.

Continue on next page

Section 6. Health Hazard Data, *continued*

Exposure can result in severe burns, tissue damage, scarring, functional inhibition, and blindness if splashed in the eye. Although ingestion is unlikely, it may cause severe injury and death. **Medical Conditions Aggravated by Long-Term Exposure:** Chronic respiratory, gastrointestinal, nervous, skin or eye diseases. **Target Organs:** Respiratory system, eyes, skin, and teeth. **Primary Entry Routes:** Inhalation, skin and eye contact. **Acute Effects:** Vapor or mist inhalation causes coughing, sneezing, nose irritation and nose bleeds, reflex bronchospasm, shortness of breath, pulmonary edema (fluid in lungs), emphysema, and permanent changes in pulmonary function. Ingestion causes corrosion of the mucous membranes of mouth, throat, and esophagus; and epigastric pain with nausea and vomiting of mucoid and "coffee ground" material. Skin contact produces severe burns; initially the zone of contact is bleached and turns brown prior to the formation of a clearly defined ulcer. These wounds are slow in healing and may cause extensive scarring that results in functional inhibition. If burns are extensive, the outcome may prove fatal. Circulatory collapse with clammy skin, weak and rapid pulse, shallow respirations, and scanty urine may follow ingestion or skin contact. Circulatory shock is often the immediate cause of death. Eye contact produces deep corneal ulceration, kerato-conjunctivitis, palpebral lesions, and possible blindness. **Chronic Effects:** Chronic effects may include dental erosion, conjunctivitis, tracheobronchitis, emphysema, stomatitis (inflammation of the mouth mucous membranes), gastritis (inflammation of stomach mucous membranes), and dermatitis. **FIRST AID Eyes:** *Do not* allow victim to rub or keep eyes tightly shut. Gently lift eyelids and flush immediately and continuously with flooding amounts of water until transported to an emergency medical facility. Consult an ophthalmologist immediately. **Skin:** *Quickly* remove contaminated clothing. Rinse with flooding amounts of water for at least 15 min. Use a 2% sodium bicarbonate solution to further neutralize any H_2SO_4 on the skin. Wash exposed area with soap and water. For reddened or blistered skin, consult a physician. **Inhalation:** Remove exposed person to fresh air and support breathing as needed. **Ingestion:** Never give anything by mouth to an unconscious or convulsing person. Contact a poison control center. Unless otherwise advised, have that *conscious and alert* person drink 1 to 2 glasses of water or milk to dilute. *Do not* induce vomiting! Do not attempt to neutralize the acid with sodium bicarbonate. **Note to Physicians:** Monitor arterial blood gases, chest x-ray, and pulmonary function tests if respiratory tract irritation or respiratory depression is evident. Treat dermal irritation or burns with standard topical therapy.

Section 7. Spill, Leak, and Disposal Procedures

Spill/Leak: Notify safety personnel of spill, evacuate all unnecessary personnel, remove all ignition sources, and provide adequate ventilation. Cleanup personnel should wear fully-encapsulating, vapor-protective clothing to protect against inhalation and skin or eye contact. Keep water and combustibles away from release. Stop or control leak if this can be done without undue risk. Neutralize small spills with sodium bicarbonate or a mixture of soda ash/slaked lime (50/50) and place into sealed containers for disposal. If a neutralizing agent is not available, absorb spilled sulfuric acid with vermiculite, dry sand, or earth. *Never* use organic material (e.g., sawdust) to absorb spill. For large spills, dike far ahead to contain for later disposal. Follow applicable OSHA regulations (29 CFR 1910.120). Report any release in excess of 1000 lbs. **Disposal:** Contact your supplier or a licensed contractor for detailed recommendations. Neutralize waste water pH between 5.5 and 8.5. Follow applicable Federal, state, and local regulations.

Aquatic Toxicity: LC_{50} (saltwater, prawns): 42.5 ppm for 48 hrs; lethal (freshwater, bluegill): 24.5 ppm/24 hr.

EPA Designations

Listed as a RCRA Hazardous Waste (40 CFR 261.33): Characteristic of corrosivity
Listed as a CERCLA Hazardous Substance* (40 CFR 302.4): Final Reportable Quantity (RQ), 1000 lb (454 kg) [* per CWA, Sec. 311(b)(4)]
Listed as a SARA Extremely Hazardous Substance (40 CFR 355), TPQ: 1000 lbs.
Listed as a SARA Toxic Chemical (40 CFR 372.65)

OSHA Designations

Listed as an Air Contaminant (29 CFR 1910.1000, Table Z-1-A)

Section 8. Special Protection Data

Goggles: Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Because contact lens use in industry is controversial, establish your own policy. **Respirator:** Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a MSHA/NIOSH-approved respirator. For concentrations < 25 mg/m^3 use any powered, air-purifying respirator with acid gas cartridge(s) in combination with a high-efficiency particulate filter. For concentrations < 50 mg/m^3, use any chemical cartridge respirator with a full facepiece and acid gas cartridge(s) in combination with a high-efficiency particulate filter. For concentrations < 80 mg/m^3, use any supplied air-respirator with a full facepiece and operated in pressure-demand or other positive-pressure mode. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. If respirators are used, OSHA requires a respiratory protection program that includes at least: medical certification, training, fit-testing, periodic environmental monitoring, maintenance, inspection, cleaning, and convenient, sanitary storage areas. **Other:** Wear chemically protective gloves, boots, aprons, and gauntlets to prevent skin contact. H_2SO_4 has a minor to moderate effect on neoprene or rubber.[131] **Ventilation:** Provide general and local exhaust ventilation systems to maintain airborne concentrations below the OSHA PEL (Sec. 2). Local exhaust ventilation is preferred because it prevents contaminant dispersion into the work area by controlling it at its source.[103] **Safety Stations:** Make available in the work area emergency eyewash stations, safety/quick-drench showers, and washing facilities. **Contaminated Equipment:** Separate contaminated work clothes from street clothes and launder before reuse. Remove this material from your shoes and clean personal protective equipment. **Comments:** Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

Section 9. Special Precautions and Comments

Storage Requirements: Store in clearly labelled, steel containers in a cool [below 50 °F (10 °C)], dry, well-ventilated location on an acid-resistant cement floor and away from direct sunlight, combustibles, and other reactive materials. Separate from carbides, chlorates, fulminates, nitrates, picrates, and powdered metals. Protect storage containers against damage and water. Use non-sparking tools near sulfuric acid carboys, drums, tank cars, or metal storage tanks because of the possible production of hydrogen during storage. Use hand pumps for the decanting and emptying of carboys. **Engineering Controls:** To reduce potential health hazards, use sufficient dilution or local exhaust ventilation to control airborne contaminants and to maintain concentrations at the lowest practical level. Total enclosures of processes and the mechanization of handling procedures are the most effective measures to prevent contact with sulfuric acid. Protect electrical installations against the corrosive action of acid vapors. **Administrative Controls:** Consider preplacement and periodic physical examinations with emphasis on the respiratory tract (including pulmonary function tests), skin, eyes, and teeth.

Transportation Data (49 CFR 172.101)

DOT Shipping Name: Sulfuric acid
DOT Hazard Class: 8
ID No.: UN1830
DOT Packaging Group: II
DOT Label: Corrosive
Special Provisions (172.102): A3, A7, B2, B83, B84, N34, T9, T27

Packaging Authorizations
a) Exceptions: 173.154
b) Non-bulk Packaging: 173.202
c) Bulk Packaging: 173.242

Quantity Limitations
a) Passenger, Aircraft, or Railcar: 1L
b) Cargo Aircraft Only: 30L

Vessel Stowage Requirements
a) Vessel Stowage: C
b) Other: 14

MSDS Collection **References:** 26, 73, 89, 100, 101, 103, 124, 126, 127, 131, 132, 139, 140, 148, 149, 153, 159, 163, 164, 167, 171, 174, 180
Prepared by: MJ Wurth, BS; **Industrial Hygiene Review:** DJ Wilson, CIH; **Medical Review:** AC Darlington, MPH

Genium Publishing Corporation
One Genium Plaza
Schenectady, NY 12304-4690 USA
(518) 377-8854

Material Safety Data Sheets Collection:

Sheet No. 7
Nitric Acid

Issued: 10/88 Revision: D, 9/92

Section 1. Material Identification

Nitric Acid (HNO_3) Description: A solution of nitrogen dioxide in water commercially available in many concentrations. Derived by oxidation of ammonia by catalytic process (heated platinum catalyst); or by direct synthesis, combining atmospheric nitrogen and oxygen in an electric arc (an expensive process, thus largely abandoned). HNO_3 is usually found in conjunction with nitrogen dioxide, which is considered more hazardous. Used in fertilizer production (ammonium nitrate), in photoengraving, steel etching, explosives (TNT, nitroglycerin, trinitrophenol); manufacture of metallic nitrates, sulfuric acid, aqua regia and oxalic acid, jewelry, various dyes and dyestuffs, pharmaceuticals; as a laboratory reagant, in metallurgy (*mainly* as a pickling agent) and the printing industy.
Other Designations: CAS No. 7697-37-2, aqua fortis, aqua regia, azotic acid, engravers nitrate, hydrogen nitrate, red fuming nitric acid (RFNA), white fuming nitric acid (WFNA).
Manufacturer: Contact your supplier or distributor. Consult latest *Chemical Week Buyers' Guide*(73) for suppliers list.

Cautions: Nitric acid is a corrosive, strong oxidizer that causes irritation or severe burns to the skin, eyes, and respiratory tract. Exposures to high levels of the concentrated acid can be fatal. Increases the flammability of combustibles. Use extreme caution when handling HNO_3.

R	2	HMIS			NFPA
I	4	H	3*	*Fuming* nitric acid	0 / 3 / 1 / ox
S	4	F	0		
K	0	R	1		
		PPE**			

R	2	HMIS			
I	4	H	3*	>40% nitric acid	0 / 3 / 0 / ox
S	4	F	0		
K	0	R	1		
		PPE**			

R	2	HMIS			
I	3	H	3*	≤40% nitric acid	0 / 3 / 0 / –
S	3	F	0		
K	0	R	0		
		PPE**			

* Chronic effects ** See Sec. 8

Section 2. Ingredients and Occupational Exposure Limits

Nitric acid, various %. Commercially available in nearly all concentrations; most common are 56 and 68%. RFNA (85%), WFNA (97.5%).

1991 OSHA PELs
8-hr TWA: 2 ppm (5 mg/m³)
15-min STEL: 4 ppm (10 mg/m³)

1990 IDLH Level
100 ppm

1990 NIOSH REL
8-hr TWA: 2 ppm (5 mg/m³)
15-min STEL: 4 ppm (10 mg/m³)

1992-93 ACGIH TLVs
TWA: 2 ppm (5.2 mg/m³)
STEL: 4 ppm (10 mg/m³)

1990 DFG (Germany) MAK
2 ppm (5 mg/m³)
Category I: local irritants
Peak Exposure Limit: 2 ppm
5 min momentary value, 8 per shift

1985-86 Toxicity Data*
Man, unreported route, LD_{Lo}: 110 mg/kg; toxic effects not yet reviewed
Rat, oral, TD_{Lo}: 5275 g/kg administered from 1 to 21 days of pregnancy caused post-implantation mortality and specific developmental abnormalities of the musculoskeletal system.
Rat, inhalation, LC_{50}: 67 ppm (NO_2)/4 hr; toxic effects not yet reviewed

* See NIOSH, *RTECS* [QU5775000 (nitric acid), QU5900000 (RFNA), QU6000000 (WFNA)] , for additional reproductive and toxicity data.

Section 3. Physical Data

Boiling Point: 186.8 °F (86 °C)
Melting Point: -43.6 °F (-42 °C)
Vapor Pressure: 67% HNO_3 = 6.8 mm Hg at 68 °F (20 °C); 95 to 98% = 113 at 100.4 °F (38 °C)
Saturated Vapor Density (Air = 1.2 kg/m³): 1.212 kg/m³ or 0.0757 lb/ft³ (67 % HNO_3)
pH: 1

Molecular Weight: 63.02
Density: 1.50269 at 77/39.2 °F (25/4 °C)
Water Solubility: Soluble (releases heat)
Ionization Potential: 11.95 eV

Appearance and Odor: Transparent, clear to yellow, fuming liquid with an acrid, suffocating odor which darkens to a brownish color on aging and exposure to light. "Fuming" nitric acid is red-brown in color.

Section 4. Fire and Explosion Data

Flash Point: Noncombustible	Autoignition Temperature: Noncombustible	LEL: None reported	UEL: None reported

Extinguishing Media: For small fires (< 40% HNO_3), use dry chemical, carbon dioxide (CO_2), water spray, or regular foam. For large fires, use water spray, fog, or regular foam. For small fires (> 40% HNO_3), use water spray, dry chemical, or soda ash. For large fires, flood area with water (*do not* get inside HNO_3 containers). Apply water from as far a distance as possible.
Unusual Fire or Explosion Hazards: HNO_3 is noncombustible but is an oxidizer which increases fire involving combustibles and can initiate an explosion. It releases flammable hydrogen gas in contact with many metals.
Special Fire-fighting Procedures: Because fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode. Structural firefighters' protective clothing is not effective for fires involving nitric acid. Acid-resistant clothing is needed. Apply cooling water to sides of containers until well after fire is out. Stay away from ends of tanks. For massive fire in cargo area, use monitor nozzles or unmanned hose holders; if impossible, withdraw from area and let fire burn. *Do not* release runoff from fire control methods to sewers or waterways.

Section 5. Reactivity Data

Stability/Polymerization: Nitric acid decomposes in air and in contact with light and organic matter. Hazardous polymerization cannot occur.
Chemical Incompatibilities: Nitric acid reacts explosively with combustibles, organics or readily oxidizable materials such as wood, turpentine, metal powder and hydrogen sulfide, carbides, cyanides, and alkalies; causes spattering with strong bases; is corrosive to paper, cloth and most metals (except aluminum, gold, platinum, thorium, and tantalum. Will also attack some forms of plastics, rubber, and coatings. There are at least 150 chemicals and chemical combinations which are incompatible with nitric acid. HNO_3 reacts with water to produce heat and toxic corrosive fumes. Refer to *Genium* references 126 and 159 for further detail. **Conditions to Avoid:** Avoid exposure to moisture, heat, and incompatibles.
Hazardous Decomposition Products: Thermal oxidative decomposition of HNO_3 produces nitrogen peroxide and toxic, irritating nitrogen oxides.

Section 6. Health Hazards Data

Carcinogenicity: The IARC,(164) NTP,(169) and OSHA(164) do not list nitric acid as a carcinogen.
Summary of Risks: Nitric acid is very corrosive to the skin, eyes, digestive and respiratory tract or any tissue it comes in contact with. 58 to 68% (nitric acid) vapors are moderately irritating and can't be tolerated at high concentrations. 95% (nitric acid) vapors cause severe irritation at very low levels and the liquid causes 2nd and 3rd degree burns on short contact with skin or eyes. Vapor inhalation may cause pulmonary edema (fluid in lungs) leading to death. HNO_3 vapor or mist can slowly corrode teeth when chronically exposed. **Medical Conditions Aggravated by Long-Term Exposure:** Chronic respiratory diseases. **Target Organs:** Eyes, skin, respiratory tract, teeth.

Continue on next page

Section 6. Health Hazard Data, continued

Primary Entry Routes: Inhalation, ingestion, skin and eye contact. **Acute Effects:** Inhalation symptoms may take several hours and include throat and nose irritation, cough, chest pain, difficulty breathing, salivation, giddiness, nausea, muscular weakness, ulceration of nasal mucous membranes, pulmonary edema, and chemical pneumonia. Skin contact is moderately irritating to severely corrosive depending on % of nitric acid. Burns may penetrate deeply causing ulcers. Skin may be stained yellowish brown. Dilute solutions cause irritation and tend to harden the epithelium (outer skin layer) without destroying it. HNO_3 liquid causes yellow discoloration of the eyes and severe burns which may result in permanent damage, i.e., sight loss. Ingestion produces immediate pain and digestive tract burns followed by throat swelling, convulsions, risk of stomach perforation (causing a rigid abdomen) and possible coma. **Chronic Effects:** Repeated inhalation of low concentrations may cause chronic bronchitis, tooth erosion, and/or appetite loss. Repeated exposure to $NO_{(g)}$ such as produced by thermal decomposition of HNO_3 is implicated in chronic lung diseases.

FIRST AID

Eyes: *Do not* allow victim to rub or keep eyes tightly shut. Gently lift eyelids and flush immediately and continuously with flooding amounts of water until transported to an emergency medical facility. Consult a physician immediately. **Skin:** *Quickly* remove contaminated clothing (*do not force removal if stuck to skin*). Rinse with flooding amounts of water for at least 15 min. Apply a 5% triethanolamine solution to affected area. Wash exposed area with soap and water. For reddened or blistered skin, consult a physician. **Inhalation:** Remove exposed person to fresh air and support breathing as needed. **Ingestion:** Never give anything by mouth to an unconscious or convulsing person. Contact a poison control center. Unless the poison control center advises otherwise, have that *conscious and alert* person drink 1 to 2 glasses of water to dilute followed by lime milk or milk of magnesia. Do not induce vomiting. *Do not* give sodium bicarbonate or attempt to neutralize the acid.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: Observe for several hours since symptoms such as pulmonary edema may be delayed.

Section 7. Spill, Leak, and Disposal Procedures

Spill/Leak: Immediately notify safety personnel, isolate and ventilate area, deny entry, and stay upwind. Cleanup personnel should wear fully-encapsulating vapor-protective clothing. Use water spray to cool and disperse vapor. Keep combustibles away from spilled material. For small spills, take up with earth, sand, vermiculite, or other absorbent, noncombustible material and place in dry containers for disposal. For large spill, flush with water to containment area and neutralize with agricultural (slaked) lime, sodium bicarbonate, crushed limestone, soda ash, or lime. Report any release in excess of 1000 lb. Control runoff and dike for disposal. Follow applicable OSHA regulations (29 CFR 1910.120).

Disposal: Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.

EPA Designations

Listed as a SARA Toxic Chemical (40 CFR 372.65)
Listed as a SARA Extremely Hazardous Substance (40 CFR 355), TPQ: 1000 lb
Listed as a RCRA Hazardous Waste (40 CFR 261.22): No. D001, Characteristic of corrosivity
Listed as a CERCLA Hazardous Substance* (40 CFR 302.4): Final Reportable Quantity (RQ), 1000 lb (454 kg) [* per CWA, Sec. 311(b)(4)]

OSHA Designations

Listed as an Air Contaminant (29 CFR 1910.1000, Table Z-1-A)
Listed as a Process Safety Hazardous Chemical (29 CFR 1910.119), TQ: 500 lb

Section 8. Special Protection Data

Goggles: Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Because contact lens use in industry is controversial, establish your own policy. **Respirator:** Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a MSHA/NIOSH-approved respirator. Select respirator based on its suitability to provide adequate worker protection for given working conditions, level of airborne contamination, and presence of sufficient oxygen. For < 50 ppm, use any supplied-air respirator operated in a continuous-flow mode. For < 100 ppm, use any supplied-air respirator or SCBA with a full facepiece. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.* If respirators are used, OSHA requires a written respiratory protection program that includes at least: medical certification, training, fit-testing, periodic environmental monitoring, maintenance, inspection, cleaning, and convenient, sanitary storage areas. **Other:** Wear acid-proof gloves, boots, aprons, and gauntlets to prevent skin contact. **Ventilation:** Provide general and local exhaust ventilation systems to maintain airborne concentrations below OSHA PELs (Sec. 2). Local exhaust ventilation is preferred because it prevents contaminant dispersion into the work area by controlling it at its source.[103] **Safety Stations:** Make available in the work area emergency eyewash stations, safety/quick-drench showers, and washing facilities. **Contaminated Equipment:** Separate contaminated work clothes from street clothes. Launder contaminated work clothing before wearing. Remove this material from your shoes and clean personal protective equipment. **Comments:** Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

Section 9. Special Precautions and Comments

Storage Requirements: Prevent physical damage to containers. Store in aluminum, stainless steel, or glass containers on a cement floor in a cool, dry, well-ventilated area away from incompatibles (Sec. 5). Dike around storage tanks with large kirbs or stills to retain the acid in event of leakage. Keep neutralization agents on hand and install a fire hydrant in storage area. (See NFPA Code 43A). **Engineering Controls:** To reduce potential health hazards, use sufficient dilution or local exhaust ventilation to control airborne contaminants and to maintain concentrations at the lowest practical level. **Administrative Controls:** Consider preplacement and periodic medical exams of exposed workers that emphasize the eyes, skin, respiratory tract and teeth. Pulmonary function tests (FEV< FVC) are helpful. Educate workers about the hazardous properties of nitric acid.

Transportation Data (49 CFR 172.101)

DOT Shipping Name: *, †, ‡, §, ¥, ψ, ϕ
DOT Hazard Class: 8
ID No.: UN1826 (*†), UN1796 (‡§), UN2031 (¥ψ), UN2032 (ϕ)
DOT Packing Group: I (†§¥ϕ), II (*‡ψ)
DOT Packaging Label: Corrosive (*‡¥ψ), Corrosive, Oxidizer (†§), Corrosive, Oxidizer, Poison (ϕ)
Special Provisions (172.102): B2, T12, T27 (*); T12, T27 (†); B2, T12, T27 (‡); T12, T27 (§); B12, B53, T9, T27 (¥); B2, B12, B53, T9, T27(ψ); 2, B9, B32, B74, T38, T43, T45(ϕ)

Packaging Authorizations
a) Exceptions: None
b) Non-bulk Packaging: 173.158 (*†‡§¥ψ), 173.227 (ϕ)
c) Bulk Packaging: 173.242 (*‡ψ), 173.243 (†§¥), 173.244(ϕ)

Quantity limitations
a) Passenger Aircraft or Railcar: Forbidden
b) Cargo Aircraft Only: 30L (*‡ψ), 2.5L (†§¥), Forbidden (ϕ)

Vessel Stowage Requirements
a) Vessel stowage: D
b) Other: 40(*); 40, 66, 89 (†); 40 (‡); 40, 66, 89 (§); 110, 111 (¥); 110, 111 (ψ); 40, 66, 74, 89, 90, 95 (ϕ)

* Nitrating acid mixtures spent, < 50% HNO_3
† Nitrating acid mixtures spent, > 50% HNO_3
‡ Nitrating acid mixtures, < 50% HNO_3
§ Nitrating acid mixtures, > 50% HNO_3
¥ Nitric acid other than red fuming, > 70% HNO_3
ψ Nitric acid other than red fuming, < 70% HNO_3
ϕ Nitric acid, red fuming.

***MSDS Collection* References:** 26, 73, 89, 100, 101, 103, 124, 126, 127, 132, 136, 139, 140, 148, 149, 153, 159, 162, 163, 164, 167, 168, 171, 174, 175
Prepared by: M Gannon, BA; **Industrial Hygiene Review:** PA Roy, MPH, CIH; **Medical Review:** W Silverman, MD

Genium Publishing Corporation
1145 Catalyn Street
Schenectady, NY 12303-1836 USA
(518) 377-8854

Material Safety Data Sheets Collection:

Sheet No. 8
Phosphoric Acid

Issued: 3/83 Revision: C, 4/90

Section 1. Material Identification

Phosphoric Acid Description: Obtained commercially by: 1) the action of sulfuric acid or hydrochloric acid in combination with tributylphosphate extraction on phosphate rock and 2) heating phosphate rock, silica, and coke in an electric furnace, burning the elemental phosphate produced, and then hydrating the phosphoric oxide. Used to manufacture fertilizers, detergents, foods, beverages, gelatin, animal feeds, yeasts, waxes and polishes; in pharmaceuticals, water treatment, and electropolishing; as a catalyst for ethanol manufacture; as a soil stabilizer; as a binder for ceramics; as a laboratory reagent; for pickling and rust-proofing metals; in dental cements; to coagulate rubber latex; and to purify hydrogen peroxide.

Other Designations: CAS No. 7664-38-2; H_3PO_4;* orthophosphoric acid; phosphoric acid, liquid (DOT); phoshoric acid, solid (DOT).

Manufacturer: Contact your supplier or distributor. Consult the latest *Chemicalweek Buyers' Guide*[7] for a suppliers list.

* In industrial practice, phosphoric anhydride (P_2O_5) is shipped for phosphoric acid. The addition of water yields phosphoric acid.

R 1
I 3
S 3
K 0

NFPA
0
2 0
-

HMIS
H 2
F 0
R 0
PPG†
† Sec. 8

Section 2. Ingredients and Occupational Exposure Limits

Phosphoric acid, ca 100%

OSHA PELs
8-hr TWA: 1 mg/m³
STEL: 3 mg/m³

ACGIH TLVs, 1989-90
TWA: 1 mg/m³
STEL: 3 mg/m³

NIOSH REL, 1987
1 mg/m³

Toxicity Data*
Rat, oral, LD_{50}: 1530 mg/kg
Rabbit, skin, LD_{50}: 2740 mg/kg
Man, unreported route, LD_{Lo}: 220 mg/kg

* See NIOSH, *RTECS* (TB6300000), for additional irritative and toxicity data.

Section 3. Physical Data

Boiling Point: 502 °F/261 °C
Melting Point: 108.23 °F/42.35 °C
Vapor Pressure: 0.0285 mm Hg at 68 °F/20 °C
Viscosity at 68 °F/20 °C: 140

Molecular Weight: 98 g/mol
Water Solubility: Completely soluble
pH (0.1 N in H_2O): 1.5
Specific Gravity (H_2O = 1 at 39 °F/4 °C): 1.834 at 64.4 °F/18 °C

Appearance and Odor: Viscous, water-white, odorless liquid.

Section 4. Fire and Explosion Data

Flash Point: None reported	Autoignition Temperature: None reported	LEL: None reported	UEL: None reported

Extinguishing Media: Use water to extinguish phosphoric acid fires. Otherwise, use extinguishing media appropriate for surrounding fire. If water is used, use it abundantly to control heat and acid buildup.

Unusual Fire or Explosion Hazards: Phosphoric acid is noncombustible, but contact with common metals may liberate hydrogen, a flammable gas that readily forms explosive mixtures with air.

Special Fire-fighting Procedures: Phosphoric acid is hazardous in a fire situation. Since toxic vapors may form, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in the pressure-demand or positive-pressure mode. Avoid skin and eye exposure to splashes and mists of phosphoric acid. Cool fire-exposed containers and sealed tanks with water spray to avoid rupture from heat-generated pressure. Be aware of runoff from fire control methods. Do not release to sewers or waterways.

Section 5. Reactivity Data

Stability/Polymerization: Phosphoric acid is stable at room temperature in closed containers under normal storage and handling conditions. Violent polymerization can occur with epoxides, azo compounds, and polymerizable compounds.

Chemical Incompatibilities: This material is a strong acid that reacts with alkalis (bases) to form phosphate salts and is corrosive (especially when hot) to many metals and alloys. It liberates explosive hydrogen gas when reacting with chlorides and stainless steel, and can react violently with sodium tetrahydroborate. Exothermic reactions with aldehydes, amines, amides, alcohols and glycols, azo-compounds, carbamates, esters, caustics, phenols and cresols, ketones, organophosphates, epoxides, explosives, combustible materials, unsaturated halides, and organic peroxides. Phosphoric acid forms flammable gases with sulfides, mercaptans, cyanides, and aldehydes. It also forms toxic fumes with cyanides, sulfides, fluorides, organic peroxides, and halogenated organics. Hot, dilute phosphoric acid reacts with nickel carbonate to form trinickel orthophosphate. Mixtures with nitromethane are explosive.

Hazardous Products of Decomposition: Thermal oxidative decomposition of phosphoric acid can produce toxic phosphorous oxide (PO_x) fume

Section 6. Health Hazard Data

Carcinogenicity: Neither the NTP, IARC, nor OSHA lists phosphoric acid as a carcinogen.
Summary of Risks: Phosphoric acid mist is a corrosive irritant to eyes, skin, mucous membranes, and the upper respiratory tract. Concentrated solutions are moderately toxic by ingestion and skin contact.
Medical Conditions Aggravated by Long-Term Exposure: None reported.
Target Organs: Respiratory system, eyes, skin.
Primary Entry Routes: Inhalation of mist, ingestion, skin and eye contact.
Acute Effects: Mist inhalation may cause coughing, sneezing, salivation, and difficult breathing. Severe exposures may lead to chemical pneumonitis. Phosphoric acid is irritating on contact with any body tissue, but burning may not be immediate upon skin contact. Ingestion can produce vomiting, abdominal pain, shock, bloody diarrhea, and severe gastrointestinal damage.
Chronic Effects: Phosphoric acid may cause dermatitis and chronic respiratory disease with repeated exposure.
FIRST AID
Eyes: Flush immediately, including under the eyelids, gently but thoroughly with flooding amounts of running water for at least 15 min. If irritation and pain persist, consider an opthalmologic examination.
Skin: *Quickly* remove contaminated clothing. After rinsing affected skin with flooding amounts of water for at least 15 min, wash it with soap and water. Treat burns with standard topical therapy. If pain and irritation persist, consult a physician.
Inhalation: Remove exposed person to fresh air and support breathing as needed.
Ingestion: Never give anything by mouth to an unconscious or convulsing person. If ingested, have a *conscious* person drink several glasses of water or milk, then give milk of magnesia or aluminum hydroxide gel. *Never induce vomiting.* If vomiting occurs, give more milk.
After first aid, get appropriate in-plant, paramedic, or community medical support.
Physician's Note: Gastric lavage should not be routine for ingestions. Carefully weigh its benefits—based on amount ingested, timing, and history—against its potential complications. Carefully observe patients with inhalation exposure for the development of any systemic signs or symptoms. Maintain oxygenation and ventilation with close arterial blood gas monitoring. Patients developing hypersensitivity dermal reactions may require treatment with antihistamines or topical cortocosteroids.

Section 7. Spill, Leak, and Disposal Procedures

Spill/Leak: *Design and practice a phosphoric acid spill control and countermeasure plan (SCCP).* Notify safety personnel of spill or leak, evacuate all unnecessary personnel from the area, and provide adequate ventilation. Cleanup personnel should protect against skin and eye contact and mist inhalation. Absorb spilled phosphoric acid with an alkaline material (soda ash or lime), add water and mix to form a slurry, and place waste in poly- or laquered-lined disposal drums. Flush spill area with water. Do not release to sewers or waterways. The acidity of phosphoric acid may be reduced by natural water hardness minerals, but the phosphate may persist indefinitely. A 100- to 1000-ppm concentration of phosphoric acid during a 96-hr test period is the median tolerance limit (TLm96) at which 50% of the aquatic organisms survive. Follow applicable OSHA regulations (29 CFR 1910.120).
Disposal: Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.
EPA Designations
RCRA Hazardous Waste (40 CFR 261.33): Not listed
Listed as CERCLA Hazardous Substance* (40 CFR 302.4), Reportable Quantity (RQ): 5000 lb (2270 kg) [* per Clean Water Act, Sec. 311(b)(4)]
SARA Extremely Hazardous Substance (40 CFR 355): Not listed
Listed as a SARA Toxic Chemical (40 CFR 372.65)
OSHA Designations
Listed as an Air Contaminant (29 CFR 1910.1000, Table Z-1)

Section 8. Special Protection Data

Goggles: Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133).
Respirator: Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a NIOSH-approved respirator. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA.
Warning: Air-purifying respirators do *not* protect workers in oxygen-deficient atmospheres.
Other: Wear impervious gloves, boots, aprons, and gauntlets to prevent prolonged or repeated skin contact. Phosphoric acid has very little effect on neoprene and nitrile gloves.
Ventilation: Provide general and local explosion-proof ventilation systems to maintain airborne concentrations below OSHA PELs, ACGIH TLVs, and NIOSH REL (Sec. 2). Local exhaust ventilation is preferred since it prevents contaminant dispersion into the work area by controlling it at its source.[103]
Safety Stations: Make available in the work area emergency eyewash stations, safety/quick-drench showers, and washing facilities.
Contaminated Equipment: Never wear contact lenses in the work area: soft lenses may absorb, and all lenses concentrate, irritants. Remove this material from your shoes and equipment. Launder contaminated clothing before wearing.
Comments: Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

Section 9. Special Precautions and Comments

Storage Requirements: Store in closed containers in a cool, dry, well-ventilated area with good drainage away from potential fire hazards, reactive materials, and metal powders. To prevent crystallization, store 85% acid above 70 °F/21 °C, 80% acid above 40 °F/4.4 °C, and 75% acid above 0 °F/-17.8 °C. (Phosphoric acid solutions normally supercool without crystallizing, but this effect is unpredictable.) Protect containers from physical damage. Store in glass or polyethylene bottles, carboys, or drums. Keep soda ash or lime in storage area for emergency use.
Engineering Controls: Avoid breathing phosphoric acid mist. Adequate ventilation, approved respirator protection, and personal protective gear is essential. Prevent contact with eyes, skin, or clothing. Practice good personal hygiene procedures.

Transportation Data (49 CFR 172.101, .102)

DOT Shipping Name: Phosphoric acid	**IMO Shipping Name:** Phosphoric acid, liquid
DOT Hazard Class: Corrosive material	**IMO Hazard Class:** 8
ID No.: UN1805	**IMO Label:** Corrosive
DOT Label: Corrosive	**IMDG Packaging Group:** III
DOT Packaging Requirements: 173.245	**ID No.:** UN1805
DOT Packaging Exceptions: 173.244	

***MSDS Collection* References:** 1-12, 14-16, 26, 27, 37-39, 43, 73, 84, 85, 88, 89, 100, 103, 123, 124, 126, 127, 131, 136
Prepared by: MJ Allison, BS; **Industrial Hygiene Review:** DJ Wilson, CIH; **Medical Review:** MJ Hardies, MD FI

Genium Publishing Corporation
One Genium Plaza
Schenectady, NY 12304-4690 USA
(518) 377-8854

Material Safety Data Sheets Collection:

Sheet No. 30A
Hydrochloric Acid

Issued: 10/77 Revision: C, 9/92

Section 1. Material Identification

Hydrochloric Acid (HCl) Description: An aqueous solution of hydrogen chloride. Derived by dissolving hydrogen chloride gas in water at various concentrations. Hydrochloric acid is also formed as a byproduct from oxychlorination and/or oxyhydrochlorination of organic materials. Used in metal pickling and cleaning (boiler and heat exchange equipment scale removal), ore reduction, processing (corn syrup, hydrolyzing starch), dye and dye intermediate production, electroplating, leather tanning, in fertilizer, artificial silk, and paint pigment production, refining soaps and edible fats and oils, petroleum extraction, toilet bowl cleaners; as an alcohol denaturant, a chemical intermediate and solvent in organic synthesis, and in the photographic, textile, and rubber industries.

Other Designations: CAS No. 7647-01-0, Caswell No. 486, chlorohydric acid, Muriatic acid, spirits of salt.

Manufacturer: Contact your supplier or distributor. Consult latest *Chemical Week Buyers' Guide*[73] for a suppliers list.

Cautions: Hydrochloric acid is highly corrosive and causes serious skin and eye burns as well as acute and chronic respiratory problems.

R	1
I	4
S	4
K	0

NFPA

HMIS
H 2*
F 0
R 0
PPE†

* Chronic effects
† Sec. 8

Section 2. Ingredients and Occupational Exposure Limits

Hydrochloric acid; ~38% (commercial), 20% ("azeotrope"). Trace impurities include ammonia, arsenic, iron, sulfate, free Cl-, and heavy metals.

1991 OSHA PEL
Ceiling: 5 ppm (7 mg/m^3)

1990 IDLH Level
100 ppm

1990 NIOSH REL
Ceiling: 5 ppm (7 mg/m^3)

1992-93 ACGIH TLV
Ceiling: 5 ppm (7.5 mg/m^3)

1990 DFG (Germany) MAK
Ceiling: 5 ppm (7 mg/m^3)
Category 1: local irritants
Peak Exposure Limit: 10 ppm,
5 min momentary value/8 per shift

1985-86 Toxicity Data*
Human, inhalation, LC_{Lo}: 1300 ppm/30 min; toxic effects not yet reviewed
Rabbit, oral, LD_{50}: 900 mg/kg; toxic effects not yet reviewed
Rat, inhalation, TC_{Lo}: 450 mg/m^3/1 hr (1 day prior to pregnancy) produced fetotoxicity (except death) & specific developmental abnormalities (homeostasis).
Rabbit, eye: 100 mg rinse caused mild irritation.

*See NIOSH, *RTECS* (MW4025000), for additional irritation, reproductive, and toxicity data.

Section 3. Physical Data

Boiling Point: -120.64 °F (-84.8 °C)*
Vapor Pressure: 4 atm at 64 °F (17.8 °C)
Vapor Density (Air = 1): 1.257
Surface Tension: 23 at 244.68 (118.16 °C)
Molecular Weight: 36.46
Odor Threshold: 0.1 to 5 ppm
Ionization Potential: 12.74 eV

Freezing Point: 1.1 °F (-17.14 °C) for 10.81%, -51.16 °F (-46.2 °C) for 31.24%
Density: 1.194 at -14.8 °F (-26 °C)
Water Solubility: Soluble, 823 g/L at 32 °F (0 °C); 561 g/L at 140 °F (60 °C).
Other Solubilities: Soluble in alcohol, benzene, and ether; insoluble in hydrocarbons.
pH: 1N (0.1), 0.1N (1.1), 0.01N (2.02), 0.001N (3.02), 0.0001N (4.01)
Refraction Index (1N solution): 1.34168 at 64.4 °F (18 °C/D)

Appearance and Odor: Colorless liquid that fumes in air and has a strong pungent odor. Can be slightly yellow from traces of iron, chlorine, or organic matter. Forms a constant boiling azeotrope at 20 % HCl, 108.58 °C and 760 mm Hg.

* Decomposes at 3239.6 °F (1782 °C).

Section 4. Fire and Explosion Data

Flash Point: Noncombustible	Autoignition Temperature: None reported	LEL: None reported*	UEL: None reported*

Extinguishing Media: Use extinguishing agents suitable for surrounding fire.
Unusual Fire or Explosion Hazards: *Extreme heat or contact with many metals liberates hydrogen gas which has explosion limits of 4 to 75%.
Special Fire-fighting Procedures: Because fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode. Structural firefighter's protective clothing is *ineffective* for fires involving hydrochloric acid. Stay away from ends of tanks. Cool tanks with water spray until well after fire is out. *Do not* release runoff from fire control methods to sewers or waterways.

Section 5. Reactivity Data

Stability/Polymerization: Hydrochloric acid has high thermal stability (decomposes at 3239.6 °F/1782 °C). Hazardous polymerization does not occur unless exposed to aldehydes or epoxides.
Chemical Incompatibilities: Polymerizes on contact with aldehydes or epoxides; attacks most metals (except mercury, silver, gold, platinum, tantalum, and some alloys), some plastics, rubber, and coatings; reacts explosively with alcohols + hydrogen cyanide, potassium permanganate, tetraselenium tetranitride; ignites on contact with fluorine, hexalithium disilicide, metal acetylides or carbides (cesium acetylide, rubidium acetylide); and is incompatible with acetic anhydride, 2-amino ethanol, ammonium hydroxide, calcium phosphide, chlorosulfonic acid, 1,1-difluoroethylene, ethylene diamine, ethylene imine, oleum, perchloric acid, ß-propiolacetone, propylene oxide, sodium hydroxide, silver perchlorate + carbon tetrachloride, sulfuric acid, uranium phosphide, acetate, calcium carbide, magnesium bromide, mercuric sulfate, and chlorine + dinitroaniline.
Conditions to Avoid: Avoid contact with incompatibles.
Hazardous Products of Decomposition: Thermal oxidative decomposition of HCl produces toxic chloride fumes and explosive hydrogen gas.

Section 6. Health Hazard Data

Carcinogenicity: The IARC,[164] NTP,[169] and OSHA[164] do not list HCl as a carcinogen.
Summary of Risks: HCl is a highly corrosive liquid and depending on concentration and duration of exposure, symptoms range from irritation to ulcerations and permanent injury. **Target Organs:** Eyes, skin, respiratory tract, and liver (in animals). **Primary Entry Routes:** Inhalation, skin and eye contact. **Medical Conditions Aggravated by Long-Term Exposure:** Respiratory disorders.

Continue on next page

Section 6. Health Hazard Data, *continued*

Acute Effects: Inhalation of vapors or mists is corrosive to the respiratory tract and can cause tracheal and bronchial epithelium necrosis (tissue death), cough, choking, ulceration. Liquid aspiration can cause pulmonary edema, lung collapse, emphysema and damage to the pulmonary blood vessels. Skin contact with HCl solutions causes burns and ulcerations. Permanent eye damage may result from splashes. Ingestion is unlikely but if it occurs, symptoms include gray tongue color, corrosion of mucous membranes, esophagus, and stomach, nausea, vomiting, intense thirst, diarrhea, difficulty swallowing, circulatory collapse and possible death. **Chronic Effects:** Repeated or prolonged exposure can cause dermatitis, conjunctivitis, gastritis, photosensitization, tooth erosion, and repeated exposure to mists from heated-metal pickling solutions can cause nose and gum bleeds, ulceration of oral or nasal mucosa, and "renders facial skin so tender that shaving is painful."[133]

FIRST AID

Eyes: *Do not* allow victim to rub or keep eyes tightly shut. Gently lift eyelids and flush immediately and continuously with flooding amounts of water until transported to an emergency medical facility. Consult a physician immediately. **Skin:** *Quickly* remove contaminated clothing. Rinse with flooding amounts of water for at least 15 min. Treat skin with a 5% triethanolamine solution. For reddened or blistered skin, consult a physician. **Inhalation:** Remove exposed person to fresh air and support breathing as needed. **Ingestion:** Never give anything by mouth to an unconscious or convulsing person. Contact a poison control center. Unless the poison control center advises otherwise, have that *conscious and alert* person drink 1 to 2 glasses of water to dilute. *Do not* induce vomiting!

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: Consider a chest x-ray in acute overexposure. Gastric lavage with 5% sodium bicarbonate may be helpful.

Section 7. Spill, Leak, and Disposal Procedures

Spill/Leak: Notify safety personnel, isolate and ventilate area, deny entry, and stay upwind. Neutralize spills with crushed limestone, soda ash, lime, or sodium bicarbonate. After neutralizing, take up small spills with earth, sand, vermiculite, or other absorbent, noncombustible material and place in suitable containers for disposal; flush large spills to containment area and reclaim (if possible) or await disposal. Follow applicable OSHA regulations (29 CFR 1910.120). **Environmental Transport:** In soil, HCl will infiltrate moving faster in the presence of moisture. It may dissolve some soil matter, particularly those of a carbonate base will be neutralized to some degree and will be transported to groundwater. **Ecotoxicity Values:** Chronic plant toxicity = 100 ppm; injurious to irrigatable crops at 350 mg/L; trout, LC_{100}, 10 mg/L/24 hr shrimp, LC_{50}, 100 to 330 ppm/starfish, LC_{50}, 100 to 330 mg/L/48 hr; shore crab, LC_{50}, 240 mg/L/48 hr. **Disposal:** Neutralize to between 5.5 & 8.5 before disposal. Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.

EPA Designations

Listed as a RCRA Hazardous Waste (40 CFR 261.23, *0.01N solution or higher*): No. D002, Characteristic of corrosivity
Listed as a CERCLA Hazardous Substance* (40 CFR 302.4): Final Reportable Quantity (RQ), 5000 lb (2270 kg) [* per CWA, Sec. 311 (b)(4)]
SARA Extremely Hazardous Substance (40 CFR 355), TPQ: Not listed
Listed as a SARA Toxic Chemical (40 CFR 372.65)

OSHA Designations

Listed as an Air Contaminant (29 CFR 1910.1000, Table Z-1-A)

Section 8. Special Protection Data

Goggles: Wear chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Because contact lens use in industry is controversial, establish your own policy. **Respirator:** Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a MSHA/NIOSH-approved respirator. For < 50 ppm, use a cartridge respirator with acid gas cartridges, or any supplied-air respirator (SAR) or SCBA. For < 100 ppm, use any chemical cartridge respirator with a full facepiece and cartridge that protects against HCl inhalation, or any SAR or SCBA with a full facepiece. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.* If respirators are used, OSHA requires a written respiratory protection program that includes at least: medical certification, training, fit-testing, periodic environmental monitoring, maintenance, inspection, cleaning, and convenient, sanitary storage areas. **Other:** Wear chemically protective gloves, boots, aprons, and gauntlets to prevent skin contact. Polycarbonate, butyl rubber, polyvinyl chloride, and chlorinated polyethylene are recommended materials for PPE. Polyvinyl alcohol is not recommended. **Ventilation:** Provide general and local exhaust ventilation systems to maintain airborne concentrations below the OSHA PEL (Sec. 2). Local exhaust ventilation is preferred because it prevents contaminant dispersion into the work area by controlling it at its source.[103] **Safety Stations:** Make available in the work area emergency eyewash stations, safety/quick-drench showers, and washing facilities. **Contaminated Equipment:** Separate contaminated work clothes from street clothes. Launder contaminated work clothing before wearing. Remove this material from your shoes and clean personal protective equipment. **Comments:** Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

Section 9. Special Precautions and Comments

Storage Requirements: Prevent physical damage to containers. Store in a cool, dry, well-ventilated area on a cement floor away from direct sunlight and heat sources. Use decanting pumps or pouring frames to minimize spillage during loading and unloading operations.

Engineering Controls: To reduce potential health hazards, use sufficient dilution or local exhaust ventilation to control airborne contaminants and to maintain concentrations at the lowest practical level. HCl should be manufactured in closed systems. Pay close attention to leak detection. Aqueous scrubbers are used to control hydrogen chloride emissions from vent stacks and other sources. Workers shouldn't enter tanks previously containing HCl until they have been cleaned.

Administrative Controls: Consider preplacement and periodic medical exams of exposed workers with emphasis on the eyes, skin, and respiratory tract. Pulmonary function tests (FEV, FVC) are useful in determining lung disorders. Conduct difficult operations in fume hoods.

Transportation Data (49 CFR 172.101)

DOT Shipping Name: Hydrochloric acid, solution
DOT Hazard Class: 8
ID No.: UN1789
DOT Label: Corrosive
DOT Packing Group: II
Special provisions (172.102): A3, A6, B2, B15, N41, T9, T27

Packaging Authorizations
a) Exceptions: 173.154
b) Non-bulk Packaging: 173.202
c) Bulk Packaging: 173.242

Quantity limitations
a) Passenger, Aircraft, or Railcar: 1 L
b) Cargo Aircraft Only: 30 L

Vessel Stowage Requirements
a) Vessel Stowage: C
b) Other: 8

***MSDS Collection* References:** 26, 73, 89, 100, 101, 103, 124, 126, 127, 132, 133, 136, 139, 148, 149, 153, 159, 163, 164, 167, 168, 171, 174, 180
Prepared by: M Gannon, BA; **Industrial Hygiene Review:** DJ Wilson, CIH; **Medical Review:** AC Darlington, MPH, MD

Material Safety Data Sheet

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

U.S. Department of Labor
Occupational Safety and Health Administration
(Non-Mandatory Form)
Form Approved
OMB No. 1218-0072

IDENTITY (As Used on Label and List): ALCONOX

Note: Blank spaces are not permitted. If any item is not applicable, or no information is available, the space must be marked to indicate that.

Section I

Manufacturer's Name: ALCONOX, INC.	Emergency Telephone Number: (212) 473-1300
Address (Number, Street, City, State, and ZIP Code): 215 PARK AVENUE SOUTH	Telephone Number for Information: (212) 473-1300
NEW YORK, N.Y. 10003	Date Prepared: JULY 1, 1989
	Signature of Preparer (optional):

Section II — Hazardous Ingredients/Identity Information

Hazardous Components (Specific Chemical Identity; Common Name(s))	OSHA PEL	ACGIH TLV	Other Limits Recommended	% (optional)
THERE ARE NO INGREDIENTS IN ALCONOX WHICH APPEARED ON THE OSHA STANDARD 29 CFR 1910 SUBPART Z.				

Section III — Physical/Chemical Characteristics

Boiling Point	N.A.	Specific Gravity (H_2O = 1)	N.A.
Vapor Pressure (mm Hg.)	N.A.	Melting Point	N.A.
Vapor Density (AIR = 1)	N.A.	Evaporation Rate (Butyl Acetate = 1)	N.A.

Solubility in Water: APPRECIABLE (GREATER THAN 10 PER CENT)

Appearance and Odor: WHITE POWDER INTERSPERED WITH CREAM COLORED FLAKES - ODORLESS

Section IV — Fire and Explosion Hazard Data

Flash Point (Method Used): NONE	Flammable Limits	LEL: N.A.	UEL: N.A.

Extinguishing Media: WATER, CO_2, DRY CHEMICAL, FOAM, SAND/EARTH

Special Fire Fighting Procedures: FOR FIRES INVOLVING THIS MATERIAL DO NOT ENTER WITHOUT PROTECTIVE EQUIPMENT AND SELF CONTAINED BREATHING APPARATUS.

Unusual Fire and Explosion Hazards: NONE

Section V — Reactivity Data

Stability	Unstable		Conditions to Avoid: NONE
	Stable	XX	

Incompatibility (*Materials to Avoid*): AVOID STRONG ACIDS

Hazardous Decomposition or Byproducts: MAY RELEASE CO, GAS ON BURNING

Hazardous Polymerization	May Occur		Conditions to Avoid: NONE
	Will Not Occur	XX	

Section VI — Health Hazard Data

Route(s) of Entry: Inhalation? YES Skin? NO Ingestion? YES

Health Hazards (*Acute and Chronic*): INHALATION OF POWDER MAY PROVE LOCALLY IRRITATING TO MUCOUS MEMBRANES. INGESTION MAY CAUSE DISCOMFORT AND/OR DIARRHEA.

Carcinogenicity: NTP? NO IARC Monographs? NO OSHA Regulated? NO

Signs and Symptoms of Exposure: EXPOSURE MAY IRRITATE MUCOUS MEMBRANES. MAY CAUSE SNEEZING.

Medical Conditions Generally Aggravated by Exposure: RESPIRATORY CONDITIONS MAY BE AGGRAVATED BY POWDER

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

Section VII — Precautions for Safe Handling and Use

Steps to Be Taken in Case Material is Released or Spilled: MATERIAL FOAMS PROFUSELY. SHOVEL AND RECOVER AS MUCH AS POSSIBLE. RINSE REMAINDER TO SEWER MATERIAL IS COMPLETELY BIODEGRADABLE.

Waste Disposal Method: SMALL QUANTITIES MAY BE DISPOSED OF IN SEWER. LARGE QUANTITIES SHOULD BE DISPOSED OF ACCORDING TO LOCAL REQUIREMENTS FOR NON-HAZARDOUS DETERGE

Precautions to Be Taken in Handling and Storing: STORE IN A DRY AREA TO PREVENT CAKING.

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

Section VIII — Control Measures

Respiratory Protection (*Specify Type*): DUST MASK

Ventilation	Local Exhaust: NORMAL	Special: N.A.
	Mechanical (General): N.A.	Other: N.A.

Protective Gloves: USEFUL-NOT REQUIRED

Eye Protection: USEFUL-NOT REQUIRED

Other Protective Clothing or Equipment: NOT REQUIRED

Work/Hygienic Practices: NO SPECIAL PRACTICES REQUIRED

• USGPO 1988-491-529/45775

MATERIAL SAFETY DATA SHEET

IDENTITY: SIGHT SAVERS brand ANTI-FOG LIQUID

CATALOG #24, 25, 68, 69, 3565, 3570, 143060, 3569, 50103

SECTION 1: MANUFACTURER'S NAME AND ADDRESS

Bausch & Lomb
1400 N. Goodman St.
Rochester, NY 14609

(800) 553-5340 MEDICAL EMERGENCY 8AM/4PM
MON.-FRI. 8AM/5PM
Other times: Call Local Poison Center

(800) 553-5340 ALL OTHER QUESTIONS

Date Prepared: February 26, 1992

SECTION 2: HAZARDOUS INGREDIENTS

Ingredient (CAS#)	%	PEL	UNITS	TLV	UNITS	STEL	UNITS	SKI
Isopropanol (67-63-0)	12	400	PPM	400	PPM	500	PPM	-
Sodium Lauryl Sulfate (151-21-3)	2	None	-	None	-	None	-	-
Dipropylene Glycol Monomethyl Ether (34590-94-8)	2	100	PPM	100	PPM	150	PPM	X

SECTION 3: PHYSICAL DATA

Boiling Point (C): 100
Vapor Pressure (mm Hg): 30
Vapor Density: (air=1):Not Determined
Solubility: soluble in water
ph: not determined
Specific Gravity: 1.0
Melting Point: N/A
Evaporation Rate: less/1
Percent Volatile by Weight: <16%
Appearance and Odor: Purple liquid, odor of rubbing alcohol

SECTION 4: FIRE AND EXPLOSION HAZARD DATA

Flash Point (F): 105 Open Cup Flammable Limits: not determined

Extinguishing Media: CO2, Foam, Dry Chemical, Water Fog

Fire Fighting Procedures: Use self contained breathing apparatus.

Unusual Fire and Explosion Hazards: None.

SECTION 5: REACTIVITY DATA

Stability: Stable

Incompatibility: Hydrogen & Palladium, Nitroform, Oleum, Potassium-Tert-Butoxide, Aluminum, Aluminum Isopropoxide, Crotonaldehyde, Oxidants, Phosgene

Hazardous Decomposition Products: CO, CO2, SiO2

Hazardous Polymerization: Will not occur

Conditions to avoid: Sources of ignition, heat, open flame

SECTION 6: HEALTH HAZARD DATA

Route(s) of Entry:
Inhalation: Irritation, central nervous system depression
Skin Contact: Defatting, dermatitis possible.
Ingestion: nausea, vomiting, headache, dizziness, coma possible, abdominal pain, vomiting, diarrhea

Health Hazards (Acute and Chronic):
Carcinogenicity: NTP: N/A IARC Monographs: N/A
OSHA Regulated: N/A
Signs and Symptoms of Exposure: N/A

Medical Conditions Generally Aggravated by Exposure: N/A

Emergency and First Aid Procedures:

Inhalation: Move to fresh air, get medical help.
Skin Contact: Wash with soap and water.
Ingestion: Gastric lavage, give fluids, get medical help.
Eye Contact: Flush with water for 15 minutes, get medical help.

SECTION 7: PRECAUTIONS FOR SAFE HANDLING AND USE

Spill Procedure: Remove sources of ignition, absorb with vermiculite.

Waste Disposal: As per local, state and Federal regulation.

Spill Reporting Information (49 CFR 171.3, 40 CFR 117)

Hazardous Substance: None
Reportable Quantity: None
Concentration of Hazardous Substance: N/A
Reportable Quantity of Product: N/A

Precautions to be taken in handling and storing:

Store in a cool, dry, well ventilated place.

SECTION 8: CONTROL MEASURES

Respiratory Protection: NIOSH Approved Respirator if exposure exceeds the permissible exposure limit (PEL)

Ventilation: Sufficient to keep exposure below the PEL, general room air circulation sufficient for normal use of product.

Eye and Face Protection: Safety Glasses and whatever is required by other occupational conditions.

Protective Clothing: None required for normal use of product.

Work/Hygienic Practices: N/A

Approved By: _____

The above information is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes.

CLOROX

Pleasanton, California
Tel. (510) 847-6100

Data Sheet

FLAMMABILITY	
REACTIVITY	
PERSONAL	

I Product: REGULAR CLOROX BLEACH

Description: CLEAR, LIGHT YELLOW LIQUID WITH CHLORINE ODOR

Other Designations	Manufacturer	Emergency Telephone No.
EPA Reg. No. 5813-1 Sodium hypochlorite solution Liquid chlorine bleach Clorox Liquid Bleach	The Clorox Company 1221 Broadway Oakland, CA 94612	Notify your Supervisor Rocky Mountain Poison Center (800) 446-1014 For Transportation Emergencies Chemtre (800) 424-9300

II Health Hazard Data

*Causes severe but temporary eye injury. May irritate skin. May cause nausea and vomiting if ingested. Exposure to vapor or mist may irritate nose, throat and lungs. The following medical conditions may be aggravated by exposure to high concentrations of vapor or mist; heart conditions or chronic respiratory problems such as asthma, chronic bronchitis or obstructive lung disease. Under normal consumer use conditions the likelihood of any adverse health effects are low.

FIRST AID: EYE CONTACT: Immediately flush eyes with plenty of water. If irritation persists, see a doctor. SKIN CONTACT: Remove contaminated clothing. Wash area with water. INGESTION: Drink a glassful of water and call a physician. INHALATION: If breathing problems develop remove to fresh air.

III Hazardous Ingredients

Ingredients	Concentration	Worker Exposure Limi
Sodium hypochlorite CAS # 7681-52-9	5.25%	not established

None of the ingredients in this product are on the IARC, NTP or OSH carcinogen list. Occasional clinical reports suggest a low potential fo sensitization upon exaggerated exposure to sodium hypochlorite if si damage (e.g. irritation) occurs during exposure. Routine clinical test conducted on intact skin with Clorox Liquid Bleach found no sensitiz in the test subjects.

IV Special Protection and Precautions

Hygienic Practices: Wear safety glasses. With repeated or prolonged use, wear gloves.

Engineering Controls: Use general ventilation to minimize exposure to vapor or mist.

Work Practices: Avoid eye and skin contact and inhalation of vapor or mist.

Keep out of the reach of children.

V Transportation and Regulatory Data

U.S. DOT Hazard Class: Not restricted

U.S. DOT Proper Shipping Name: Hypochlorite solution with not m than 7% available chlorine. Not Restricted per 49CFR172.101(c)(12

Section 313 (Title III Superfund Amendment and Reauthorization Act As a consumer product, this product is exempt from supplier notifica requirements under Section 313 Title III of the Superfund Amendmer and Reauthorization Act of 1986 (reference 40 CFR Part 372).

VI Spill or Leak Procedures

Small Spills (<5 gallons)
1) Absorb, containerize, and landfill in accordance with local regulations. (2) Wash down residual to sanitary sewer.*

Large Spills (>5 gallons)
1) Absorb, containerize, and landfill in accordance with local regulations; wash down residual to sanitary sewer.* - OR - (2) Pump material to waste drum(s) and dispose in accordance with local regulations; wash down residual to sanitary sewer.*

* Contact the sanitary treatment facility in advance to assure ability to process washed-down material.

VII Reactivity Data

Stable under normal use and storage conditions. Strong oxidizing a Reacts with other household chemicals such as toilet bowl cleaners, removers, vinegar, acids or ammonia containing products to produc hazardous gases, such as chlorine and other chlorinated species. Prolonged contact with metal may cause pitting or discoloration.

VIII Fire and Explosion Data

Not flammable or explosive. In a fire, cool containers to prevent rupture and release of sodium chlorate.

IX Physical Data

Boiling point ..... 212°F/100°C decomp
Specific Gravity (H O=1) .....
Solubility in Water ..... cor
pH .....

DATE PREPARED 1/92

PROCTER & GAMBLE

Bar Soap & Household Cleaning
Products Division
Sharon Woods Technical Center
11520 Reed Hartman Highway
Cincinnati, Ohio 45241-2422

MATERIAL SAFETY DATA SHEET

Issue Date: 5/90

SECTION I

Emergency Telephone Number: 1-800-926-9441

Identity: COMET CLEANSER (regular and lemon fresh fragrances)

Ingredients/Chemical Name: Bleach, cleansing agent (calcium carbonate), cleaning agent (sodium carbonate), detergents, quality control agents, perfume, color. Comet Cleanser contains no phosphorus.

SECTION II - HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

Hazardous Ingredients as defined by OSHA, 29 CFR 1910. 1200.

NOTE: This product is not "hazardous" within the meaning of the OSHA Hazard Communication Standard.

SECTION III - PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point (°F): N.A.	Specific Gravity (H_2O=1): ca. 1
Vapor Pressure (mm Hg): N.A.	Percent Volatile by Volume (%): ca. 1
Vapor Density (AIR=1): N.A.	Evaporation Rate (nBuOAc=1): N.A.
Solubility in Water: Moderately	Appearance and Odor: Green powder, cedar pine or lemon scent

SECTION IV - FLAMMABILITY AND REACTIVITY

Flash Point (Method Used): N.A.	Explosive Limits: LEL: N.A. UEL: N.A.

Extinguishing Media: Use CO_2, water or dry chemical.

Special Fire Fighting Procedures: None required.

Unusual Fire Hazards: None

Stability	Unstable: / Stable: X	Conditions to Avoid: None

Incompatibility (Materials to avoid): Ammonia and acids.

Hazardous Decomposition/By Products: Chlorine gas.

Hazardous Polymerization	May Occur: / Will Not Occur: X	Conditions to Avoid: None

AGA Gas Inc.
6225 Oaktree Blvd.
P.O. Box 94737
Cleveland, Ohio 44101-4737

Telephone
(216) 642-6600

MATERIAL SAFETY DATA SHEET

PRODUCT NAME Compressed Air	CAS # N/A
TRADE NAME AND SYNONYMS Compressed Air; Air; Compressed Air, Breathing Quality	DOT I D No. UN 1002
CHEMICAL NAME AND SYNONYMS See last page.	DOT Hazard Class Nonflammable gas
ISSUE DATE AND REVISIONS 25 November 1985	Formula See last page. Chemical Family N/A

HEALTH HAZARD DATA

TIME WEIGHTED AVERAGE EXPOSURE LIMIT
None listed (ACGIH, 1985-86)

SYMPTOMS OF EXPOSURE
Air is nontoxic and necessary to support life. Inhalation of air in a high pressure environment such as underwater diving, caissons or hyperbaric chambers can result in symptoms similar to overexposure to pure oxygen. These include tingling of fingers and toes, abnormal sensations, impaired coordination and confusion. Decompression sickness pains or "bends" are possible following rapid decompression.

TOXICOLOGICAL PROPERTIES
High pressure effects (greater than two atmospheres of oxygen) are on the central nervous system. Improper decompression results in the accumulation of nitrogen in the blood.

RECOMMENDED FIRST AID TREATMENT
Facilities or practices at which air is breathed in a high pressure environment should be prepared to deal with the illnesses associated with decompression (bends or caisson disease). Decompression equipment may be required.

HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES

N/A

PHYSICAL DATA

BOILING POINT -317.8°F (-194.3°C)	LIQUID DENSITY AT BOILING POINT 54.56 lb/ft^3 (874 kg/m^3)
VAPOR PRESSURE @ 70°F (21.1°C): Above the critical temp. of -221.1°F (-140.6°C)	GAS DENSITY AT 70°F, 1 atm .0749 lb/ft^3 (1.200 kg/m^3)
SOLUBILITY IN WATER Very slightly	FREEZING POINT N/A
EVAPORATION RATE N/A	SPECIFIC GRAVITY (AIR=1) 1.0
APPEARANCE AND ODOR Colorless, odorless gas	

FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Method used) N/A	AUTO IGNITION TEMPERATURE N/A	FLAMMABLE LIMITS % BY VOLUME LEL N/A UEL N/A
EXTINGUISHING MEDIA Nonflammable gas		ELECTRICAL CLASSIFICATION Nonhazardous

SPECIAL FIRE FIGHTING PROCEDURES

N/A

UNUSUAL FIRE AND EXPLOSION HAZARDS

Compressed air at high pressures will accelerate the burning of materials to a greater rate than they burn at atmospheric pressure.

REACTIVITY DATA

STABILITY		CONDITIONS TO AVOID
Unstable		
Stable	X	N/A

INCOMPATIBILITY (Materials to avoid)

None

HAZARDOUS DECOMPOSITION PRODUCTS

None

HAZARDOUS POLYMERIZATION		CONDITIONS TO AVOID
May Occur		
Will Not Occur	X	N/A

SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED

N/A

WASTE DISPOSAL METHOD

N/A

RESPIRATORY PROTECTION (Specify type)
N/A

VENTILATION	LOCAL EXHAUST	SPECIAL
N/A	N/A	N/A
	MECHANICAL (Gen.) N/A	OTHER N/A

PROTECTIVE GLOVES
Any material

EYE PROTECTION
Safety goggles or glasses

OTHER PROTECTIVE EQUIPMENT
Safety shoes

SPECIAL PRECAUTIONS*

SPECIAL LABELING INFORMATION
DOT Shipping Name: Air, compressed DOT Hazard Class: Nonflammable gas
DOT Shipping Label: Nonflammable gas I.D. No.: UN 1002

SPECIAL HANDLING RECOMMENDATIONS
Valve protection caps must remain in place unless container 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 back flow into the cylinder.

For additional handling recommendations, consult the Compressed Gas Association's Pamphlets P-1, G-7 and G-7.1.

SPECIAL STORAGE RECOMMENDATIONS
Protect cylinders from physical damage. Store in cool, dry, well-ventilated area away from heavily trafficked areas and emergency exits. Do not allow the temperature where cylinders are stored to exceed 130F (54C). 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 excesssive periods of time.

For additional storage recommendations, consult the Compressed Gas Association's Pamphlets P-1, G-7, and G-7.1.

SPECIAL PACKAGING RECOMMENDATIONS

Dry air is noncorrosive and may be used with all materials of construction. Moisture causes metal oxides which are formed with air to be hydrated so that they increase in volume and lose their protective role (rust formation). Concentrations of SO_2, Cl_2, salt, etc. in the moisture enhances the rusting of metals in air.

OTHER RECOMMENDATIONS OR PRECAUTIONS
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.

CHEMICAL FORMULA: (Continued)

Atmospheric air which is compressed is composed of the following concentrations of gases:

Gas	Molar %
Nitrogen	78.09
Oxygen	20.94
Argon	0.93
Carbon Dioxide	0.033*
Neon	18.18×10^{-4}
Helium	5.239×10^{-4}
Krypton	1.139×10^{-4}
Hydrogen	0.5×10^{-4}
Xenon	0.086×10^{-4}
Radon	6×10^{-18}
Water vapor	Varying concentrations

*Concentrations may have slight variations.

Compressed air is also produced by reconstitution using only oxygen and nitrogen. This product contains 79 molar percent nitrogen and 21 molar percent oxygen plus trace amounts of other atmospheric gases which are present in the oxygen and nitrogen.

EXXON COMPANY, U.S.A.
A DIVISION OF EXXON CORPORATION

DATE ISSUED: 09/11/92
SUPERSEDES DATE: 12/02/91

MATERIAL SAFETY DATA SHEET

EXXON COMPANY, U.S.A. P.O. BOX 2180 HOUSTON, TX 77252-2180

A. IDENTIFICATION AND EMERGENCY INFORMATION

PRODUCT NAME
EXXON DIESEL 2

PRODUCT CODE
072700 - 00787

PRODUCT CATEGORY
Petroleum Distillate Fuel

PRODUCT APPEARANCE AND ODOR
Clear liquid, yellow color
Faint petroleum hydrocarbon odor

MEDICAL EMERGENCY TELEPHONE NUMBER
(713) 656-3424

B. COMPONENTS AND HAZARD INFORMATION

COMPONENTS	CAS NO. OF COMPONENTS	APPROXIMATE CONCENTRATION
Fuels, diesel, no. 2	68476-34-6	100%

All components of this product are listed on the U.S. TSCA inventory.

See Section E for Health and Hazard Information.

See Section H for additional Environmental Information.

HAZARDOUS MATERIALS IDENTIFICATION SYSTEM (HMIS)

Health	Flammability	Reactivity	BASIS
1	2	0	Recommended by Exxon

EXPOSURE LIMIT FOR TOTAL PRODUCT
100 ppm (900 mg/m3) for an 8-hour workday

BASIS
Recommended by Exxon

C. PRIMARY ROUTES OF ENTRY AND EMERGENCY AND FIRST AID PROCEDURES

EYE CONTACT
If splashed into the eyes, flush with clear water for 15 minutes or until irritation subsides. If irritation persists, call a physician.

SKIN
In case of skin contact, remove any contaminated clothing and wash skin with soap and water. Launder or dry-clean clothing before reuse. If product is injected into or under the skin, or into any part of the body, regardless of the appearance of the wound or its size, the individual should be evaluated immediately by a physician as a surgical emergency. Even though initial symptoms from high pressure injection may be minimal or absent, early surgical treatment within the first few hours may significantly reduce the ultimate extent of injury.

INHALATION
Overexposure may cause gasping, nausea and disorientation.

Vapor pressure is very low. Vapor inhalation under ambient conditions is normally not a problem. If overcome by vapor from hot product, remove from exposure and call a physician immediately. If breathing is irregular or has stopped, start resuscitation, administer oxygen, if available.

INGESTION
If ingested, DO NOT induce vomiting; call a physician immediately.

D. FIRE AND EXPLOSION HAZARD INFORMATION

FLASH POINT (MINIMUM)
COMBUSTIBLE - Per DOT 49 CFR 173.115
60°C (140°F)
ASTM D 93, Pensky Martens Closed Cup

NOTE: Non-marine product may be 52°C (125°F) minimum flash to meet No. 2 Diesel Fuel Oil (ASTM D 975). Seasonal blends may be as low as 38°C (100°F).

AUTOIGNITION TEMPERATURE
Greater than 204°C (400°F)

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA) - HAZARD IDENTIFICATION

Health	Flammability	Reactivity	BASIS
0	2	0	Recommended by the National Fire Protection Association

HANDLING PRECAUTIONS
This liquid is volatile and gives off invisible vapors. Either the liquid or vapor may settle in low areas or travel some distance along the ground or surface to ignition sources where they may ignite or explode.

Keep product away from ignition sources, such as heat, sparks, pilot lights, static electricity, and open flames.

FLAMMABLE OR EXPLOSIVE LIMITS (APPROXIMATE PERCENT BY VOLUME IN AIR)
Estimated values: Lower Flammable Limit 0.9% Upper Flammable Limit 7%

EXTINGUISHING MEDIA AND FIRE FIGHTING PROCEDURES
Foam, water spray (fog), dry chemical, carbon dioxide and vaporizing liquid type extinguishing agents may all be suitable for extinguishing fires involving this type of product, depending on size or potential size of fire and circumstances related to the situation. Plan fire protection and response strategy through consultation with local fire protection authorities or appropriate specialists.

The following procedures for this type of product are based on the recommendations in the National Fire Protection Association's "Fire Protection Guide on Hazardous Materials", Eighth Edition (1984):

Use dry chemical, foam or carbon dioxide to extinguish the fire. Water may be ineffective, but water should be used to keep fire-exposed containers cool. If a leak or spill has ignited, use water spray to disperse the vapors and to protect men attempting to stop a leak. Water spray may be used to flush spills away from exposures. Minimize breathing of gases, vapor, fumes or decomposition products. Use supplied-air breathing equipment for enclosed or confined spaces or as otherwise needed.

NOTE: The inclusion of the phrase "water may be ineffective" is to indicate that although water can be used to cool and protect exposed material, water may not extinguish the fire unless used under favorable conditions by experienced fire fighters trained in fighting all types of flammable liquid fires.

DECOMPOSITION PRODUCTS UNDER FIRE CONDITIONS
Fumes, smoke, carbon monoxide, aldehydes and other decomposition products, in the case of incomplete combustion.

"EMPTY" CONTAINER WARNING
"Empty" containers retain residue (liquid and/or vapor) and can be dangerous. DO NOT PRESSURIZE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS, STATIC ELECTRICITY, OR OTHER SOURCES OF IGNITION; THEY MAY EXPLODE AND CAUSE INJURY OR DEATH. Do not attempt to clean since residue is difficult to remove. "Empty" drums should be completely drained, properly bunged and promptly returned to a drum reconditioner. All other containers should be disposed of in an environmentally safe manner and in accordance with governmental regulations. For work on tanks refer to Occupational Safety and Health Administration regulations, ANSI Z49.1, and other governmental and industrial references pertaining to cleaning, repairing, welding, or other contemplated

operations.

E HEALTH AND HAZARD INFORMATION

VARIABILITY AMONG INDIVIDUALS
Health studies have shown that many petroleum hydrocarbons and synthetic lubricants pose potential human health risks which may vary from person to person. As a precaution, exposure to liquids, vapors, mists or fumes should be minimized.

EFFECTS OF OVEREXPOSURE (Signs and symptoms of exposure)
Prolonged or repeated liquid contact with the skin will dry and defat the skin, leading to possible irritation and dermatitis.
High vapor concentrations (greater than approximately 1000 ppm, attainable at temperatures well above ambient) are irritating to the eyes and the respiratory tract, and may cause headaches, dizziness, anesthesia, drowsiness, unconsciousness, and other central nervous system effects, including death.

NATURE OF HAZARD AND TOXICITY INFORMATION
Prolonged or repeated skin contact with this product tends to remove skin oils, possibly leading to irritation and dermatitis; however, based on human experience and available toxicological data, this product is judged to be neither a "corrosive" nor an "irritant" by OSHA criteria.

Product contacting the eyes may cause eye irritation.

Lifetime skin painting studies conducted by the American Petroleum Institute, Exxon and others have shown that similar products boiling between 175-370°C (350-700°F) usually produce skin tumors and/or skin cancer in laboratory mice. The degree of carcinogenic response was weak to moderate with a relatively long latent period. The implications of these results for humans have not been determined.

Limited studies on oils that are very active carcinogens have shown that washing the animals' skin with soap and water between applications greatly reduces tumor formation. These studies demonstrate the effectiveness of cleansing the skin after contact.

Potential risks to humans can be minimized by observing good work practices and personal hygiene procedures generally recommended for petroleum products. See Section I for recommended protection and precautions.

Contains light hydrocarbon components. Lifetime studies by the American Petroleum Institute have shown that kidney damage and kidney cancer can occur in male rats after prolonged inhalation exposures at elevated concentrations of total gasoline. Kidneys of mice and female rats were unaffected. The U.S. EPA Risk Assessment Forum has concluded that the male rat kidney tumor results are not relevant for humans. Total gasoline exposure also produced liver tumors in female mice only. The implication of these data for humans has not been determined. Certain components, such as normal hexane, may also affect the nervous system at high concentrations (e.g., 1000-1500 ppm).

Product has a low order of acute oral and dermal toxicity, but minute amounts aspirated into the lungs during ingestion or vomiting may cause mild to severe pulmonary injury and possibly death.

This product is judged to have an acute oral LD50 (rat) greater than 5 g/kg of body weight, and an acute dermal LD50 (rabbit) greater than 3.16 g/kg of body weight.

Inhalation of components of exhaust from burning, such as carbon monoxide, may cause death at high concentrations.
Long-term repeated exposure of laboratory animals to whole diesel exhaust has resulted in an increased incidence of lung cancer.
Exposure to exhaust from burning and diesel exhaust should be minimized.

PRE-EXISTING MEDICAL CONDITIONS WHICH MAY BE AGGRAVATED BY EXPOSURE
Petroleum Solvents/Petroleum Hydrocarbons - Skin contact may aggravate an existing dermatitis.

F. PHYSICAL DATA

The following data are approximate or typical values and should not be used for precise design purposes.

BOILING RANGE
160-350°C (320-650°F)

SPECIFIC GRAVITY (15.6 C/15.6 C)
0.86

MOLECULAR WEIGHT
Approximately 212 average

pH
Essentially neutral

POUR, CONGEALING OR MELTING POINT
-18°C (0°F)
Pour Point by ASTM D 97

VISCOSITY
2.7 cSt @ 40°C

VAPOR PRESSURE
Less than 1 mm Hg @ 20°C

VAPOR DENSITY (AIR = 1)
Greater than 5

PERCENT VOLATILE BY VOLUME
100

EVAPORATION RATE @ 1 ATM. AND 25 C (77 F)
(n-BUTYL ACETATE = 1)
0.02

SOLUBILITY IN WATER @ 1 ATM. AND 25 C (77 F)
Negligible; less than 0.1%

G. REACTIVITY

This product is stable and will not react violently with water. Hazardous polymerization will not occur. Avoid contact with strong oxidants such as liquid chlorine, concentrated oxygen, sodium hypochlorite, calcium hypochlorite, etc., as this presents a serious explosion hazard.

H. ENVIRONMENTAL INFORMATION

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED
Shut off and eliminate all ignition sources. Keep people away. Recover free product. Add sand, earth or other suitable absorbent to spill area. Minimize breathing vapors. Minimize skin contact. Ventilate confined spaces. Open all windows and doors. Keep product out of sewers and watercourses by diking or impounding. Advise authorities if product has entered or may enter sewers, watercourses, or extensive land areas.
Assure conformity with applicable governmental regulations. Continue to observe precautions for volatile, combustible vapors from absorbed material.

THE FOLLOWING INFORMATION MAY BE USEFUL IN COMPLYING WITH VARIOUS STATE AND FEDERAL LAWS AND REGULATIONS UNDER VARIOUS ENVIRONMENTAL STATUTES:

REPORTABLE QUANTITY (RQ), EPA REGULATION 40 CFR 302 (CERCLA Section 102)
No RQ for product or any constituent greater than 1% or 0.1% (carcinogen).

THRESHOLD PLANNING QUANTITY (TPQ), EPA REGULATION 40 CFR 355 (SARA Sections 301-304)
No TPQ for product or any constituent greater than 1% or 0.1% (carcinogen).

TOXIC CHEMICAL RELEASE REPORTING, EPA REGULATION 40 CFR 372 (SARA Section 313)
No toxic chemical is present greater than 1% or 0.1% (carcinogen).

HAZARDOUS CHEMICAL REPORTING, EPA REGULATION 40 CFR 370 (SARA Sections 311-312)

EPA HAZARD CLASSIFICATION CODE:	Acute Hazard	Chronic Hazard	Fire Hazard	Pressure Hazard	Reactive Hazard	Not Applicable
		XXX	XXX			

I. PROTECTION AND PRECAUTIONS

VENTILATION
Use only with ventilation sufficient to prevent exceeding recommended exposure limit or buildup of explosive concentrations of vapor in air.

RESPIRATORY PROTECTION
Use supplied-air respiratory protection in confined or enclosed spaces, if needed.

PROTECTIVE GLOVES
Use chemical-resistant gloves, if needed, to avoid prolonged or repeated skin contact.

EYE PROTECTION
Use splash goggles or face shield when eye contact may occur.

OTHER PROTECTIVE EQUIPMENT
Use chemical-resistant apron or other impervious clothing, if needed, to avoid contaminating regular clothing, which could result in prolonged or repeated skin contact.

WORK PRACTICES / ENGINEERING CONTROLS
Keep containers closed when not in use. Do not store near heat, sparks, flame or strong oxidants.

In order to prevent fire or explosion hazards, use appropriate equipment.

Information on electrical equipment appropriate for use with this product may be found in the latest edition of the National Electrical Code (NFPA-70). This document is available from the National Fire Protection Association, Batterymarch Park, Quincy, Massachusetts 02269.

PERSONAL HYGIENE
Minimize breathing vapor, mist or fumes. Avoid prolonged or repeated contact with skin. Remove contaminated clothing; launder or dry-clean before re-use. Remove contaminated shoes and thoroughly clean before re-use; discard if oil-soaked. Cleanse skin thoroughly after contact, before breaks and meals, and at end of work period. Product is readily removed from skin by waterless hand cleaners followed by washing thoroughly with soap and water.

J. TRANSPORTATION AND OSHA RELATED LABEL INFORMATION

TRANSPORTATION INCIDENT INFORMATION
For further information relative to spills resulting from transportation incidents, refer to latest Department of Transportation Emergency Response Guidebook for Hazardous Materials Incidents, DOT P 5800.3.

DOT IDENTIFICATION NUMBER
Fuel Oil, No. 2 / Combustible Liquid / NA 1993

OSHA REQUIRED LABEL INFORMATION
In compliance with hazard and right-to-know requirements, the following OSHA Hazard Warnings should be found on a label, bill of lading or invoice accompanying this shipment.

DANGER!

COMBUSTIBLE

LONG-TERM, REPEATED EXPOSURE MAY CAUSE SKIN CANCER

Note: Product label will contain additional non-OSHA related information.

The information and recommendations contained herein are, to the best of Exxon's knowledge and

belief, accurate and reliable as of the date issued. Exxon does not warrant or guarantee their accuracy or reliability, and Exxon shall not be liable for any loss or damage arising out of the use thereof.

The information and recommendations are offered for the user's consideration and examination, and it is the user's responsibility to satisfy itself that they are suitable and complete for its particular use. If buyer repackages this product, legal counsel should be consulted to insure proper health, safety and other necessary information is included on the container.

The Environmental Information included under Section H hereof as well as the Hazardous Materials Identification System (HMIS) and National Fire Protection Association (NFPA) ratings have been included by Exxon Company, U.S.A. in order to provide additional health and hazard classification information. The ratings recommended are based upon the criteria supplied by the developers of these rating systems, together with Exxon's interpretation of the available data.

FOR ADDITIONAL INFORMATION ON HEALTH EFFECTS CONTACT:

DIRECTOR OF INDUSTRIAL HYGIENE
EXXON COMPANY, U.S.A.
KELLOGG TOWER, ROOM 550
P. O. BOX 2180
HOUSTON, TX 77252-2180
(713) 656-2443

FOR OTHER PRODUCT INFORMATION CONTACT:

MANAGER, MARKETING TECHNICAL SERVICES
EXXON COMPANY, U.S.A.
ROOM 2355
P. O. BOX 2180
HOUSTON, TX 77252-2180
(713) 656-5949

MATERIAL SAFETY DATA SHEET NO. C024 ISSUE DATE: 11/2/90

MATERIAL NAME: DOVE LIGHT DUTY LIQUID DISHWASHING DETERGENT
SUPPLIER: LEVER BROTHERS COMPANY 390 PARK AVENUE NY, NY 10022
EMERGENCY PHONE: 212 688-6000
SYNONYMS: N.A.
COMPONENTS: Confidential
EPA/TSCA STATUS: N.A. CAS NO.: N.A.
DOT HAZARD CLASS: N.A.
DOT SHIPPING NAME: N.A.

NFPA CODE	EXPOSURE LIMITS
HEALTH: 2	
FLAMM: 0	OSHA PEL: N.A. ACGIH TWA: N.A.
REACT: 0	LEVER TLV: N.A. ACGIH STEL: N.A.

HAZARDOUS COMPONENTS	CAS NUMBER	%	OSHA PEL	ACGIH: TWA	STEL
None					

PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE AND ODOR: Liquid
PH: 6.2-6.6
BOILING POINT: N.D.
SPECIFIC GRAVITY: 1.035-1.055
MELTING POINT: N.A.
SOLUBILITY: Soluble in Water
FREEZING POINT: N.D.
VAPOR PRESSURE: N.D.
VAPOR DENSITY: N.D.
SPILL OR LEAK PROCEDURES: Flush small amounts to sanitary sewer. For 5 gallons or more, use absorbent material.

FIRE, EXPLOSION, REACTIVITY DATA

FLASH POINT: N.A.
FLAMMABLE LIMITS: N.A.
UNUSUAL FIRE AND EXPLOSION HAZARDS: None
EXTINGUISHING MEDIA: Normal
HAZARDOUS DECOMPOSITION PRODUCTS: Oxides of nitrogen and sulfur
FIRE FIGHTING PROCEDURES: Normal
NFPA CLASS: N.D.
SPECIAL PRECAUTIONS: N.D.
INCOMPATIBILITIES (materials to avoid): Chlorine containing compounds
STABILITY: Stable

DISPOSAL DATA

DISPOSAL SHIPPING NAME: N.A.
EPA HAZARD CODE: N.A.
EPA HAZARD WASTE #: N.A.
DOT HAZARD WASTE ID #: N.A.
DISPOSAL: Dispose in accordance with Federal, State and Local Regulations.

N.A. = NOT APPLICABLE N.D. = NOT DETERMINED

MATERIAL SAFETY DATA SHEET NO. C024 ISSUE DATE: 11/2/90
MATERIAL NAME: DOVE LIGHT DUTY LIQUID DISHWASHING DETERGENT

ACUTE TOXICITY INFORMATION

ORAL:	Nontoxic
INHALATION:	N.D.
DERMAL:	N.D.
EYE IRRITATION:	Irritant to eyes by FHSA test standards. Minimal eye effects in humans with similar products.
SKIN IRRITATION:	Nonirritant
SKIN SENSITIZATION:	Nonsensitizer
PRIMARY ROUTES OF ENTRY:	Eye

CHRONIC EXPOSURE EFFECTS

TARGET ORGANS: Eye

CARCINOGEN: (NTP, IARC & OSHA LIST) None

MEDICAL CONDITION AGGRAVATED BY EXPOSURE: None Known

SYMPTOMS AND EFFECTS OF EXPOSURE

EYE:	May cause discomfort, lacrimation and erythema.
SKIN:	Possible irritation from prolonged or repeated contact.
INGESTION:	May produce nausea, abdominal discomfort and diarrhea. Spontaneous emesis may occur if ingested in sufficient amount.
INHALATION:	May produce irritation of respiratory tract.

EMERGENCY AND FIRST AID TREATMENT

EYE:	Immediately rinse eyes with water. Remove contact lenses, if any, then continue rinsing for 5 to 10 minutes.
SKIN:	Remove contaminated clothing and rinse skin with water.
INGESTION:	Drink a glass of water or milk. Vomiting need not be induced, but ingestion of large quantities may produce spontaneous vomiting.
INHALATION:	Move person to fresh air.
COMMENTS:	Call a physician if symptoms persist or amount swallowed was large.

PERSONAL SAFETY MEASURES AND EQUIPMENT

EYES:	Safety glasses with side shields.
RESPIRATOR:	Not normally needed.
GLOVES:	Impermeable gloves if needed.
VENTILATION:	Local exhaust if needed.

While Lever Brothers Co. believes that the data contained herein comply with 29CFR 1910.1200, they are not to be taken as a warranty or representation fo which Lever Brothers Co. assumes legal responsibility. They are offered sole for your consideration and verification. This MSDS is not prepared for consu use situations.

Material Safety Data Sheet

From Genium's Reference Collection
Genium Publishing Corporation
1145 Catalyn Street
Schenectady, NY 12303-1836 USA
(518) 377-8855

GENIUM PUBLISHING CORP.

No. 54
CARBON DIOXIDE
(Revision A)

Issued: July 1979
Revised: April 1986

SECTION 1. MATERIAL IDENTIFICATION

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MATERIAL NAME: CARBON DIOXIDE

OTHER DESIGNATIONS: Carbonic Anhydride, Dry Ice, CO_2, CAS #0124-38-9

DESCRIPTION: Material is supplied in steel cylinders as a liquid under its own vapor pressure (ca. 870 psig at 70°F [21.9°C]) or in a solid form as dry ice.

MANUFACTURER/SUPPLIER: Available from several suppliers, including: Scientific Gas Products, Ashland Chemical Co., 2330 Hamilton Blvd., S. Plainfield, NJ 07080; Telephone: (201) 754-7700

Not Found

HMIS
H: 3
F: 0
R: 0 (Liq.)
PPE*
*See Sect. 8

R 1
I 1
S 2 (Liquid)
K 0

SECTION 2. INGREDIENTS AND HAZARDS

	%	HAZARD DATA
Carbon Dioxide, CAS #0124-38-9	>99.5	8-hr. TWA: 5000 ppm or 9000 mg/m^3*
		Human, Inhalation, LCLo: 100,000 ppm/1 min.
* Current OSHA PEL and ACGIH (1985-86) TLV. NIOSH recommended a 10-hr. TWA of 10,000 ppm with a ceiling level of 30,000 ppm (10-minute sample).		Rat, Inhalation, LCLo: 657,000 ppm for 15 min.
		Rat (10 Days Pregnant), Inhalation, TCLo: 60,000 ppm/24 hrs.; Teratogenic Effects

SECTION 3. PHYSICAL DATA

Boiling Point, @1 atm ... -109.3°F (-78.5°C)
Vapor Pressure @ 20°C ... 1 atm
Solubility in Water @ 1 atm, 20°C ml/100 ml ... 90
Vapor Density (Air = 1) ... 1.5
Critical Temperature ... 87.8°F (31°C)
Molecular Weight ... 44.01

Appearance and odor: Colorless gas; clear, colorless, volatile liquid; or a white solid. Odorless. (At high concentrations an acidic taste is detectable.)

SECTION 4. FIRE AND EXPLOSION DATA

Flash Point and Method	Autoignition Temperature	Flammability Limits in Air	LOWER	UPPER
Not Found	Not Found	Not Found	Not Found	Not Found

EXTINGUISHING MEDIA: Use extinguishing media appropriate to the surrounding fire. Use water spray to cool fire-exposed containers or, if desired, to increase the rate of evaporation of the liquid/solid if the increased rate can be controlled. CO_2 is used as a fire-extinguishing agent primarily for its smothering effect (reduction of oxygen concentration to the point where the immediate atmosphere cannot support combustion). It is not effective on fires involving chemicals that have their own oxygen supply (i.e., cellulose nitrate); or on fires involving reactive metals (such as potassium, sodium, magnesium, aluminum, titanium, and zirconium); or their hydrides, as these materials can decompose carbon dioxide.

UNUSUAL FIRE/EXPLOSION HAZARDS: This material is noncombustible and will not support combustion. It presents no unusual explosion hazard unless compressed gas is exposed to a fire, then containers may rupture violently.

SPECIAL FIRE-FIGHTING PROCEDURES: Fire fighters should use self-contained breathing apparatus and wear fully protective clothing.

SECTION 5. REACTIVITY DATA

Carbon dioxide is stable. Hazardous polymerization cannot occur.

CO_2 can cause violent polymerization of acrylaldehyde or ethylenimine. It decomposes to carbon monoxide (CO) and oxygen (O_2) when heated above 3092°F (1700°C). This weakly acidic material will react with alkaline materials to form carbonates and bicarbonates.

An explosion can occur when CO_2 contacts sodium peroxide mixed with aluminum or magnesium. Reactive metals (such as alkali metals, magnesium, aluminum, titanium, or zirconium); their hydrids; and materials like diethyl magnesium, moist cesium oxide, or lithium acetylide with ammonia can ignite in a CO_2 atmosphere. Dry ice can form shock-sensitive mixtures with sodium, potassium, or sodium-potassium alloy.

HAZARDOUS DECOMPOSITION PRODUCTS may include carbon monoxide.

SECTION 6. HEALTH HAZARD INFORMATION

Carbon dioxide is not listed as a carcinogen by the NTP, IARC, or OSHA. This material is relatively inert. It can cause asphyxiation by displacing oxygen. Symptoms of exposure depend on the degree and duration of oxygen deficiency. Symptoms of overexposure include headache, dizziness, shortness of breath, muscular weakness, drowsiness, and ringing in the ears. High concentrations produce a faint "acidic" taste and can cause paralysis of the respiratory control center of the nervous system: 2% (20,000 ppm) by volume in the atmosphere will cause a 50% increase in the rate of breathing; 3%, a 100% rate increase; >4% produces labored breathing and is dangerous for even a few minutes of exposure; >12% causes rapid unconsciousness. Contact with liquid or solid CO_2 can produce frostbite and freeze burns.
Because CO_2 is an asphyxiant, primary entry is by inhalation. Acute effect is asphyxiation.
FIRST AID: CONTACT WITH LIQUID/SOLID: Promptly flush areas affected with lots of tepid water to reduce freezing of tissue. (Do not apply direct heat to affected area!) Loosely apply dry, sterile, bulky dressings to protect area from infection and from further injury. Get medical help.* INHALATION: (CAUTION! Would-be rescuers need to be concerned with their own safety in oxygen-deficient areas. Use self-contained breathing equipment.) Remove victim to fresh air. Quickly restore and/or support his breathing as required, administering oxygen if available. Get medical help.*

* GET MEDICAL ASSISTANCE = In plant, paramedic, community. Get medical help for further treatment, observation, and support after first aid.

SECTION 7. SPILL, LEAK, AND DISPOSAL PROCEDURES

Notify safety personnel of major leaks or spills. Evacuate area until ventilation can restore a safe oxygen level. Emergency personnel need self-contained breathing equipment and protective clothing against contact with solid material (dry ice).

DISPOSAL: Remove the scrap solid ("snow" or dry ice), take the leaking cylinder outdoors, or place it into a hood with good forced ventilation. Allow gas to be discharged at a moderate rate. Defective cylinders should be tagged to indicate a defect. Close the valve and return the defective cylinder to the supplier.

SECTION 8. SPECIAL PROTECTION INFORMATION

RESPIRATOR: Provide air-supplied or self-contained breathing equipment for emergency or nonroutine situations where the level of carbon dioxide is excessive.
VENTILATION: Provide adequate general and local exhaust ventilation to prevent workplace atmospheres from becoming oxygen deficient (minimum O_2 volume = 18%). Carbon dioxide is heavier than air and accumulates along the floor and in depressions.
SPECIAL CONSIDERATIONS: Use a safety line and a standby worker when respirator-protected personnel enter a hazardous carbon dioxide-enriched area. (The standby worker should have a self-contained breathing apparatus immediately available.) Those working with carbon dioxide should wear approved insulated gloves, safety glasses, and other protective clothing, as required by conditions of use, to prevent any skin contact with carbon dioxide. Safety shoes are recommended for those handling cylinders of gases. Contact lenses pose a special hazard; soft lenses may absorb irritants, and all lenses concentrate irritants.

SECTION 9. SPECIAL PRECAUTIONS AND COMMENTS

STORAGE SEGREGATION: Store in a cool, dark, well-ventilated area away from sources of heat.

SPECIAL HANDLING/STORAGE: Handling, storage, and utilization of compressed-gas cylinders must be in accordance with 29 CFR 1910.101(6). Do not store them in enclosed or subsurface areas.

OTHER PRECAUTIONS: Do not put dry ice in a closed container where evolved gas cannot escape. Use an unsealed, insulated storage chest or container for dry ice. Occupational exposures may occur in places such as mines, silos, vats, or ships' holds, where fermentation processes may deplete oxygen with carbon dioxide.
DOT Classification: Nonflammable Gas
UN1013 (Gas); UN2187 (Liquid); UN1845 (Solid)
Data Source(s) Code: 1-10, 12, 14, 17-19, 25, 26, 31, 38, 47, 55, 82, 84. CK

Approvals JO Rebecca, 1/87.
Indust. Hygiene/Safety 12-86
Medical Review

17-325; 17-325-2; 17-325-

ANSUL

ANSUL FIRE PROTECTION
MARINETTE, WI 54143-2542

MATERIAL SAFETY DATA SHEET

FORAY
QUICK IDENTIFIER (In Plant Common Name)

Manufacturer's Name:	ANSUL FIRE PROTECTION, WORMALD U.S., INC.	Emergency Telephone No.:	(715) 735-7411
Address:	One Stanton Street, Marinette, WI 54143-2542	Other Information Calls:	Same
Prepared By:	Safety and Health Department	Date Prepared:	June 1, 1989

SECTION 1 — IDENTITY

Common Name: (used on label) (Trade Name and Synonyms)	FORAY Dry Chemical Extinguishing Agent	CAS No.:	N/A
Chemical Name:	N/A This is a Mixture	Chemical Family:	Mixture
Formula:	N/A		

SECTION 2 — INGREDIENTS

PART A — HAZARDOUS INGREDIENTS

Principal Hazardous Component(s) (chemical and common name(s)):	%	CAS No.	ACGIH TLV	Acute Toxicity Data
Muscovite Talc	Less than 5	12001-26-2	20 mppcf*	NDA
Magnesium Aluminum Silicate	Less than 10	8031-18-3	10 mg/M3	NDA

*Million particles per cubic foot

PART B — OTHER INGREDIENTS

Other Component(s) (chemical and common name(s)):	%	CAS No.	Acute Toxicity Data
Monoammonium Phosphate	Greater than 75	7722-76-1	NDA
Ammonium Sulfate	Greater than 10	7783-20-2	NDA
Methyl Hydrogen Polysiloxane	Less than 1	63148-57-2	NDA
Yellow Pigment	Less than 0.1	5468-75-7	NDA

SECTION 3 — PHYSICAL AND CHEMICAL CHARACTERISTICS (Fire and Explosion Data)

Boiling Point:	N/A			Specific Gravity (H_2O = 1):	N/A	Vapor Pressure (mm Hg):	N/A
Percent Volatile by Volume (%):	N/A	Vapor Density (Air = 1):	N/A	Evaporation Rate (= 1):	N/A		
Solubility in Water:	Slight			Reactivity in Water:	Unreactive		
Appearance and Odor:	Yellow colored powder, no characteristic odor						
Flash Point:	None	Flammable Limits in Air % by Volume:	N/A	Extinguisher Media:	N/A	Auto-Ignition Temperature:	N/A
Special Fire Fighting Procedures:	NONE – THIS IS AN EXTINGUISHING AGENT						
Unusual Fire and Explosion Hazards:	None						

SECTION 4 – PHYSICAL HAZARDS

Stability:	Unstable ☐ Stable ☒	Conditions to Avoid:	N/A
Incompatibility (Materials to Avoid):	Strong alkalis, Mg		
Hazardous Decomposition Products:	NH_3 and/or PO_x may be evolved		
Hazardous Polymerization:	May Occur ☐ Will Not Occur ☒	Conditions to Avoid:	N/A

SECTION 5 — HEALTH HAZARDS

Threshold Limit Value:	OSHA nuisance dust limit of 15 mg/M3 or ACGIH nuisance dust value of 10 mg/M3 for the eight hour time-weighted average.
Routes of Entry: Eye Contact:	Mildly irritating for a short period of time.
Skin Contact:	May be mildly irritating.
Inhalation:	Treat as a mineral dust. Irritant to the respiratory tract.
Ingestion:	Not an expected route of entry.
Signs and Symptoms: Acute Overexposure:	Transient cough, shortness of breath.
Chronic Overexposure:	Chronic fibrosis of the lung, pneumoconiosis.
Medical Conditions Generally Aggravated by Exposure:	Reactive airway
Chemical Listed as Carcinogen or Potential:	National Toxicology Program: Yes ☐ No ☒ — I.A.R.C. Monographs: Yes ☐ No ☒ — OSHA: Yes ☐ No ☒

SECTION 6 — EMERGENCY AND FIRST AID PROCEDURES

Eye Contact:	Flush with large amounts of water; if irritation persists, seek Medical attention.
Skin Contact:	Wash with soap and water; if irritation persists, seek Medical attention.
Inhalation:	Remove victim to fresh air. Seek Medical attention if discomfort continues.
Ingestion:	If patient is conscious, give large amounts of water and induce vomiting. Seek Medical help.

SECTION 7 — SPECIAL PROTECTION INFORMATION

Respiratory Protection (Specify Type):	Dust mask where dustiness is prevalent, or TLV exceeded. Mechanical filter respirator if exposure is prolonged.			
Ventilation:	Local Exhaust:	Discretionary	Mechanical (General):	Recommended
Protective Gloves:	N/A		Eye Protection:	Recommended as mechanical barrier for prolonged exposure.
Other Protective Clothing or Equipment:	If irritation occurs, long sleeves and impervious gloves should be worn.			

SECTION 8 — SPECIAL PRECAUTIONS AND SPILL/LEAK PROCEDURES

Precautions to be Taken in Handling and Storage:	Should be stored in original container or Ansul fire extinguisher.
Other Precautions:	Do not mix agents.
Steps to be Taken in Case Material is Released or Spilled:	Sweep up.
Waste Disposal Methods:	Dispose of in compliance with local, state, and federal regulations.

HAZARDOUS MATERIAL IDENTIFICATION SYSTEM RATINGS

HAZARD INDEX:	
4 Severe Hazard 3 Serious Hazard 2 Moderate Hazard 1 Slight Hazard 0 Minimal Hazard	1 HEALTH 0 FLAMMABILITY 0 REACTIVITY

N/A = Not Applicable NDA = No Data Available

Petroleum Company

PRODUCT NAME: REGULAR UNLEADED GASOLINE
MARATHON MSDS NO: 115MAR001

THE FOLLOWING INFORMATION IS FURNISHED SUBJECT TO THE DISCLAIMER ON THE BOTTOM OF THIS FORM

SECTION 1 - PRODUCT IDENTIFICATION

PRODUCT NAME: REGULAR UNLEADED GASOLINE

SYNONYMS:
GASOLINE, REGULAR UNLEADED; LEAD-FREE GASOLINE; MILE-MAKER LEAD-FREE GASOLINE; REGULAR UNLEADED GASOLINE; UNLEADED REGULAR GASOLINE

MANUFACTURER / DISTRIBUTOR:
MARATHON PETROLEUM COMPANY
539 SOUTH MAIN STREET
FINDLAY, OH
45840
EMERGENCY PHONE NUMBERS:
(419) 422-2121 (MARATHON)
(800) 424-9300 (CHEMTREC)

CHEMICAL FAMILY: PETROLEUM HYDROCARBON
CHEMICAL FORMULA: MIXTURE
CAS NO: MIXTURE
PRODUCT CODE:

SECTION 2 - PHYSICAL PROPERTIES

BOILING POINT	MELTING POINT	SPECIFIC GRAVITY(H2O=1)
90-437 F	N.A. F	0.71-0.77
% SOLUBILITY IN WATER	VAPOR DENSITY(AIR=1)	VAPOR PRESSURE
NEGLIGIBLE	3-4	414-776 MM HG @ 100F

PH INFORMATION: PH: N.A. AT CONC.
APPEARANCE: BLUE OR CLEAR LIQUID ODOR: GASOLINE

SECTION 3 - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT	AUTOIGNITION TEMP	EXPLOSIVE LIMITS (% BY VOLUME IN AIR)
-50 F	C.A. 495 F	LOWER/UPPER: 1.4/ 7.6

EXTINGUISHING MEDIA:

ONLY U.L. APPROVED CLASS B FIRE EXTINGUISHING MEDIA SUCH AS FOAM, CO2, HALON 1211, OR DRY CHEMICAL. WATER SPRAY SHOULD BE USED ONLY BY QUALIFIED FIRE FIGHTING PERSONNEL.

SPECIAL FIRE FIGHTING INSTRUCTIONS:

CAUTION MUST BE FOLLOWED AFTER EXTINGUISHMENT DUE TO EASE OF REIGNITION OF HOT GASOLINE VAPORS. WATER CAN BE USED TO COOL EXPOSED SURFACES.

STABILITY: THE MATERIAL IS STABLE AT 70 F, 760MM PRESSURE
CONDITIONS TO AVOID:

HAZARDOUS DECOMPOSITION PRODUCTS:
CARBON MONOXIDE, ALDEHYDES, AROMATIC HYDROCARBONS.

INCOMPATIBLE MATERIALS:
OXIDIZERS.

HAZARDOUS POLYMERIZATION: WILL NOT OCCUR

PRODUCT NAME: REGULAR UNLEADED GASOLINE
MARATHON MSDS NO: 115MAR001

SECTION 4 - PRODUCT COMPOSITION AND EXPOSURE LIMITS

EXPOSURE LIMITS FOR PRODUCT:	TLV			SOURCE
REGULAR UNLEADED GASOLINE	300.00 PPM	(8 HR TWA)		ACGIH
	500.00 PPM	(STEL)		ACGIH

COMPONENTS:	PERCENT RANGE	TLV			SOURCE
SATURATED HYDROCARBONS (PARAFFINS & CYCLOPARAFFINS)	57.00- 59.00	0.00		( )	
UNSATURATED HYDROCARBONS (OLEFINS)	1.00- 7.00	0.00		( )	
AROMATIC HYDROCARBONS (INCLUDING BENZENE, TOLUENE, XYLENES, ETHYLBENZENE AND TRIMETHYL BENZENES)	30.00- 40.00	0.00		( )	
BENZENE	.50- 3.00	10.00	PPM	(8 HR TWA)	ACGIH
		1.00	PPM	(8 HR TWA)	OSHA
		5.00	PPM	(STEL)	OSHA

MARATHON ACTION LEVEL 0.50 PPM (8 HR TWA)

***
COMPLEX MIXTURE OF PARAFFINIC, CYCLOPARAFFINIC, OLEFINIC AND AROMATIC HYDROCARBONS (PREDOMINANTLY C4-C12).
***
CONTAINS SMALL AMOUNTS (0.02%) OF DYES AND OTHER ADDITIVES WHICH ARE NOT CONSIDERED TO BE HAZARDOUS AT THE CONCENTRATIONS USED.

SECTION 5 - POTENTIAL HEALTH EFFECTS

EYE:

EYE IRRITATION MAY RESULT FROM CONTACT WITH THE LIQUID OR EXPOSURE TO VAPOR CONCENTRATIONS ABOVE THE TLV.

SKIN:

PROLONGED OR REPEATED LIQUID CONTACT CAN DEFAT THE SKIN AND LEAD TO IRRITATION AND/OR DERMATITIS.

INHALATION:

EXPOSURE TO VAPOR CONCENTRATIONS EXCEEDING 1000 PPM CAN CAUSE RESPIRATORY IRRITATION, HEADACHE, DIZZINESS, NAUSEA AND LOSS OF COORDINATION. HIGHER CONCENTRATIONS MAY CAUSE LOSS OF CONSCIOUSNESS, CARDIAC SENSITIZATION, COMA AND DEATH RESULTING FROM RESPIRATORY FAILURE.

INGESTION:

INGESTION MAY RESULT IN NAUSEA, VOMITING, DIARRHEA AND RESTLESSNESS. ASPIRATION (BREATHING) OF VOMITUS INTO THE LUNGS MUST BE AVOIDED AS EVEN SMALL QUANTITIES IN THE LUNGS CAN PRODUCE CHEMICAL PNEUMONITIS AND PULMONARY EDEMA/HEMORRHAGE.

PRODUCT NAME: REGULAR UNLEADED GASOLINE
MARATHON MSDS NO: 115MAR001

SECTION 5 - POTENTIAL HEALTH EFFECTS (CON'T)

ADDITIONAL TOXICITY INFORMATION:

TWO YEAR INHALATION TOXICITY STUDIES WITH FULLY VAPORIZED GASOLINE (67,292 & 2056 PPM) PRODUCED KIDNEY DAMAGE & KIDNEY TUMORS IN MALE RATS BUT NOT IN FEMALE RATS OR MALE AND FEMALE MICE. FEMALE MICE DEVELOPED A SLIGHTLY HIGHER INCIDENCE OF LIVER TUMORS COMPARED TO CONTROLS AT THE HIGHEST EXPOSURE LEVEL. SINCE THESE RESPONSES ARE SPECIES SPECIFIC AND HAVE NOT BEEN OBSERVED IN HUMANS, THEIR BIOLOGIC SIGNIFICANCE AS IT RELATES TO HUMAN HEALTH IS DIFFICULT TO INTERPRET AT THIS TIME. THE AMERICAN PETROLEUM INSTITUTE IS CURRENTLY CONDUCTING STUDIES TO HELP ANSWER THESE QUESTIONS. CHRONIC HUMAN HEALTH EFFECTS WOULD NOT BE EXPECTED AS LONG AS GOOD PERSONAL HYGIENE AND PROPER SAFETY PRECAUTIONS ARE PRACTICED.

PROLONGED AND REPEATED OVEREXPOSURE TO BENZENE MAY PRODUCE INJURY TO THE BLOOD-FORMING TISSUES CAUSING BLOOD ABNORMALITIES AND POSSIBLY LEUKEMIA; HOWEVER, EXPOSURES TO SUCH HIGH LEVELS ARE NOT LIKELY TO BE ENCOUNTERED IN TYPICAL GASOLINE HANDLING OPERATIONS DUE TO THE COMPARATIVELY LOW BENZENE CONTENT.

EMERGENCY FIRST AID PROCEDURES

EYE:

FLUSH EYES WITH LARGE AMOUNTS OF WATER FOR AT LEAST 15 MINUTES. IF SYMPTOMS OR IRRITATION OCCUR, CALL A PHYSICIAN.

SKIN:

WASH WITH SOAP AND LARGE AMOUNTS OF WATER. REMOVE CONTAMINATED CLOTHING. IF SYMPTOMS OR IRRITATION OCCUR, CALL A PHYSICIAN.

INHALATION:

MOVE PERSON TO FRESH AIR. IF NOT BREATHING OR IF NO HEARTBEAT, GIVE ARTIFICIAL RESPIRATION OR CARDIOPULMONARY RESUSCITATION (CPR). IMMEDIATELY CALL A PHYSICIAN.

INGESTION:

DO NOT INDUCE VOMITING. DO NOT GIVE LIQUIDS. IMMEDIATELY CALL A PHYSICIAN.

SECTION 6 - SPECIAL PROTECTION INFORMATION

VENTILATION:

LOCAL OR GENERAL EXHAUST REQUIRED IN ENCLOSED AREAS OR WITH INADEQUATE VENTILATION.

PRODUCT NAME: REGULAR UNLEADED GASOLINE
MARATHON MSDS NO: 115MAR001

SECTION 6 - SPECIAL PROTECTION INFORMATION (CON'T)

RESPIRATORY PROTECTION

APPROVED ORGANIC VAPOR CHEMICAL CARTRIDGE OR SUPPLIED AIR RESPIRATORS SHOULD BE WORN FOR EXPOSURES EXCEEDING THE TLV OR STEL. OBSERVE RESPIRATOR PROTECTION FACTOR CRITERIA CITED IN ANSI Z88.2 (1980).

PROTECTIVE GLOVES:

NEOPRENE, NITRILE OR PVA GLOVES FOR REPEATED OR PROLONGED SKIN EXPOSURE.

OTHER PROTECTIVE EQUIPMENT:

USE EXPLOSION-PROOF EQUIPMENT.

SECTION 7 - SPILL OR LEAK PROCEDURES

ENVIRONMENTAL EFFECTS:

LIQUID CAN BE TOXIC TO AQUATIC LIFE.

STEPS TO BE TAKEN IN CASE OF SPILL, LEAK OR RELEASE:

KEEP PUBLIC AWAY. SHUT OFF SOURCE IF POSSIBLE TO DO SO WITHOUT HAZARD. ELIMINATE ALL IGNITION SOURCES. ADVISE NATIONAL RESPONSE CENTER (800-424-8802) IF PRODUCT HAS ENTERED A WATERCOURSE. ADVISE LOCAL AND STATE EMERGENCY SERVICES AGENCIES, IF APPROPRIATE. CONTAIN LIQUID WITH SAND OR SOIL. RECOVER AND RETURN FREE LIQUID TO SOURCE. USE SUITABLE SORBENTS TO CLEAN UP RESIDUAL LIQUIDS.

WASTE DISPOSAL METHOD:

DISPOSE OF CLEANUP MATERIALS IN ACCORDANCE WITH APPLICABLE LOCAL, STATE AND FEDERAL REGULATIONS.

SECTION 8 - HANDLING AND STORAGE PRECAUTIONS

USE APPROPRIATELY GROUNDED DISPENSING PRACTICES. STORE IN A RELATIVELY COOL PLACE. DO NOT EXPOSE TO HEAT, OPEN FLAMES OR OXIDIZERS.

SECTION 9 - HAZARD WARNING

DANGER!

EXTREMELY FLAMMABLE

HARMFUL OR FATAL IF SWALLOWED

CONTAINS BENZENE WHICH MAY CAUSE CANCER OR BE TOXIC TO BLOOD-FORMING ORGANS.

PRODUCT NAME: REGULAR UNLEADED GASOLINE
MARATHON MSDS NO: 115MAR001

SECTION 10 - ADDITIONAL COMMENTS

SECTION 11 - ADDITIONAL COMMENTS CONTINUED

SECTION 12 - REGULATIONS

INFORMATION SUPPLIED BY: COORDINATOR TOXICOLOGY AND PRODUCT SAFETY
CRAIG M. PARKER PHONE: (419)422-2121

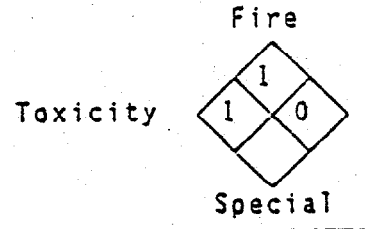
MSDS DATE: 04/10/87 DATE OF PREVIOUS MSDS: / /

WITCO MATERIAL SAFETY DATA SHEET

AMALIE MULTI-PURPOSE LS GEAR LUBRICANT

Product Code: 473 6752

NFPA HAZARD RATING
4 - Extreme
3 - High
2 - Moderate
1 - Slight
0 - Insignificant



DIVISION AND LOCATION---SECTION I

Division: AMALIE REFINING COMPANY
Location: BRADFORD, PENNSYLVANIA
ONE AMALIE WAY,BRADFORD,PA,16701
Emergency Telephone Number: (814) 368-6111
Transportation Emergency: CHEMTREC 1-(800) 424-9300 (U.S. and Canada)

CHEMICAL AND PHYSICAL PROPERTIES---SECTION II

Chemical Name:
petroleum hydrocarbon plus additives
Formula: not applicable
Hazardous Decomposition Products:
carbon monoxide and carbon dioxide from burning.
oxides of phosphorous from burning
oxides of sulfur
Incompatibility (Keep away from):
strong oxidizers such as hydrogen peroxide, bromine, and chromic acid.
Toxic and Hazardous Ingredients:
none
Form: liquid Odor: pungent,sulfur type
Appearance: viscous liquid Color: green to brown
Specific Gravity (water=1): .89
Boiling Point: greater than 330°C (625°F)
Melting Point: -18°C (0°F)
Solubility in Water (by weight %): 0 at 20°C
Volatile (by weight %): 0
Evaporation Rate: 0
Vapor Pressure (mm Hg at 20°C): 0
Vapor Density (air=1): not volatile
pH (as is): not applicable
Stability: Product is stable under normal conditions
Viscosity SUS at 100°F: Less than 100

(Continued on next page)

FIRE AND EXPLOSION DATA---SECTION III

Special Fire Fighting Procedures:
Do not use water except as fog.

Unusual Fire and Explosion Hazards:
none

Flashpoint: (Method Used) Cleveland open cup greater than 190°C (375°F)

Flammable limits %: not applicable

Extinguishing agents:
Drychemical or Waterfog or CO_2 or Foam
Closed containers exposed to fire may be cooled with water.

HEALTH HAZARD DATA---SECTION IV

Permissible concentrations (air):
If used in applications where a mist may be generated, observe a TWA/PEL of 5 mg/m^3 for mineral oil mist (OSHA and ACGIH).

Chronic effects of overexposure:
Prolonged or repeated skin contact may cause dermatitis (skin irritation)

Acute toxicological properties:
no data available

Emergency First Aid Procedures:

Eyes: Immediately flush with large quantities of water for at least 15 minutes and call a physician.

Skin Contact: Remove excess with cloth or paper. Wash thoroughly with soap and water.

Inhalation: Remove victim to fresh air. Call a physician.

If Swallowed: Call a physician immediately. DO NOT induce vomiting. (Vomiting may cause aspiration into lungs resulting in chemical pneumonia.)

SPECIAL PROTECTION INFORMATION---SECTION V

Ventilation Type Required (Local,mechanical,special):
Local if necessary to maintain allowable PEL(permissible exposure limit) or TLV(threshhold limit value)

Respiratory Protection (Specify type):
Use NIOSH/MSHA certified respirator with dual organic vapor/mist and particulates cartridge if vapor concentration exceeds permissible exposure limit.

Protective Gloves:
neoprene type

Eye Protection:
chemical safety goggles

Other Protective Equipment:
none

(Continued on next page)

HANDLING OF SPILLS OR LEAKS---SECTION VI

Procedures for Clean-Up:
Transfer bulk of mixture into another container. Absorb residue with an inert material such as earth, sand, or vermiculite. Sweep up and dispose as solid waste in accordance with local, state, and federal regulations.

Waste Disposal:
Dispose of in accordance with all applicable federal, state and local regulations.

SPECIAL PRECAUTIONS---SECTION VII

Precautions to be taken in handling and storage:
Do not handle or store at temperatures over
Maximum Storage Temperature: 38°C (100°F)

TRANSPORTATION DATA---SECTION VIII

D.O.T.: Not Regulated
Reportable Quantity: not applicable
Freight Classification: Petroleum Lubricating Oil
Special Transportation Notes:
none

COMMENTS

* STATE REGULATORY INFORMATION:
Pennsylvania Worker And Community Right To Know Act: This product contains the following ingredient(s).
Hydrocarbon oils CAS. NO. 8020-83-5
The additive mixtures in this product have been declared a trade secret by the additive manufacturers.

Prepared by: Robert Kellam
Title: Group Supervisor, Lubricants Testing, Maintenance, and Safety
Original Date: 05/20/81 Sent to: DAVID DABOIEN
Revision Date: 04-12-90 OHM CORP
Supersedes : 07-19-89 2910 WEST BEAVER ST
Date Sent : 10/30/92 JACKSONVILLE FL 32205

(Continued on next page)

We believe the statements, technical information and recommendations contained herein are reliable, but they are given without warranty or guarantee of any kind, express or implied, and we assume no responsibility for any loss, damage, or expense, direct or consequential, arising out of their use.

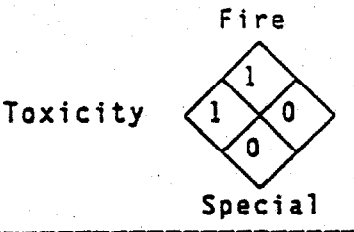
FE

W I T C O M A T E R I A L S A F E T Y D A T A S H E E T

Kendall C-915 Grease

Product Code: J63 7834

NFPA HAZARD RATING
4 - Extreme
3 - High
2 - Moderate
1 - Slight
0 - Insignificant



DIVISION AND LOCATION---SECTION I

Division: KENDALL REFINING COMPANY
Location: BRADFORD, PENNSYLVANIA
77 N. KENDALL AVE.,BRADFORD,PA,16701
Emergency Telephone Number: (814) 368-6111
Transportation Emergency: CHEM TREC 1-(800) 424-9300 (U.S. and Canada)

CHEMICAL AND PHYSICAL PROPERTIES---SECTION II

Chemical Name:
petroleum hydrocarbon and calcium stearate
Formula: not applicable
azardous Decomposition Products:
carbon monoxide and carbon dioxide from burning.
Incompatibility (Keep away from):
strong oxidizers such as hydrogen peroxide, bromine, and chromic acid.
Toxic and Hazardous Ingredients:
none
Form: semi-solid Odor: mineral oil
Appearance: grease Color: black
Specific Gravity (water=1): .94
Boiling Point: greater than 260°C (500°F)
Melting Point: not applicable
Solubility in Water (by weight %): negligible
Volatile (by weight %): negligible
Evaporation Rate: negligible
Vapor Pressure (mm Hg at 20°C): negligible
Vapor Density (air=1): not applicable
pH (as is): not applicable
Stability: Product is stable under normal conditions
Viscosity SUS at 100°F: Greater than or = to 100

FIRE AND EXPLOSION DATA---SECTION III

Special Fire Fighting Procedures:
Do not use water except as fog.
"nusual Fire and Explosion Hazards:
none

(Continued on next page)

(Section III continued)

Flashpoint: (Method Used) ASTM D92 greater than 210°C (410°F)
Flammable limits %: not applicable
Extinguishing agents:
Drychemical or Waterfog or CO_2 or Foam or Sand/Earth
Water may cause frothing.
Closed containers exposed to fire may be cooled with water.

HEALTH HAZARD DATA---SECTION IV

Permissible concentrations (air):
not applicable
Chronic effects of overexposure:
Extended skin contact may cause dermatitis to some individuals.
Acute toxicological properties:
no data available
Emergency First Aid Procedures:
Eyes: Immediately flush with large quantities of water for at least 15 minutes and call a physician.
Skin Contact: Remove excess with cloth or paper. Wash thoroughly with soap and water.
Inhalation: Remove victim to fresh air. Call a physician.
If Swallowed: Contact a physician immediately.

SPECIAL PROTECTION INFORMATION---SECTION V

Ventilation Type Required (Local,mechanical,special):
none required
Respiratory Protection (Specify type):
none required
Protective Gloves:
rubber
Eye Protection:
chemical safety goggles
Other Protective Equipment:
none

HANDLING OF SPILLS OR LEAKS---SECTION VI

Procedures for Clean-Up:
Transfer bulk of mixture into another container. Absorb residue with an inert material such as earth, sand, or vermiculite. Sweep up and dispose as solid waste in accordance with local, state, and federal regulations.
Waste Disposal:
Dispose of in accordance with all applicable federal, state and local regulations.

(Continued on next page)

SPECIAL PRECAUTIONS---SECTION VII

Precautions to be taken in handling and storage:
Do not handle or store at temperatures over
Maximum Storage Temperature: 38°C (100°F)

TRANSPORTATION DATA---SECTION VIII

D.O.T.: Not Regulated
Reportable Quantity: not applicable
Freight Classification: Petroleum Lubricating Grease
Special Transportation Notes:

Robert Kellam

Prepared by: L.D.DROMGOLD
Title: MANAGER,NEW PRODUCTS
Original Date: 06/18/82 Sent to: CHRIS MCKEEMAN
Revision Date: 11/13/85 OHM CORPORATION
Supersedes : 05/11/84 16406 US ROUTE 224E
Date Sent : 07/28/89 FINDLAY OH 45840

We believe the statements, technical information and recommendations contained herein are reliable, but they are given without warranty or guarantee of any kind, express or implied, and we assume no responsibility for any loss, damage, or expense, direct or consequential, arising out of their use.

GO-JO® HAND CLEANER with Fine Italian PUMICE

HEALTH HAZARD DATA:

Routes of Entry:

___ Inhalation ___ Skin _X_ Eye _X_ Ingestion

Carcinogenicity:

_X_ None Known ___ NTP ___ IARC ___ OSHA Regulated

Signs and Symptoms of Exposure:

EYE CONTACT - Irritation. SKIN CONTACT - Prolonged contact may result in contact dermatitis which is characterized by dryness, chapping, and reddening. INGESTION - Ingestion of small quantities is usually nonfatal unless aspiration occurs. Aspiration may lead to chemical pneumonitis which is characterized by pulmonary edema, and hemorrhage and may be fatal.

Medical Conditions Generally Aggravated by Exposure:

None known

Emergency and First Aid Procedures:

EYE CONTACT - DO NOT RUB EYES. Flush with water for 15 minutes, if irritation persists, contact physician.
INGESTION - DO NOT INDUCE VOMITING. Contains Mineral Oil. Contact Physician or Poison Control Center immediately.

PRECAUTIONS FOR SAFE HANDLING AND USE:

Steps to be Taken in Case Material is Released or Spilled:

Absorb and collect for disposal. Flush area with water to reduce possible slippery floor hazard.

Waste Disposal Method:

According to all local, state, and federal regulations.

Precautions to be Taken in Handling and Storage:

Avoid eye contact and store at ambient conditions.

Other Precautions:

KEEP OUT OF REACH OF CHILDREN!

CONTROL MEASURES:

Respiratory & Ventilation / Gloves & Eye Protection:

None Required if used as directed.

Other Protective Clothing or Equipment:

None Required if used as directed.

Work/Hygienic Practices:

Routine

PREPARED BY: Ronald A. Williams

Ronald A. Williams,
Administrative Scientist

DATE: 9/23/91

SUPERSEDES: 8/30/90

NOTICE: The information herein is based on data considered to be accurate as of the date of preparation of this Material Safety Data Sheet. However, no warranty or representation, expressed or implied, is made as to the accuracy or completeness of the foregoing data and safety information. The user assumes all liability for any damage or injury resulting from abnormal use, from any failure to adhere to recommended practices, or from any hazards inherent in the nature of the product.

NA = Not Applicable NO = No Data NE = Not Established

This form complies with OSHA Form 174.

1151-2.RG1

INSTA FOAM PRODUCTS COMPANY
1500 Cedarwood Drive
Joliet, Illinois 60435
Tel 815 741 6800 Fax 815 741 6822
FOR EMERGENCY: CHEMTREC (800) 424-9300

MATERIAL SAFETY DATA SHEET

1 PRODUCT Great Stuff

2 COMPOSITION

CHEMICAL	CAS#	CONCENTRATION	REGULATED[1]
4,4-Diphenylmethane-diisocyanate (MDI)	101-68-8	30-60%	Yes
Polymeric MDI	9016-87-9	30-60%	No
Polyether Poly Blend	Mixture[2]	15-40%	No
Chlorodifluoromethane	75-45-6	15-40%	Yes
Trisphosphate	NA	3-7%	No

(1-see regulatory section for more information)
(2-different raw material sources).
APPEARANCE Off white, sticky material with a mild odor.

3 HAZARDS IDENTIFICATION CAUTION! Contents under pressure. Irritating to eyes, skin and respiratory tract. May cause sensitization by skin contact, and inhalation. Exposure to individuals with asthma, eczema, and or allergies may aggrevate existing conditions. Symptoms may include: coughing, wheezing, and shortness of breath.

4 FIRST AID MEASURES

EYE flush with clean, low pressure water for 15 minutes while holding eyelids open.
SKIN remove contaminated clothing; wash skin with soap and water.
INHALATION remove to fresh air.
INGESTION in case of excessive ingestion, give large amount of liquids. Do not induce vomiting.
In all cases, seek additional medical attention.

5 FIRE-FIGHTING MEASURES

Flash Point: >200°F (>93°C) CC
Extinguishing Media: Carbon Dioxide, Dry Chemical, Foam, Water
Special Protective Equipment: Self Contained Breathing Apparatus
Hazardous Decomposition Products: During combustion, carbon dioxide, carbon monoxide, nitrogen oxides, ammonia and trace amounts of hydrogen cyanide are given off.

6 ACCIDENTAL RELEASE MEASURES Provide adequate ventilation. Wear suitable personal protective clothing and equipment. Scrape up the bulk of the spill and put into a suitable waste receptacle. Avoid spreading the spill to other surfaces.

INSTA FOAM PRODUCTS COMPANY
1500 Cedarwood Drive
Joilet, Illinois 60435
Tel 815 741 6800 Fax 815 741 6822
FOR EMERGENCY: CHEMTREC (800) 424-9300

MATERIAL SAFETY DATA SHEET

7	HANDLING AND STORAGE	Protect containers from physical abuse Avoid direct sunlight Storage temperatures: 32°F- 120°F (0°C- 49oC) DO NOT incinerate aerosol can.
8	EXPOSURES CONTROLS/PERSONAL PROTECTION	EYE wear safety goggles. SKIN wear protective clothing. RESPIRATORY use only in well-ventilated areas. With insufficient ventilation, wear Self Contained Breathing Apparatus.
9	PHYSICAL AND CHEMICAL PROPERTIES	Vapor Pres.(21°C/70°F): 4000mmHg Specific Gravity: 1.3 VOC Content (lb/gal): 0
10	STABILITY AND REACTIVITY	Stable under normal handling and use. Avoid water contamination, open flames, alcohols, strong bases, acids and ammonia. Reaction may be violent at elevated temperatures.
11	TOXICOLOGICAL INFORMATION	No toxicological testing has been done on this mixture
12	ECOLOGICAL INFORMATION	Unknown
13	DISPOSAL INFORMATION	Do not puncture or incinerate. Relieve all pressure prior to disposal. (See operating instructions for complete disposal procedures.)
14	TRANSPORTATION INFORMATION	Consumer Commodity ORM-D For 10 lb: Compressed Gas, N.O.S. (Nitrogen, Chlorodifluoromethane) Non-flammable Gas UN1956

15 REGULATORY INFORMATION

EXPOSURE LIMITS (OEL)	TWA(8 hour), mg/m³	SHORT TERM(10 mins), mg/m³
4,4-Diphenylmethane-diisocyanate (MDI)	0.05 (0.005ppm)	.2 (0.02ppm) ceiling
Chlorodifluoromethane	3500 (1000ppm)	NA

REGULATED CHEMICAL	APPLICABLE REGULATIONS
4,4-Diphenylmethane-diisocyanate (MDI)	SARA 311/312/313, CAA 1990 Toxic Air Pollutant
Chlorodifluoromethane	Canada, MA, NJ, PA

16	OTHER INFORMATION	N/A

S.C. Johnson Wax
Racine, Wisconsin 53403-5011
Phone:(414) 631-2777
Emergency Phone:(800) 228-5635
Extension 092

4=Very High
3=High
2=Moderate
1=Slight
0=Insignificant

HAZARD RATING	
HMIS	NFPA
1 Health	
4 Flammability	
0 Reactivity	

MATERIAL SAFETY DATA SHEET

SECTION I-PRODUCT IDENTIFICATION

PRODUCT NAME:				PRODUCT CODE
OFF! INSECT REPELLENT				11810-24-25
CHEMICAL OR COMMON NAME:	DATE ISSUED:	SUPERSEDES:	MSDS SECTIONS WITH CHANGES:	PREPARED BY:
NA	08/09/91	06/13/91		Terry A. Meyers Chemical Info. Adm.

SECTION II-INGREDIENT INFORMATION

INGREDIENTS	WEIGHT %	EXPOSURE LIMIT
N,N-Diethyl-Meta-Toluamide (CAS# 134-62-3)	14.25	NOT ESTABLISHED
Ethyl Alcohol (CAS# 64-17-5)	70-80	1000 PPM ACGIH/OSHA TWA
Propane\Isobutane\N-Butane (CAS# 74-98-6,75-28-5,106-97-8)	10-20	1000 PPM OSHA PEL NOT ESTABLISHED 800 PPM ACGIH/OSHA TWA

SECTION III-PHYSICAL DATA

APPEARANCE/ODOR: Dispensed as a spray mist with perfume odor	SPECIFIC GRAVITY (H2O=1): 0.78
VAPOR PRESSURE (mm Hg): ND	PERCENT VOLATILE BY VOLUME (%): NA
SOLUBILITY IN WATER: Appreciable	VAPOR DENSITY (Air=1): ND
FREEZING POINT (°F): NA	BOILING POINT (°F): ND
pH: NA	EVAPORATION RATE (Butyl Acetate=1): NA
VOC (as packaged, minus H2O): ND	THEORETICAL VOC (lb/gal): ND

SECTION IV-FIRE AND EXPLOSION INFORMATION

FLASH POINT (°F) (Method Used): under 20(TCC) (Propellant)

FLAMMABLE LIMITS: ND

EXTINGUISHING MEDIA: Foam. CO2. Dry Chemical. Water fog.

SPECIAL FIREFIGHTING PROCEDURES: Normal fire fighting procedures may be used. Fight fire from maximum distance or protected area. Cool and use caution when approaching or handling fire-exposed containers. Fire fighters should wear self-contained breathing apparatus and protective clothing.

UNUSUAL FIRE AND EXPLOSION HAZARDS: No special hazards known.

SECTION V-HEALTH HAZARD DATA

PRIMARY ROUTE OF ENTRY: Eye contact.

SIGNS AND SYMPTOMS: Direct contact of product with eyes can cause irritation. Product may cause distress and illness if taken internally.

FIRST AID PROCEDURES: Flush eyes with water for 15 minutes. If irritation persists, seek medical aid. If product is swallowed, seek medical aid at once.

MATERIAL SAFETY DATA SHEET

S.C. Johnson Wax
1525 Howe Street
Racine, Wisconsin 53403

OFF! INSECT REPELLENT
Product Number: 11810
Serial Number: 24-25

SECTION V-HEALTH HAZARD DATA (cont.)

MEDICAL CONDITIONS GENERALLY RECOGNIZED AS BEING AGGRAVATED BY EXPOSURE:

SECTION VI-REACTIVITY DATA

STABILITY: Stable

STABILITY-CONDITIONS TO AVOID: None known

INCOMPATIBILITY: None known

HAZARDOUS DECOMPOSITION PRODUCTS: When exposed to fire, produces normal products of combustion.

HAZARDOUS POLYMERIZATION: Will not occur.

HAZARDOUS POLYMERIZATION-CONDITIONS TO AVOID: None known

SECTION VII-SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED: Eliminate all ignition sources. Rinse affected area thoroughly with water.

WASTE DISPOSAL INFORMATION: Recycle empty aerosol can to nearest steel recycling center.

SECTION VIII-SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION: No special requirements under normal use conditions.

VENTILATION: General room ventilation adequate.

PROTECTIVE GLOVES: No special requirements under normal use conditions.

EYE PROTECTION: No special requirements under normal use conditions.

OTHER PROTECTIVE MEASURES: Use good personal hygiene practices.

SECTION IX-SPECIAL PRECAUTIONS

PRECAUTIONARY LABELING: CAUTION: Keep out of reach of children. Harmful if swallowed. Avoid contact with eyes and lips. Do not allow children to rub eyes if hands have been treated. In case of contact with eyes, flush with plenty of water. Do not apply to excessively sunburned or damaged skin. Flammable: Contents under pressure. See Section X.

OTHER HANDLING AND STORAGE CONDITIONS: Keep out of reach of children.

SECTION X-ADDITIONAL INFORMATION

ADDITIONAL INFORMATION: NFPA 30B Level 2 Do not use near heat, sparks, or open flame. Do not puncture or incinerate containers. Exposure to temperatures above 120° F may cause bursting. Keep treated surfaces away from fire or flame until dry.

SECTION XI-TRANSPORTATION INFORMATION

DOT CLASS: ORM-D.

DOT #: NA

MATERIAL SAFETY DATA SHEET

S.C. Johnson Wax
1525 Howe Street
Racine, Wisconsin 53403

OFF! INSECT REPELLENT
Product Number: 11810
Serial Number: 24-25

SECTION XI-TRANSPORTATION INFORMATION (cont.)

SHIPPING NAME: Insecticides or insect repellents, NOI, other than poison.

DOT NOTES: Consumer Commodity.

NA-Not Applicable, NE-Not Established, NSR-No Special Requirement, ND-Not Determined

Material Safety Data Sheet

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

U.S. Department of Labor
Occupational Safety and Health Administration
(Non-Mandatory Form)
Form Approved
OMB No. 1218-0072

IDENTITY (As Used on Label and List)
Isobutylene Span Gas/Calibration Gas

Note: Blank spaces are not permitted. If any item is not applicable, or no information is available, the space must be marked to indicate that.

Section I

Manufacturer's Name: HNU Systems, Inc.	Emergency Telephone Number: (617)964-6690 or 1-800-241-4357
Address (Number, Street, City, State, and ZIP Code): 160 Charlemont St., Newton Highlands, MA 02601	Telephone Number for Information: (617)964-6690
	Date Prepared: 12/8/87
	Signature of Preparer (optional)

Section II — Hazardous Ingredients/Identity Information

Hazardous Components (Specific Chemical Identity; Common Name(s))	OSHA PEL	ACGIH TLV	Other Limits Recommended	% (optional)
Isobutylene, Isobutene, 2-Methyloropene C_4H_8, Molecular weight 56.03				

Section III — Physical/Chemical Characteristics

Boiling Point	19.6°F	Specific Gravity (H_2O = 1)	0.59
Vapor Pressure (mm Hg.) at 20°C	24 sig	Melting Point	-140.35°C / -220.63°F
Vapor Density (AIR = 1)	1.93	Evaporation Rate (Butyl Acetate = 1)	N/A

Solubility in Water: unavailable

Appearance and Odor: clear, unpleasant odor similar to coal gas

Section IV — Fire and Explosion Hazard Data

Flash Point (Method Used): -76°C or -105°F closed cup	Flammable Limits	LEL 1.8%	UEL 9.6%

Extinguishing Media: CO_2 or dry chemical

Special Fire Fighting Procedures: Stop flow of isobutylene if possible. Use water spray to cool surrounding containers.

Unusual Fire and Explosion Hazards: Isobutylene is heavier than air and may travel a considerable distance to a source of ignition. Should flame be extinguished and flow of gas continue, increase ventilation to prevent formation of flammable mixture in low areas or pockets.

(Reproduce locally) OSHA 174, Sept. 1985

* Data is given for pure Isobutylene. A cylinder of HNU Span Gas/Isobutylene Calibration Gas contains 100 ppm (V/V) in zero air or 0.01% isobutylene in air.

Section V — Reactivity Data

Reactivity	Unstable		Conditions to Avoid
	Stable X		

Incompatibility (Materials to Avoid): Oxidizers

Hazardous Decomposition or Byproducts: None

Hazardous Polymerization	May Occur		Conditions to Avoid
	Will Not Occur X		

Section VI — Health Hazard Data

Route(s) of Entry: Inhalation? X Skin? Ingestion?

Health Hazards (Acute and Chronic)

Carcinogenicity: NTP? IARC Monographs? OSHA Regulated?

Signs and Symptoms of Exposure

'Isobutylene is a simple asphyxiant: moderate concentrations in air cause unconsciousness. Contact with liquid causes frostbite.

Medical Conditions Generally Aggravated by Exposure

Emergency and First Aid Procedures

If breathed, remove individual to fresh air. If breathing is difficult, administer oxyge
If breathing has stopped, give artificial respiration. Keep person warm, quiet: get medi

Section VII — Precautions for Safe Handling and Use

Steps to Be Taken in Case Material is Released or Spilled

Waste Disposal Method

Precautions to Be Taken in Handling and Storing: Store away from heat and protect cylinders from physical d

Other Precautions: Do not puncture cylinder

Section VIII — Control Measures

Respiratory Protection (Specify Type): Positive pressure air line or self contained breathing apparatus for emergency use.

Ventilation	Local Exhaust: to prevent accumulation above LEL	Special	
Hood with forced ventilation	Mechanical (General): According to electrical code	Other	
Protective Gloves	Plastic or rubber	Eye Protection	Safety goggles or glasses

Other Protective Clothing or Equipment: Safety shoes, safety shower, eyewash fountain

Work/Hygienic Practices

* See note at bottom of page on other side.

J.T.BAKER INC. 222 RED SCHOOL LANE, PHILLIPSBURG, NJ 08865
M A T E R I A L S A F E T Y D A T A S H E E T
24-HOUR EMERGENCY TELEPHONE -- (908) 859-2151
CHEMTREC # (800) 424-9300 -- NATIONAL RESPONSE CENTER # (800) 424-8802

EFFECTIVE: 03/09/92 ISSUED: 03/28/92

J.T.BAKER INC., 222 RED SCHOOL LANE, PHILLIPSBURG, NJ 08865

SECTION I - PRODUCT IDENTIFICATION

PRODUCT NAME: 2-PROPANOL
COMMON SYNONYMS: ISOPROPYL ALCOHOL; ISOPROPANOL; IPA; SEC-PROPANOL; DIMETHYLCARBINOL
CHEMICAL FAMILY: ALCOHOLS
FORMULA: CH3CHOHCH3
FORMULA WT.: 60.10
CAS NO.: 67-63-0
NIOSH/RTECS NO.: NT8050000
PRODUCT USE: LABORATORY REAGENT
PRODUCT CODES: 9088,5373,9059,9334,9079,9082,9089,9083,6809,9081,5610,5806 9084,9095

PRECAUTIONARY LABELING

BAKER SAF-T-DATA# SYSTEM

HEALTH	-	1	SLIGHT
FLAMMABILITY	-	4	EXTREME (FLAMMABLE)
REACTIVITY	-	2	MODERATE
CONTACT	-	2	MODERATE

LABORATORY PROTECTIVE EQUIPMENT

GOGGLES; LAB COAT; VENT HOOD; PROPER GLOVES; CLASS B EXTINGUISHER

U.S. PRECAUTIONARY LABELING

DANGER
EXTREMELY FLAMMABLE. CAUSES IRRITATION. MAY CAUSE EYE DAMAGE. HARMFUL IF SWALLOWED OR INHALED. MAY BE HARMFUL IF ABSORBED THROUGH SKIN. KEEP AWAY FROM HEAT, SPARKS, FLAME. AVOID CONTACT WITH EYES, SKIN, CLOTHING. AVOID BREATHING VAPOR. KEEP IN TIGHTLY CLOSED CONTAINER. USE WITH ADEQUATE VENTILATION. WASH THOROUGHLY AFTER HANDLING. IN CASE OF FIRE, USE ALCOHOL FOAM, DRY CHEMICAL, CARBON DIOXIDE - WATER MAY BE INEFFECTIVE. IN CASE OF SPILL, SOAK UP WITH SAND OR EARTH. FLUSH SPILL AREA WITH WATER.

CONTINUED ON PAGE: 2

PRECAUTIONARY LABELING (CONTINUED)

INTERNATIONAL LABELING

HIGHLY FLAMMABLE.
KEEP CONTAINER TIGHTLY CLOSED. KEEP AWAY FROM SOURCES OF IGNITION - NO SMOKING.

SAF-T-DATA# STORAGE COLOR CODE: RED (FLAMMABLE)

SECTION II - COMPONENTS

COMPONENT	CAS NO.	WEIGHT %	OSHA/PEL	ACGIH/TLV
2-PROPANOL	67-63-0	99-100	400 PPM	400 PPM

SECTION III - PHYSICAL DATA

BOILING POINT: 82 C (179 F)
(AT 760 MM HG)

VAPOR PRESSURE (MMHG): 33
(20 C)

MELTING POINT: -89 C (-128 F)
(AT 760 MM HG)

VAPOR DENSITY (AIR=1): 2.1

SPECIFIC GRAVITY: 0.79
(H2O=1)

EVAPORATION RATE: 2.5
(BUTYL ACETATE = 1)

SOLUBILITY(H2O): COMPLETE (100%)

% VOLATILES BY VOLUME: 100
(21 C)

PH: N/A

ODOR THRESHOLD (P.P.M.): 28.2

PHYSICAL STATE: LIQUID

COEFFICIENT WATER/OIL DISTRIBUTION: N/A

APPEARANCE & ODOR: CLEAR, COLORLESS LIQUID. ALCOHOL ODOR.

CONTINUED ON PAGE: 3

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (CLOSED CUP): 11 C (53 F) NFPA 704M RATING: 1-3-0

AUTOIGNITION TEMPERATURE: 398 C (750 F)

FLAMMABLE LIMITS: UPPER - 12.0 % LOWER - 2.0 %

FIRE EXTINGUISHING MEDIA
USE ALCOHOL FOAM, DRY CHEMICAL OR CARBON DIOXIDE. (WATER MAY BE INEFFECTIVE.)

SPECIAL FIRE-FIGHTING PROCEDURES
FIREFIGHTERS SHOULD WEAR PROPER PROTECTIVE EQUIPMENT AND SELF-CONTAINED BREATHING APPARATUS WITH FULL FACEPIECE OPERATED IN POSITIVE PRESSURE MODE. MOVE CONTAINERS FROM FIRE AREA IF IT CAN BE DONE WITHOUT RISK. USE WATER TO KEEP FIRE-EXPOSED CONTAINERS COOL.

UNUSUAL FIRE & EXPLOSION HAZARDS
VAPORS MAY FLOW ALONG SURFACES TO DISTANT IGNITION SOURCES AND FLASH BACK. CLOSED CONTAINERS EXPOSED TO HEAT MAY EXPLODE. CONTACT WITH STRONG OXIDIZERS MAY CAUSE FIRE.

TOXIC GASES PRODUCED
CARBON MONOXIDE, CARBON DIOXIDE

EXPLOSION DATA-SENSITIVITY TO MECHANICAL IMPACT
NONE IDENTIFIED.

EXPLOSION DATA-SENSITIVITY TO STATIC DISCHARGE
NONE IDENTIFIED.

SECTION V - HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE (TLV/TWA): 980 MG/M3 (400 PPM)

SHORT-TERM EXPOSURE LIMIT (STEL): 1225 MG/M3 (500 PPM)

PERMISSIBLE EXPOSURE LIMIT (PEL): 980 MG/M3 (400 PPM)

TOXICITY OF COMPONENTS

CONTINUED ON PAGE: 4

SECTION V - HEALTH HAZARD DATA (CONTINUED)

ORAL RAT LD50 FOR 2-PROPANOL	5840 MG/KG
INTRAPERITONEAL MOUSE LD50 FOR 2-PROPANOL	933 MG/KG
ORAL DOG LD50 FOR 2-PROPANOL	6150 MG/KG
SKIN RABBIT LD50 FOR 2-PROPANOL	13 G/KG

CARCINOGENICITY: NTP: NO IARC: NO Z LIST: NO OSHA REG: NO

CARCINOGENICITY
NONE IDENTIFIED.

REPRODUCTIVE EFFECTS
NONE IDENTIFIED.

EFFECTS OF OVEREXPOSURE

INHALATION: IRRITATION OF NOSE AND THROAT, HEADACHE, NAUSEA, DIZZINESS, DROWSINESS, IRRITATION OF UPPER RESPIRATORY TRACT, NARCOSIS, CENTRAL NERVOUS SYSTEM DEPRESSION, DIFFICULT BREATHING, PULMONARY EDEMA, UNCONSCIOUSNESS

SKIN CONTACT: IRRITATION, PROLONGED CONTACT MAY CAUSE DERMATITIS

EYE CONTACT: IRRITATION, MAY CAUSE CORNEAL DAMAGE

SKIN ABSORPTION: RAPID ABSORPTION

INGESTION: HEADACHE, NAUSEA, VOMITING, DIZZINESS, GASTROINTESTINAL IRRITATION, NARCOSIS, CENTRAL NERVOUS SYSTEM DEPRESSION, UNCONSCIOUSNESS

CHRONIC EFFECTS: NONE IDENTIFIED

TARGET ORGANS
EYES, SKIN, RESPIRATORY SYSTEM, LUNGS, CENTRAL NERVOUS SYSTEM

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE
SKIN DISORDERS, EYE DISORDERS, RESPIRATORY SYSTEM DISEASE

PRIMARY ROUTES OF ENTRY
INHALATION, INGESTION, SKIN CONTACT, EYE CONTACT, ABSORPTION

CONTINUED ON PAGE: 5

SECTION V - HEALTH HAZARD DATA (CONTINUED)

EMERGENCY AND FIRST AID PROCEDURES

INGESTION: CALL A PHYSICIAN. IF SWALLOWED, IF CONSCIOUS, GIVE LARGE AMOUNTS OF WATER. INDUCE VOMITING.

INHALATION: IF INHALED, REMOVE TO FRESH AIR. IF NOT BREATHING, GIVE ARTIFICIAL RESPIRATION. IF BREATHING IS DIFFICULT, GIVE OXYGEN.

SKIN CONTACT: 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 RE-USE.

EYE CONTACT: IN CASE OF EYE CONTACT, IMMEDIATELY FLUSH WITH PLENTY OF WATER FOR AT LEAST 15 MINUTES.

MEDICAL SURVEILLANCE
PROVIDE PREPLACEMENT AND PERIODIC MEDICAL EXAMINATIONS WITH EMPHASIS ON SKIN, SINUSES, AND RESPIRATORY SYSTEM.

SARA/TITLE III HAZARD CATEGORIES AND LISTS

ACUTE: YES CHRONIC: YES FLAMMABILITY: YES PRESSURE: NO REACTIVITY: NO

EXTREMELY HAZARDOUS SUBSTANCE:	NO	
CERCLA HAZARDOUS SUBSTANCE:	NO	
SARA 313 TOXIC CHEMICALS:	YES	CONTAINS ISOPROPYL ALCOHOL
GENERIC CLASS:		C05
TSCA INVENTORY:	YES	

SECTION VI - REACTIVITY DATA

STABILITY: STABLE HAZARDOUS POLYMERIZATION: WILL NOT OCCUR

CONDITIONS TO AVOID: HEAT, FLAME, OTHER SOURCES OF IGNITION

INCOMPATIBLES: STRONG OXIDIZING AGENTS, ALUMINUM, STRONG ACIDS, NITRIC ACID, SULFURIC ACID, HALOGENS, ACTIVE HALOGEN COMPOUNDS, AMINES AND AMMONIA, ALDEHYDES

CONTINUED ON PAGE: 6

SECTION VI - REACTIVITY DATA (CONTINUED)

DECOMPOSITION PRODUCTS: CARBON MONOXIDE, CARBON DIOXIDE

SECTION VII - SPILL & DISPOSAL PROCEDURES

STEPS TO BE TAKEN IN THE EVENT OF A SPILL OR DISCHARGE
WEAR SUITABLE PROTECTIVE CLOTHING. SHUT OFF IGNITION SOURCES; NO FLARES, SMOKING, OR FLAMES IN AREA. STOP LEAK IF YOU CAN DO SO WITHOUT RISK. USE WATER SPRAY TO REDUCE VAPORS. TAKE UP WITH SAND OR OTHER NON-COMBUSTIBLE ABSORBENT MATERIAL AND PLACE INTO CONTAINER FOR LATER DISPOSAL. FLUSH AREA WITH WATER.
DO NOT ALLOW SPILL TO ENTER DRAINS OR SEWER SYSTEM.

J. T. BAKER SOLUSORB(R) SOLVENT ADSORBENT IS RECOMMENDED FOR SPILLS OF THIS PRODUCT.

DISPOSAL PROCEDURE
DISPOSE IN ACCORDANCE WITH ALL APPLICABLE FEDERAL, STATE, AND LOCAL ENVIRONMENTAL REGULATIONS.

EPA HAZARDOUS WASTE NUMBER: D001 (IGNITABLE WASTE)

SECTION VIII - INDUSTRIAL PROTECTIVE EQUIPMENT

VENTILATION: USE GENERAL OR LOCAL EXHAUST VENTILATION TO MEET TLV REQUIREMENTS.

RESPIRATORY PROTECTION: RESPIRATORY PROTECTION REQUIRED IF AIRBORNE CONCENTRATION EXCEEDS TLV. AT CONCENTRATIONS UP TO 1000 PPM, A CHEMICAL CARTRIDGE RESPIRATOR WITH ORGANIC VAPOR CARTRIDGE IS RECOMMENDED. ABOVE THIS LEVEL, A SELF-CONTAINED BREATHING APPARATUS IS RECOMMENDED.

EYE/SKIN PROTECTION: SAFETY GOGGLES, UNIFORM, APRON, NEOPRENE GLOVES ARE RECOMMENDED.

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SECTION IX - STORAGE AND HANDLING PRECAUTIONS

SAF-T-DATA* STORAGE COLOR CODE: RED (FLAMMABLE)

STORAGE REQUIREMENTS
KEEP CONTAINER TIGHTLY CLOSED. STORE IN A COOL, DRY, WELL-VENTILATED, FLAMMABLE LIQUID STORAGE AREA. DO NOT STORE NEAR OXIDIZING MATERIALS.

SPECIAL PRECAUTIONS
BOND AND GROUND CONTAINERS WHEN TRANSFERRING LIQUID.

SECTION X - TRANSPORTATION DATA AND ADDITIONAL INFORMATION

DOMESTIC (D.O.T.)

PROPER SHIPPING NAME: ISOPROPANOL
HAZARD CLASS: FLAMMABLE LIQUID
UN/NA: UN1219
LABELS: FLAMMABLE LIQUID
REGULATORY REFERENCES: 49CFR 172.101; 173.125

INTERNATIONAL (I.M.O.)

PROPER SHIPPING NAME: ISOPROPANOL
HAZARD CLASS: 3.2 I.M.O. PAGE: 3244
UN: UN1219 MARINE POLLUTANTS: NO PACKAGING GROUP: II
LABELS: FLAMMABLE LIQUID
REGULATORY REFERENCES: 49CFR 172.102; PART 176; IMO

AIR (I.C.A.O.)

PROPER SHIPPING NAME: ISOPROPANOL
HAZARD CLASS: 3.2
UN: UN1219 PACKAGING GROUP: II
LABELS: FLAMMABLE LIQUID
REGULATORY REFERENCES: 49CFR 172.101; 173.6; PART 175; ICAO/IATA=== WE BELIEVE THE TRANSPORTATION DATA AND REFERENCES CONTAINED HEREIN TO BE FACTUAL AND THE OPINION OF QUALIFIED EXPERTS. THE DATA IS MEANT AS A GUIDE TO THE OVERALL CLASSIFICATION OF THE PRODUCT AND IS NOT PACKAGE SIZE SPECIFIC, NOR SHOULD IT BE TAKEN AS A WARRANTY OR REPRESENTATION FOR WHICH THE COMPANY ASSUMES LEGAL RESPONSIBILITY.=== THE INFORMATION IS OFFERED SOLELY FOR YOUR CONSIDERATION, INVESTIGATION, AND VERIFICATION. ANY USE OF THE INFORMATION MUST BE DETERMINED BY THE USER TO BE IN

CONTINUED ON PAGE: 8

SECTION X - TRANSPORTATION DATA AND ADDITIONAL INFORMATION (CONTINUED)

ACCORDANCE WITH APPLICABLE FEDERAL, STATE, AND LOCAL LAWS AND REGULATIONS. SEE SHIPPER REQUIREMENTS 49CFR 172.3 AND EMPLOYEE TRAINING 49CFR 173.1.

U.S. CUSTOMS HARMONIZATION NUMBER: 29051200507

N/A = NOT APPLICABLE OR NOT AVAILABLE
N/E = NOT ESTABLISHED

THE INFORMATION IN THIS MATERIAL SAFETY DATA SHEET MEETS THE REQUIREMENTS OF THE UNITED STATES OCCUPATIONAL SAFETY AND HEALTH ACT AND REGULATIONS PROMULGATED THEREUNDER (29 CFR 1910.1200 ET. SEQ.) AND THE CANADIAN WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM. THIS DOCUMENT IS INTENDED ONLY AS A GUIDE TO THE APPROPRIATE PRECAUTIONARY HANDLING OF THE MATERIAL BY A PERSON TRAINED IN, OR SUPERVISED BY A PERSON TRAINED IN, CHEMICAL HANDLING. THE USER IS RESPONSIBLE FOR DETERMINING THE PRECAUTIONS AND DANGERS OF THIS CHEMICAL FOR HIS OR HER PARTICULAR APPLICATION. DEPENDING ON USAGE, PROTECTIVE CLOTHING INCLUDING EYE AND FACE GUARDS AND RESPIRATORS MUST BE USED TO AVOID CONTACT WITH MATERIAL OR BREATHING CHEMICAL VAPORS/FUMES.
EXPOSURE TO THIS PRODUCT MAY HAVE SERIOUS ADVERSE HEALTH EFFECTS. THIS CHEMICAL MAY INTERACT WITH OTHER SUBSTANCES. SINCE THE POTENTIAL USES ARE SO VARIED, BAKER CANNOT WARN OF ALL OF THE POTENTIAL DANGERS OF USE OR INTERACTION WITH OTHER CHEMICALS OR MATERIALS. BAKER WARRANTS THAT THE CHEMICAL MEETS THE SPECIFICATIONS SET FORTH ON THE LABEL.
BAKER DISCLAIMS ANY OTHER WARRANTIES, EXPRESSED OR IMPLIED WITH REGARD TO THE PRODUCT SUPPLIED HEREUNDER, ITS MERCHANTABILITY OR ITS FITNESS FOR A PARTICULAR PURPOSE.
THE USER SHOULD RECOGNIZE THAT THIS PRODUCT CAN CAUSE SEVERE INJURY AND EVEN DEATH, ESPECIALLY IF IMPROPERLY HANDLED OR THE KNOWN DANGERS OF USE ARE NOT HEEDED. READ ALL PRECAUTIONARY INFORMATION. AS NEW DOCUMENTED GENERAL SAFETY INFORMATION BECOMES AVAILABLE, BAKER WILL PERIODICALLY REVISE THIS MATERIAL SAFETY DATA SHEET.
NOTE: CHEMTREC, CANUTEC, AND NATIONAL RESPONSE CENTER EMERGENCY TELEPHONE NUMBERS ARE TO BE USED ONLY IN THE EVENT OF CHEMICAL EMERGENCIES INVOLVING A SPILL, LEAK, FIRE, EXPOSURE, OR ACCIDENT INVOLVING CHEMICALS. ALL NON-EMERGENCY QUESTIONS SHOULD BE DIRECTED TO CUSTOMER SERVICE (1-800-JTBAKER) FOR ASSISTANCE.

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APPROVED BY QUALITY ASSURANCE DEPARTMENT.

— LAST PAGE —
"ISSUED 05/23/92"

Genium Publishing Corporation
1145 Catalyn Street
Schenectady, NY 12303-1836 USA
(518) 377-8854

Material Safety Data Sheets Collection:

Sheet No. 440
Methane

Issued: 7/80 Revision: A, 8/89

Section 1. Material Identification

Methane Description: Widely distributed in nature, methane comprises 0.00022% by volume of the earth's atmosphere. American natural gas is mostly methane (85%). At temperatures greater than 2012 °F (1100 °C), pure carbon combines with pure hydrogen to form methane. Above 2732 °F (1500 °C), the amount of methane produced increases with temperature. Obtained from sodium acetate and sodium hydroxide or from aluminum carbide and water. Commercially prepared from natural gas or by fermentation of cellulose and sewage sludge. Constituent of illuminating and cooking gas. Used in the manufacture of hydrogen, hydrogen cyanide, ammonia, acetylene, formaldehyde, and many other organics.
Other Designations: Fire damp; marsh gas; methyl hydride; CH_4; CAS No. 0074-82-8.
Manufacturer: Contact your supplier or distributor. Consult the latest *Chemicalweek Buyers' Guide* (Genium ref. 73) for a suppliers list.

R 1
I -
S -
K 4

NFPA

HMIS
H 1
F 4
R 0
PPG*
* Sec. 8

Section 2. Ingredients and Occupational Exposure Limits

Methane, ca 100%*

OSHA PEL	ACGIH TLV, 1988-89	NIOSH REL	Toxicity Data†
None established	None established	None established	Not listed

* Check with your supplier to determine the exact composition of the purchased methane. Possible contaminants are ethane (C_2H_6), propane (C_3H_8), butane (C_4H_{10}), higher molecular weight alkanes, carbon dioxide (CO_2), nitrogen (N_2), and oxygen(O_2).
† Monitor NIOSH, *RTECS* (PA1490000), for future toxicity data.

Section 3. Physical Data

Boiling Point: -259 °F (161.6 °C)
Vapor Density (Air = 1): 0.544 at 32 °F (0 °C)
Molecular Weight: 16 g/mol
Water Solubility: Slight*
Melting Point: -296.5 °F (-182.5 °C)

Appearance and Odor: A colorless, odorless, tasteless, extremely flammable gas. Commercial methane's trace amounts of a suitable mercaptan compound give it natural gas's familiar rotten egg smell.

*Soluble in alcohol and ether.

Section 4. Fire and Explosion Data

Flash Point: -213 °F (-136.11 °C)	Autoignition Temperature: 999 °F (537 °C)	LEL: 5% v/v*	UEL: 15% v/v*

Extinguishing Media: Methane's extreme flammability, extensive explosibility range, and very low flash point represent dangerous fire and explosion risks. *Treat any fire situation involving rapidly escaping and burning methane gas as an emergency.* Extinguish methane fires by shutting off the source of the gas. Use water sprays to cool fire-exposed containers and to protect the personnel attempting to seal the source of the escaping gas.
Unusual Fire or Explosion Hazards: Methane gas is very flammable with an extensive explosibility range. The best fire-fighting technique may be simply to let the burning gas escape from the pressurized cylinder, tank car, or pipelines. Never extinguish the burning gas without first locating and sealing its source. Otherwise, the still leaking gas could explosively re-ignite without warning and cause more damage than if it burned itself out.
Special Fire-fighting Procedures: Wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in the pressure-demand or positive-pressure mode.

* The loudest methane-air explosions occur when 1 volume of methane is mixed with 10 volumes of air (or 2 volumes of oxygen). **Warning:** Air with more than 14% by volume methane burns *noiselessly*. Methane burns with a pale, faintly luminous, not always easily detected flame.

Section 5. Reactivity Data

Stability/Polymerization: Methane is stable at room temperature in closed, pressurized containers during routine operations. Hazardous polymerization cannot occur.
Chemical Incompatibilities: Genium reference 84 reports that methane can react violently with bromine pentafluoride, chlorine, chlorine dioxide, nitrogen trifluoride, liquid oxygen, and oxygen difluoride.
Conditions to Avoid: Never expose methane to ignition sources such as open flame, lighted cigarettes or pipes, uninsulated heating elements, or electrical or mechanical sparks. Prevent any accidental or uncontrollably rapid release of methane gas from high-pressure cylinders, tank cars, or pipelines.
Hazardous Products of Decomposition: Thermal oxidative degradation of methane can produce carbon dioxide and toxic carbon monoxide (CO).

Section 6. Health Hazard Data

Carcinogenicity: Neither the NTP, IARC, nor OSHA lists methane as a carcinogen. **Summary of Risks:** As a simple asphyxiant, methane does not cause significant physiological responses, but it can displace the minimum required atmospheric oxygen level. Significant displacement results in an oxygen-deficient atmosphere with no adequate warning properties. Asphyxiation can occur especially in confined, poorly ventilated, undisturbed spaces infrequently entered by workers. Frostbite (cryogenic damage) can result from contact with liquid methane's extremely low temperature. **Medical Conditions Aggravated by Long-Term Exposure:** None reported. **Target Organs:** None reported. **Primary Entry:** Inhalation. **Acute Effects:** The initial symptoms of simple asphyxiant gases's effects are rapid respiration and air hunger, diminished mental alertness, and impaired muscular coordination. Continuing lack of oxygen causes faulty judgement, depression of all sensations, rapid fatique, emotional instability, nausea, vomiting, prostration, unconsciousness, and finally, convulsions, coma, and death. **Chronic Effects:** None reported.

FIRST AID

Skin: (Liquid methane): Promptly flush the affected area with lots of tepid/lukewarm water to reduce freezing of tissues. Never apply direct heat to frostbitten areas. Loosely apply dry, bulky dressings to protect the area from further injury. Get treatment from qualified medical personnel. **Inhalation:** Rescuers must consider their own safety when entering confined, poorly ventilated, oxygen-deficient areas. Self-contained breathing equipment must be readily available. Rescuers must use nonsparking tools and equipment; e.g., floodlights lowered into any incident area must be electrically grounded and bonded, shatter-resistant, and sparkproof. **After first aid, get appropriate in-plant, paramedic, or community medical attention and support for inhalation exposures in oxygen-deficient atmospheres.** Seek prompt medical assistance for further observation and treatment.

Section 7. Spill, Leak, and Disposal Procedures

Spill/Leak: *Design and practice a methane spill control and countermeasure plan (SCCP).* When a leak occurs, notify safety personnel, eliminate heat and ignition sources, evacuate unnecessary personnel, provide maximum explosion-proof ventilation, and implement the SCCP. Use only nonsparking tools and equipment. Locate and seal the source of the leaking gas. Use water sprays to protect the personnel attempting this shutoff. Large methane releases can result in spectacular explosions. If attempts to shut off the leaking gas are unsuccessful, evacuate the likely explosion area. **Disposal:** Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations. Remove leaking or defective cylinders to a safe, outside, posted, discharge location. Let the methane gas discharge at a moderate rate. When it is empty, return the cylinder to the supplier after it is properly tagged, labelled, or stenciled MT (empty) or defective.

OSHA Designations

Air Contaminant (29 CFR 1910.1000, Subpart Z): Not listed

EPA Designations

RCRA Hazardous Waste (40 CFR 261.33): Not listed
CERCLA Hazardous Substance (40 CFR 302.4): Not listed
SARA Extremely Hazardous Substance (40 CFR 355): Not listed
SARA Toxic Chemical (40 CFR 372.65): Not listed

Section 8. Special Protection Data

Goggles: Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). **Gloves:** To prevent skin contact, workers handling liquid methane should wear appropriate insulating gloves, safety glasses, and splash aprons, as required by the particular work conditions. **Respirator:** Wear a NIOSH-approved respirator if necessary. Follow OSHA respirator regulations (29 CFR 1910.134). For emergency or nonroutine operations (spills or cleaning reactor vessels and storage tanks), wear an SCBA. **Warning:** Air-purifying respirators do *not* protect workers in oxygen-deficient atmospheres; use self-contained breathing equipment there. **Ventilation:** Provide general and local explosion-proof ventilation systems to maintain airborne concentrations below the 5% v/v LEL (Sec. 4). Local exhaust ventilation is preferred since it prevents methane dispersion into the work area by eliminating it at its source (Genium ref. 103). Give special attention to proper ventilation of enclosed areas. **Safety Stations:** Make available in the work area emergency eyewash stations, safety/quick-drench showers, washing facilities, fire extinguishers, and oxygen bottles for emergency first-aid. **Contaminated Equipment:** Never wear contact lenses in the work area: soft lenses may absorb, and all lenses concentrate, irritants. Launder contaminated clothing before wearing. Remove this material from your shoes and equipment. **Other:** If appropriate, consider installing automatic sensing equipment that warns workers of oxygen-deficient atmospheres or of potentially explosive air-gas mixtures. All engineering systems in any methane gas storage, handling, or processing area must be explosion-proof so they have no spark potential or hot spots. Pressurized systems must use only approved valves, manifolds, flanges, and flame arrestors. **Comments:** Methane gas presents dangerous fire, explosion, and reactivity risks. Regularly inspect and service all the piping systems which transport methane gas in production and storage areas. Before use, thoroughly test methane lines with nitrogen gas for leaking, especially in enclosed areas.

Section 9. Special Precautions and Comments

Storage Requirements: Store methane in closed, pressurized cylinders, tank cars, pipelines, or other containers in a cool, dry, well-ventilated, fireproof area away from heat and ignition sources and incompatible chemicals (Sec. 5). Protect these containers from physical damage and heat. Shield them from direct sunlight. **Special Handling/Storage:** Electrically ground and bond all containers, tanks, cylinders, tank cars and pipelines used in methane shipping, receiving, or transferring operations. Never smoke in any work area where the possibility of exposure to methane gas (fire hazard) exits. Recommended storage containers include steel.

Transportation Data (49 CFR 172.101-2)

DOT Shipping Name: Methane
DOT Hazard Class: Flammable gas
DOT ID No.: UN1971
DOT Label: Flammable gas
DOT Packaging Requirements: 49 CFR 173.302
DOT Packaging Exceptions: 49 CFR 173.306

IMO Shipping Name: Methane, compressed
IMO Hazard Class: 2.1
IMO Label: Flammable gas

MSDS Collection **References:** 1, 6, 7, 84-94, 100, 116, 117, 119, 120, 122

Prepared by: PJ Igoe, BS; **Industrial Hygiene Review:** DJ Wilson, CIH; **Medical Review:** MJ Hardies, MD

MATERIAL SAFETY DATA SHEET

WOLF'S HEAD
A DIVISION OF PENNZOIL PRODUCTS COMPANY

I PRODUCT IDENTIFICATION

Manufacturer's Name	WOLF'S HEAD OIL COMPANY
Address	P.O. BOX 808 OIL CITY, PENNSYLVANIA 163010808
Emergency Telephone No.	(713) 236-6070
Trade Name	WOLF'S HEAD HIGH PERFORMANCE 2-CYCLE OIL
Synonyms	PETROLEUM HYDROCARBON LUBRICANT

CAS Number: MIXTURE
MSDS Code: 000588

NFPA Hazard Identification

Degree of Hazard	Hazard Ratings
Health: 1	0 - Least
Fire: 2	1 - Slight
Reactivity: 0	2 - Moderate
	3 - High
	4 - Extreme

II INGREDIENTS

COMPONENT NAME / CAS NUMBER	HAZARDOUS IN BLEND	PERCENTAGE MIN	PERCENTAGE MAX	COMPONENT EXPOSURE LIMITS			UNITS
DETERGENT/INHIBITOR SYSTEM				OSHA PEL			NO LIMIT
TRADE SECRET	NO	5.00 TO	10.00	ACGIH TLV			NO LIMIT
BASE LUBRICATING OILS				OSHA PEL			NO LIMIT
MIXTURE	NO	70.00 TO	75.00	ACGIH TLV			NO LIMIT
OIL SOLUBLE DYE				OSHA PEL			NO LIMIT
TRADE SECRET	NO	<	1.00	ACGIH TLV			NO LIMIT
POUR POINT DEPRESSANT				OSHA PEL			NO LIMIT
TRADE SECRET	NO	<	1.00	ACGIH TLV			NO LIMIT
STODDARD SOLVENT				OSHA PEL	TWA	525.0000	MG/M3
8052-41-3	YES	10.00 TO	20.00	ACGIH TLV	TWA	525.0000	MG/M3

BY: ENVIRONMENTAL, SAFETY & HEALTH — EFFECTIVE DATE: JULY 03, 1989
(713) 546-8512

DISCLAIMER OF WARRANTY:

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REQUIRED UNDER USDL SAFETY AND HEALTH REGULATIONS FOR SHIP REPAIRING, SHIPBUILDING, AND SHIPBREAKING (29 CFR 1915, 1916, 1917).

III. HEALTH EFFECT INFORMATION

EYE CONTACT	AVOID EYE CONTACT. THIS PRODUCT HAS NOT BEEN TESTED FOR ACUTE EYE HAZARDS. THIS PRODUCT MAY BE SLIGHTLY IRRITATING TO THE EYES UPON DIRECT CONTACT. EXPOSURE TO VAPORS GENERATED UNDER UNUSUAL CONDITIONS MAY BE MILDLY IRRITATING TO THE EYES.
SKIN CONTACT	AVOID SKIN CONTACT. THIS PRODUCT MAY CAUSE SLIGHT SKIN IRRITATION UPON DIRECT CONTACT. PROLONGED OR REPEATED CONTACT MAY RESULT IN CONTACT DERMATITIS WHICH IS CHARACTERIZED BY DRYNESS, CHAPPING, AND REDDENING. THIS CONDITION MAY MAKE THE SKIN MORE SUSCEPTIBLE TO OTHER IRRITANTS, SENSITIZERS, AND DISEASE. PRE-EXISTING SKIN CONDITIONS MAY MAKE THE SKIN MORE SUSCEPTIBLE AND FACILITATE UPTAKE BY THIS ROUTE. PROLONGED OR REPEATED CONTACT MAY RESULT IN OIL ACNE WHICH IS CHARACTERIZED BY BLACKHEADS WITH POSSIBLE SECONDARY INFECTION. CONSTITUENTS OF THIS PRODUCT HAVE BEEN ASSOCIATED WITH PHOTOSENSITIVITY, AN ABNORMAL SENSITIVITY OF SKIN TO SUNLIGHT. SEE HEALTH DATA SECTION BELOW.
INHALATION	THIS PRODUCT HAS A LOW VAPOR PRESSURE AND IS NOT EXPECTED TO PRESENT AN INHALATION HAZARD AT AMBIENT CONDITIONS. CAUTION SHOULD BE TAKEN TO PREVENT AEROSOLIZATION OR MISTING OF THIS PRODUCT. EXPOSURE TO VAPORS GENERATED UNDER UNUSUAL CONDITIONS MAY BE MILDLY IRRITATING TO THE NOSE AND THROAT. SEE HEALTH DATA SECTION BELOW.
INGESTION	DO NOT INGEST. THIS PRODUCT HAS NOT BEEN TESTED FOR HAZARDS RESULTING FROM INGESTION. INGESTION IS EXPECTED TO BE RELATIVELY NON-TOXIC UNLESS ASPIRATION OCCURS. THIS PRODUCT HAS LAXATIVE PROPERTIES AND MAY RESULT IN ABDOMINAL CRAMPS AND DIARRHEA. SEE HEALTH DATA SECTION BELOW.
HEALTH DATA	ON RARE OCCASIONS, PROLONGED AND REPEATED EXPOSURE TO OIL MIST POSES A RISK OF PULMONARY DISEASE SUCH AS CHRONIC LUNG INFLAMMATION. THIS CONDITION IS USUALLY ASYMPTOMATIC AS A RESULT OF REPEATED SMALL ASPIRATIONS. SHORTNESS OF BREATH AND COUGH ARE THE MOST COMMON SYMPTOMS. ASPIRATION MAY LEAD TO CHEMICAL PNEUMONITIS WHICH IS CHARACTERIZED BY PULMONARY EDEMA AND HEMORRHAGE, AND MAY BE FATAL. SIGNS OF LUNG INVOLVEMENT INCLUDE INCREASED RESPIRATION RATE, INCREASED HEART RATE, AND A BLUISH DISCOLORATION OF THE SKIN. COUGHING, CHOKING, AND GAGGING ARE OFTEN NOTED AT THE TIME OF ASPIRATION. GASTROINTESTINAL DISCOMFORT MAY DEVELOP, FOLLOWED BY VOMITTING, WITH A FURTHER RISK OF ASPIRATION. THIS PRODUCT HAS NOT BEEN EVALUATED AS A WHOLE FOR TOXICOLOGICAL PROPERTIES. IT IS FORMULATED WITH MORE THAN 1% OF A SIMILAR CHEMICAL COMPOSITION COMPONENT DEMONSTRATED TO BE A LABORATORY ANIMAL PRIMARY SKIN IRRITANT. PRIMARY SKIN IRRITATION IS NOT EXPECTED UPON DIRECT CONTACT BECAUSE OF THE LOW CONCENTRATION OF THIS COMPONENT IN THE MIXTURE. IT ALSO CONTAINS MORE THAN 1% OF A SIMILAR CHEMICAL COMPOSITION PRODUCT DEMONSTRATED TO INDUCE SYSTEMIC EFFECTS OF THE LUNGS, LIVER, LYMPH NODES, AND SPLEEN WHEN TESTED ON THE SKIN OF LABORATORY ANIMALS AT REPEATED AND PROLONGED HIGH DOSES. THIS SAME COMPONENT IS CONSIDERED A LOW HEALTH HAZARD UNLESS INHALED IN VERY HIGH CONCENTRATIONS OR ASPIRATED INTO THE LUNGS. ACUTE AND CHRONIC INHALATION OF HIGH CONCENTRATIONS OF THIS COMPONENT HAVE BEEN ASSOCIATED WITH ADVERSE EFFECTS RELATED TO THE NERVOUS SYSTEM, GASTROINTESTINAL TRACT, LUNGS, EYES, AND REPRODUCTIVE SYSTEM. NO SUCH EFFECTS ARE EXPECTED UPON EXPOSURE TO THIS PRODUCT BECAUSE OF THE LOW CONCENTRATION OF THIS COMPONENT PRESENT IN THE MIXTURE.

IV EMERGENCY & FIRST AID PROCEDURES

EYE CONTACT IMMEDIATELY FLUSH EYES WITH LARGE AMOUNTS OF WATER AND CONTINUE FLUSHING FOR 15 MINUTES UNTIL IRRITATION SUBSIDES. IF IRRITATION PERSISTS, SEEK MEDICAL ATTENTION.

SKIN CONTACT REMOVE CONTAMINATED CLOTHING. WASH CONTAMINATED AREA THOROUGHLY WITH SOAP AND WATER. IF REDNESS OR IRRITATION OCCURS, SEEK MEDICAL ATTENTION.

INHALATION IF EXPOSURE LEVELS EXCEED THE LIMITS LISTED IN SECTION II OR III, REMOVE VICTIM FROM EXPOSURE. IF BREATHING HAS STOPPED OR IS IRREGULAR, ADMINISTER ARTIFICIAL RESPIRATION AND SUPPLY OXYGEN IF IT IS AVAILABLE. IF VICTIM IS UNCONSCIOUS, REMOVE TO FRESH AIR AND SEEK MEDICAL ATTENTION.

INGESTION DO NOT INDUCE VOMITING. SEEK IMMEDIATE MEDICAL ATTENTION.

V PERSONAL HEALTH PROTECTION INFORMATION

EYE PROTECTION	EYE PROTECTION IS NOT REQUIRED UNDER CONDITIONS OF NORMAL USE. IF MATERIAL IS HANDLED SUC THAT IT COULD BE SPLASHED INTO EYES, WEAR PLASTIC FACE SHIELD OR SPLASH-PROOF SAFETY GOGGLES.
SKIN PROTECTION	NO SKIN PROTECTION IS REQUIRED FOR SINGLE, SHORT DURATION EXPOSURES. FOR PROLONGED OR REPEATED EXPOSURES, USE IMPERVIOUS SYNTHETIC RUBBER CLOTHING (BOOTS, GLOVES, APRONS, ETC. OVER PARTS OF THE BODY SUBJECT TO EXPOSURE.
RESPIRATORY PROTECTION	IF CONCENTRATIONS ARE LESS THAN 10 TIMES THE LIMITS IN SECTION II OR III, USE AN ORGANIC VAPOR RESPIRATOR. IF CONCENTRATIONS ARE GREATER THAN 10 TIMES THE LIMITS IN SECTION II OR III, USE A SUPPLIED AIR RESPIRATOR OR A SELF-CONTAINED BREATHING APPARATUS. ALL RESPIRATORS MUST BE NIOSH CERTIFIED. DO NOT USE COMPRESSED OXYGEN IN HYDROCARBON ATMOSPHERES.
VENTILATION	ADEQUATE VENTILATION IN ACCORDANCE WITH GOOD ENGINEERING PRACTICE MUST BE PROVIDED TO MAINTAIN CONCENTRATIONS BELOW THE SPECIFIED EXPOSURE OR FLAMMABLE LIMITS. SEE ALSO FIRE PROTECTION INFORMATION IN SECTION VI.
OTHER	CONSUMPTION OF FOOD AND BEVERAGE SHOULD BE AVOIDED IN WORK AREAS WHERE HYDROCARBONS ARE PRESENT. ALWAYS WASH HANDS AND FACE WITH SOAP AND WATER BEFORE EATING, DRINKING, OR SMOKING.

VI. FIRE PROTECTION INFORMATION

FLASH POINT	135F	TEST METHOD	P.M.C.C.
AUTOIGNITION TEMPERATURE	> 500F	TEST METHOD	NO DATA
FLAMMABLE LIMITS IN AIR % BY VOL	LOWER 1.0	UPPER	10.0

EXTINGUISHING MEDIA	USE DRY CHEMICAL, FOAM, OR CARBON DIOXIDE.
SPECIAL FIRE FIGHTING PROCEDURES	WATER MAY BE INEFFECTIVE BUT CAN BE USED TO COOL CONTAINERS EXPOSED TO HEAT OR FLAME.
UNUSUAL FIRE AND EXPLOSIVE CONDITIONS	DENSE SMOKE MAY BE GENERATED WHILE BURNING. CARBON MONOXIDE, CARBON DIOXIDE, AND OTHER OXIDES MAY BE GENERATED AS PRODUCTS OF COMBUSTION.

VII. REACTIVITY DATA

STABILITY (THERMAL, LIGHT, ETC.)	STABLE	CONDITIONS TO AVOID	NONE
HAZARDOUS POLYMERIZATION	WILL NOT OCCUR	CONDITIONS TO AVOID	NONE
INCOMPATIBILITY MATERIALS TO AVOID	MAY REACT WITH STRONG OXIDIZING AGENTS.		
HAZARDOUS DECOMPOSITION PRODUCTS	NONE		

VIII ENVIRONMENTAL PRECAUTIONS

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED	CONSULT HEALTH EFFECT INFORMATION IN SECTION III, PERSONAL HEALTH PROTECTION INFORMATION IN SECTION V, FIRE PROTECTION INFORMATION IN SECTION VI, AND REACTIVITY DATA IN SECTION VII. NOTIFY APPROPRIATE AUTHORITIES OF SPILL. CONTAIN SPILL IMMEDIATELY. DO NOT ALLOW SPILL TO ENTER SEWERS OR WATERCOURSES. REMOVE ALL SOURCES OF IGNITION. PROVIDE ADEQUATE VENTILATION DURING CLEAN-UP. ABSORB WITH APPROPRIATE INERT MATERIAL SUCH AS SAND, CLAY, ETC.. LARGE SPILLS MAY BE PICKED UP USING VACUUM PUMPS, SHOVELS, BUCKETS, OR OTHER MEANS AND PLACED IN DRUMS OR OTHER SUITABLE CONTAINERS.
WASTE DISPOSAL METHOD	ALL DISPOSALS MUST COMPLY WITH FEDERAL, STATE, AND LOCAL REGULATIONS. THE MATERIAL, IF SPILLED OR DISCARDED, MAY BE A RCRA WASTE. THE MATERIAL, IF SPILLED OR DISCARDED, MAY BE A REGULATED WASTE. REFER TO STATE AND LOCAL REGULATIONS. CAUTION! IF REGULATED SOLVENTS ARE USED TO CLEAN UP SPILLED MATERIAL, THE RESULTING WASTE MIXTURE MAY BE REGULATED. DEPARTMENT OF TRANSPORTATION (DOT) REGULATIONS MAY APPLY FOR TRANSPORTING THIS MATERIAL WHEN SPILLED. WASTE MATERIAL MAY BE LANDFILLED OR INCINERATED AT AN APPROVED FACILITY. MATERIALS SHOULD BE RECYCLED IF POSSIBLE.

IX MISCELLANEOUS

HANDLING AND STORAGE REQUIREMENTS	DO NOT TRANSFER TO UNMARKED CONTAINERS. STORE IN A COOL, WELL VENTILATED AREA IN CLOSED CONTAINERS AWAY FROM HEAT, SPARKS, OPEN FLAME OR OXIDIZING MATERIALS. THIS PRODUCT IS CLASSIFIED AS COMBUSTIBLE UNDER DOT REGULATIONS. SEE 49 CFR 171 THROUGH 178 FOR SHIPPING REQUIREMENTS. FIRE EXTINGUISHERS SHOULD BE KEPT READILY AVAILABLE. SEE NFPA 30 AND OSHA 1910.106--FLAMMABLE AND COMBUSTIBLE LIQUIDS.
ADDITIONAL INFORMATION	THIS MIXTURE MAY BE FORMULATED IN PART WITH COMPONENTS PURCHASED FROM OTHER COMPANIES. IN MANY INSTANCES, ESPECIALLY WHEN PROPRIETARY OR TRADE SECRET MATERIALS ARE USED, PENNZOIL COMPANY MUST RELY UPON THE HAZARD EVALUATION OF SUCH COMPONENT SUBMITTED TO PENNZOIL BY THAT PRODUCT'S MANUFACTURER OR IMPORTER.

X PHYSICAL PROPERTIES

BOILING POINT	IBP 300F	PERCENT VOLATILE	N/A
MELTING POINT	- 30F	VAPOR DENSITY (AIR=1)	4-5
APPEARANCE	GREEN-BLUE COLOR	EVAPORATION RATE (EE=1)	N/A
ODOR	LUBE OIL ODOR	SPECIFIC GRAVITY	0.875
VAPOR PRESSURE	10 MM HG @ 100F	MOLECULAR WEIGHT	VARIES
SOLUBILITY	SOLUBLE IN HYDROCARBONS.		

LUBRIPLATE®

MATERIAL SAFETY DATA SHEET

Section I

PRODUCT NAME OR NUMBER HO-2A, HO-3, HO-4, HO-5 LUBRIPLATE Hydraulic Oils - HO-0, HO-1, HO-2,	FORMULA Mineral Oil and Additives
Manufacturer's Name Fiske Brothers Refining Co.	Emergency Telephone Number 201-589-9150
Address (Number, Street, City, State, and ZIP Code) 129 Lockwood St., Newark, NJ 07105	Telephone Number for Information 201-589-9150

Section II — Hazardous Ingredients/Identity Information

Hazardous Components (Specific Chemical Identity; Common Name(s))	OSHA PEL	ACGIH TLV	Other Limits Recommended	% (optional)
Oil Mist in Air (Not Encountered in Normal Usage)	5mg/m^3	5mg/m^3		

Hazardous Material Identification System (HMIS): Health-1, Flammability-1, Reactivity-0

Section III — Physical/Chemical Characteristics

Boiling Point	> 550°F	Specific Gravity (H_2O = 1)	0.8708 - 0.8894
Vapor Pressure (mm Hg.)	< 0.01	Melting Point	Liquid
Vapor Density (AIR = 1)	> 5	Evaporation Rate (Butyl Acetate = 1)	< 0.01

Solubility in Water: Negligible

Appearance and Odor: Transparent amber liquid with mineral oil odor

Section IV — Fire and Explosion Hazard Data

Flash Point (Method Used)	Flammable Limits	LEL	UEL
C.O.C. - 415°F - 565°F		0.9%	7.0%

Extinguishing Media: Foam, Dry Chemical, Carbon Dioxide or Water Spray (Fog)

Special Fire Fighting Procedures: Cool exposed containers with water. Use air-supplied breathing equipment for enclosed or confined spaces.

Unusual Fire and Explosion Hazards: Do not store or mix with strong oxidants. Empty containers retain residue.

Do not cut, drill, grind, or weld, as they may explode.

Section V — Reactivity Data

Stability	Unstable		Conditions to Avoid: N/A
	Stable	x	

Incompatibility (Materials to Avoid): Avoid contact with strong oxidants like liquid chlorine, concentrated oxygen.

Hazardous Decomposition or Byproducts: May form SO_2. If incomplete combustion, carbon monoxide.

Hazardous Polymerization	May Occur		Conditions to Avoid: N/A
	Will Not Occur	x	

MATERIAL SAFETY DATA SHEET

EM SCIENCE
A DIVISION OF EM INDUSTRIES
P.O. BOX 70
480 DEMOCRAT RD.
GIBBSTOWN, N.J. 08027

PREPARATION DATE .....: SEP 28, '89
DATE SENT TO CUSTOMER....: DEC 20, '89
INFORMATION PHONE NUMBER :
(609) 354-9200
CHEMTREC EMERGENCY NUMBER:
1-800-424-9300

NFPA HAZARD RATINGS

HEALTH ....: 1 FLAMMABILITY ...: 3
REACTIVITY : 0 SPECIAL HAZARDS.:

SECTION I - GENERAL INFORMATION

CATALOG NUMBER(S): MX0475 MX0480 MX0482 MX0483 MX0484
MX0485 MX0485P MX0485S MX0487 MX0488 MX0489 MX0490
AXI699M
CHEMICAL NAME....: METHANOL
TRADE NAME.....: METHYL ALCOHOL, WOOD ALCOHOL
C.A.S. NUMBER....: 67-56-1
CHEMICAL FAMILY..: ALIPHATIC ALCOHOL
FORMULA.....: CH.3.OH
MOLECULAR WEIGHT.: 32.04
DOT SHIPPING NAME: METHANOL
DOT NUMBER.....: UN1230

SECTION II - HAZARDOUS INGREDIENTS

NONE OTHER THAN SPECIFIED PRODUCT

SECTION III- PHYSICAL DATA

BOILING POINT (C 760 MM HG).: 64.5C
MELTING POINT (C).....: -98C
SPECIFIC GRAVITY(H.2.O = 1)....: 0.791
VAPOR PRESSURE..(MM HG).....: 97 20C
PERCENT VOLATILE BY VOL (%)..: 99.9+
VAPOR DENSITY (AIR=1).....: 1.1
EVAPORATION RATE (BUAC=1)....: 5.91
SOLUBILITY IN WATER (%).....: MISCIBLE
APPEARANCE AND ODOR.....: COLORLESS LIQUID, CHARACTERISTIC ALCOHOLIC ODOR

SECTION IV - FIRE & EXPLOSION HAZARD DATA

FLASH POINT (F).....: 54F (TCC)
FLAMMABLE LIMITS LEL %.: 0.7
FLAMMABLE LIMITS UEL %.: 36.5
EXTINGUISHING MEDIA....: DRY CHEMICAL, "ALCOHOL" FOAM, CO-2,,
WATER MIST
FIRE FIGHTING PROC.....: WEAR SELF-CONTAINED BREATHING APPARATUS
FIRE & EXPL. HAZARDS...: CLOSED CONTAINERS MAY EXPLODE UPON HEATING.
VAPOR CAN TRAVEL DISTANCES TO IGNITION SOURCE AND FLASH BACK.

SECTION V - HEALTH HAZARD DATA (ACUTE AND CHRONIC)

ACGIH TLV/OSHA PEL (TWA).....: (TLV) 200 PPM; STEL: 250 PPM (SKIN)
(PEL) 200PPM: STEL: 250 PPM (SKIN)

TOXICITY DATA.....:
-ORL-HMN LDLO: 143 MG/KG ORL-RAT LD50: 5629 MG/KG
IHL-RAT LC50: 64000 PPM/4H

SYMPTOMS OF EXPOSURE .....:
TOXIC BY INGESTION AND INHALATION. CAN BE TOXIC BY SKIN ABSORPTION.
AFFECTS CENTRAL NERVOUS SYSTEM, ESPECIALLY OPTIC NERVE.
MARKED IMPAIRMENT OF VISION AND ENLARGEMENT OF THE LIVER HAS BEEN
REPORTED WITH CHRONIC EXPOSURE.
CAUSES DIZZINESS, NAUSEA, MUSCLE WEAKNESS, NARCOSIS,
RESPIRATORY FAILURE.
INGESTION CAN PRODUCE BLINDNESS (100 ML CAN BE FATAL).
PROLONGED OR REPEATED SKIN CONTACT MAY CAUSE IRRITATION.

MEDICAL COND. AGGRAVATED BY EXP: SKIN CONDITIONS, EYE PROBLEMS, OR
IMPAIRED LIVER OR KIDNEY FUNCTION.

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 LARGE AMOUNTS OF WATER
INHALATION: REMOVE TO FRESH AIR; GIVE ARTIFICIAL RESPIRATION IF
BREATHING HAS STOPPED
INGESTION: GET IMMEDIATE MEDICAL ATTENTION. IF MEDICAL ATTENTION IS NO
IMMEDIATELY AVAILABLE, INDUCE VOMITING. DO NOT INDUCE VOMITING I
PATIENT IS UNCONSCIOUS.
REMOVE CONTAMINATED CLOTHING AND WASH BEFORE REUSE

SECTION VI - REACTIVITY DATA

STABILITY.....: YES
CONDITIONS TO AVOID .....: HEAT; CONTACT WITH IGNITION SOURCE
MATERIALS TO AVOID.....: ( ) WATER ( ) ACIDS
( ) BASES ( ) CORROSIVES (X) OXIDIZERS

(X) OTHER: REACTIVE METALS
HAZARDOUS POLYMERIZATION...: DOES NOT OCCUR
HAZARDOUS DECOMPOSITION...: CO,X., FORMALDEHYDE

SECTION VII - ENVIRONMENTAL PROTECTION PROCEDURES

SPILL RESPONSE:
-DIKE SPILL: TAKE UP WITH ABSORBENT: 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:
MATERIAL SHOULD BE HANDLED OR TRANSFERRED IN AN APPROVED FUME HOOD OR WITH ADEQUATE VENTILATION
PROTECTIVE GLOVES (BUTYL RUBBER, VITON OR EQUIVALENT) SHOULD BE WORN TO PREVENT SKIN CONTACT
SAFETY GLASSES WITH SIDE SHIELDS SHOULD BE WORN AT ALL TIMES
NIOSH/MSHA-APPROVED RESPIRATOR SHOULD BE WORN IN THE ABSENCE OF ADEQUATE VENTILATION.

SECTION IX - SPECIAL PRECAUTIONS

HANDLING & STORAGE .....:
-KEEP CONTAINER CLOSED
STORE IN A COOL AREA AWAY FROM IGNITION SOURCES AND OXIDIZERS
DO NOT BREATHE VAPOR OR SOLUTION MIST.
DO NOT GET IN EYES, ON SKIN, OR ON CLOTHING.
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.....: 02/01/83, 10/83, 5/85, 12/8/86, 1/31/87, 6/10/87, 8/28/87, 10/27/87, 8/10/88, 10/6/88
N/A = NOT AVAILABLE:

Ace #13833, 13834, 13835, 14553, 7...34

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

U.S. Department of Labor
Occupational Safety and Health Administration
(Non-Mandatory Form)
Form Approved
OMB No. 1218-0072

IDENTITY (As Used on Label and List): Ace Bar & Chain Oil

Note: Blank spaces are not permitted. If any item is not applicable, or no information is available, the space must be marked to indicate that.

Section I

Manufacturer's Name: Olympic Oil, Ltd.	Emergency Telephone Number: (708) 458-8500
Address (Number, Street, City, State, and ZIP Code): 5000 W. 41st Street	Telephone Number for Information: (708) 458-8500
Cicero, IL 60650	Date Prepared: April 23, 1990
	Signature of Preparer (optional):

Section II — Hazardous Ingredients/Identity Information

Hazardous Components (Specific Chemical Identity; Common Name(s))	OSHA PEL	ACGIH TLV	Other Limits Recommended	% (optional)
Mineral Oil	5mg/m^2			
Polymer additive	5mg/m^2			
Anti-wear compounds containing zinc (Zn (X) wt .1%)	5mg/m^2			2

Section III — Physical/Chemical Characteristics

Boiling Point	475^{0}F	Specific Gravity (H_2O = 1)	.9
Vapor Pressure (mm Hg.)	Low	Melting Point	N/A
Vapor Density (AIR = 1)	5	Evaporation Rate (Butyl Acetate = 1)	1

Solubility in Water: Negligible

Appearance and Odor: Dark brown, slight petroleum oily odor

Section IV — Fire and Explosion Hazard Data

Flash Point (Method Used)	Flammable Limits	LEL	UEL
Cleveland open cup 400^0 min.	N/D	N/D	N/D

Extinguishing Media: Use dry chemical foam, carbon dioxide or water foam

Special Fire Fighting Procedures: Use water to cool fire exposed containers

Unusual Fire and Explosion Hazards: Water may cause frothing, treat as a petroleum product fire.

(Reproduce locally) OSHA 174, Sept. 1985

Section V — Reactivity Data

Stability	Unstable		Conditions to Avoid: None
	Stable	Y	

Incompatibility (Materials to Avoid): Strong oxidants

Hazardous Decomposition or Byproducts: CO, CO2

Hazardous Polymerization	May Occur		Conditions to Avoid: None
	Will Not Occur	Y	

Section VI — Health Hazard Data

Routes(s) of Entry: Inhalation? Yes Skin? No Ingestion? No

Health Hazards (Acute and Chronic): Skin and eye irritant

Carcinogenicity: NTP? No IARC Monographs? No OSHA Regulated? No

Signs and Symptoms of Exposure: Inhalation may cause headache, drowsiness, vomiting, diarrhea, or nausea

Medical Conditions Generally Aggravated by Exposure: Epidermal skin conditions

Emergency and First Aid Procedures: Inhalation-remove to fresh air. Dermal-wash with soap and water. Eyes-flush with large volumes of water. Ingestion-do not induce vomiting. Injection-emergency seek aid immediatel.

Section VII — Precautions for Safe Handling and Use

Steps to Be Taken in Case Material is Released or Spilled: Remove sources of heat or ignition. Contain spill with suitable material. Report spills to local authorities.

Waste Disposal Method: User must check local and state laws to determine if the material is a hazardous waste at the time of disposal.

Precautions to Be Taken in Handling and Storing: Store below 120^{0}F

Other Precautions: Caution...empty containers may contain product residue which could include flammable or explosive vapors

Section VIII — Control Measures

Respiratory Protection (Specify Type): Use respirator approved for organic vapors and mists

Ventilation	Local Exhaust: Required if mist exceeds 5mg/cu.m	Special: N/A	
	Mechanical (General): Explosion proof	Other: N/A	

Protective Gloves: Must be oil impervious

Eye Protection: Safety goggles or splash shield.

Other Protective Clothing or Equipment: Wear body covering work clothes to avoid exposure

Work/Hygienic Practices: Launder soiled work clothes before reuse.

1214

MATERIAL SAFETY DATA SHEET
29 CFR 1910.1200 OSHA Hazard
Communication Rule Format

MINE SAFETY APPLIANCES COMPANY
P.O. Box 426
Pittsburgh, PA 15230
PHONE (412) 967-3000

This product contains pentane, oxygen and nitrogen, substances subject to the Pennsylvania Worker and Community Right-To-Know Act.

PRODUCT IDENTITY

LABEL IDENTITY - MSA P/N 476304 Calibration Check Gas, 0.75% Pentane and 15% Oxygen Nitrogen

CHEMICAL NAME - Pentane, Oxygen, Nitrogen Mixture

ADDITIONAL IDENTITIES - MSA P/N 476304 Calibration Gas

FORMULA - C_5H_{12} in O_2 + N_2

APPLICABLE CHEMICAL CONTENTS

	%	TLV
Pentane (CAS 109-66-0), STEL 750 ppm (ACGIH 1987-88)	0.75	0.06%
Oxygen (CAS 7782-44-7)	15	None
Nitrogen (CAS 7727-37-9)	Balance	None

NOTE: Gas Under Pressure, 300 PSIG at 70°F
Approx. 19 Liters Gas at Atmospheric Pressure

PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE AND ODOR - Colorless Gas, Faint Hydrocarbon Odor
BOILING POINT - N/A
SPECIFIC GRAVITY (H_2O = 1) - N/A
VAPOR PRESSURE - N/A
PERCENT VOLATILE BY VOLUME - N/A
VAPOR DENSITY (AIR = 1) - Approx. 1
SOLUBILITY IN WATER - Pentane -- 11 cm^3/100 ml (16°C)
Oxygen -- 3.2 cm^3/100 ml (25°C)
Nitrogen -- 2.3 cm^3 100 ml (0°C)

Post-it™ brand fax transmittal memo 7671 | # of pages ▸ 4

To Miriam Wroe	From G Walker
Co. EHM	Co. MSA
dpt.	Phone # 412 967-3174
Fax #	Fax #

MSA P/N 476304

PHYSICAL HAZARD INFORMATION

PHYSICAL HAZARD - Compressed Gas 300 PSIG at 70°F

CONDITIONS OR MATERIALS TO AVOID - None

FLASH POINT - N/A (Pentane) LEL (1.4%) UEL (8.0

EXTINGUISHING MEDIA - This Gas Mixture is Not Flammable

SPECIAL FIRE FIGHTING PROCEDURES - See Next Item

UNUSUAL FIRE AND EXPLOSION HAZARDS - Gas Under Pressure, 300 PSIG at 70°F. Do Not Exceed 1

HEALTH HAZARDS

HEALTH HAZARDS - Pentane may be irritating to mucous membranes.

SIGNS AND SYMPTOMS OF EXPOSURE - Respiratory Tract Irritation

PRIMARY ROUTES OF ENTRY - Inhalation

TARGET ORGANS - Respiratory Tract

MSA P/N 476304

MEDICAL CONDITIONS GENERALLY RECOGNIZED AS BEING AGGRAVATED BY EXPOSURE - No Information

EXPOSURE LIMITS - ACGIH, Pentane 600 ppm, 750 ppm STEL (1987-88)

CARCINOGENICITY DATA - Component Gases Not Listed in NIOSH RTECS.

EMERGENCY AND FIRST AID PROCEDURES - Remove From Exposure

SAFE HANDLING AND USE

HYGIENIC PRACTICES - Avoid Breathing Gas

PROTECTIVE MEASURES DURING REPAIR AND MAINTENANCE OF CONTAMINATED EQUIPMENT - Not Applicable

PROCEDURES FOR SPILL OR LEAK CLEANUP - Ventilate Area. Avoid Breathing Gas.

MSA P/N 476304

WASTE DISPOSAL - Do not puncture or incinerate cylinder. Before discarding cylinder, slowly release contents to a safe exhaust.

STORAGE - Store in a cool, dry, well-ventilated area. Do not exceed 120°F.

CONTROL MEASURES

PERSONAL PROTECTIVE EQUIPMENT - Due to the limited amount of gas in the cylinder, and the lo release rate employed in instrument calibration, respiratory protection is not indicated under conditions of intended use.

ENGINEERING CONTROLS - Mechanical ventilation is suitable.

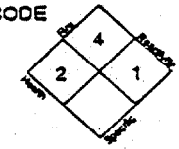
WORK PRACTICES - Avoid breathing gas. Use in well-ventilated areas. Follow the calibration procadure detailed in the MSA instruction manual provided with the instrumer under calibration.

DATE OF PREPARATION - Rev. 2, February 1988

The information provided herein has been compiled from sources believed to be reliable. However, Mine Safety Appliances Company makes no warranty as to the accuracy, completeness, or sufficiency of the information and in no event will Mine Safety Appliances Company be responsible for loss or damage of any nature whatsoever resulting from use of the information.

FIRST BRANDS

Material Safety Data Sheet
PRESTONE® Engine Starting Fluid

Any questions, please call:	EMERGENCY TELEPHONE (24 Hours)	NFPA HAZARD CODE
First Brands Corporation 83 Wooster Heights Road Building 301 Danbury, CT 06813-1911 Telephone: (203) 731-2300	CHEMTREC (800) 424-9300 483-7616 in District of Columbia	4 = Extreme 3 = High 2 = Moderate 1 = Slight 0 = Insignificant 

I. IDENTIFICATION

PRODUCT NAME	PRESTONE® Engine Starting Fluid
TYPE	Automotive Engine Starting Fluid (Aerosol)
STOCK	AS237
FORMULA	13374-84

II. PHYSICAL DATA

BOILING POINT, 760 mm Hg	95°F
FREEZING POINT	less than -30°F
DENSITY (at 68°F)	5.6 lbs/gal
VAPOR DENSITY (Air = 1)	2.6
VAPOR PRESSURE (at 68°F)	305 mm Hg
AEROSOL CONTAINER PRESSURE (at 70°F psig)	85
VOLATILES BY VOLUME	99%
SOLUBILITY IN WATER, by Wgt.	4.5%
EVAPORATION RATE (Butyl Acetate = 1)	23
APPEARANCE AND ODOR	Clear liquid, ether odor

III. HAZARDOUS INGREDIENTS

(includes IARC, NTP, OSHA and ACGIH listed carcinogens greater than 0.1%)

MATERIAL	%	CAS #	EXPOSURE LIMIT	SOURCE
Ethyl ether	40-70	60-29-7	400 ppm TWA	(3)
			500 ppm STEL	(3)
n-heptane	25-60	142-82-5	400 ppm TWA	(3)
			500 ppm STEL	(3)
Methylcyclohexane	25-60	108-87-2	400 ppm TWA	(3)
Carbon dioxide	5-10	124-38-9	10000 ppm TWA	(1)
			5000 ppm TWA	(2)
			30000 ppm STEL	(3)

NON-HAZARDOUS INGREDIENTS > 1%
None

None of the other ingredients is listed as a carcinogen or potential carcinogen by OSHA, NTP or IARC.

The source for exposure limits listed above are:
(1) OSHA Permissible Exposure Limit (effective 9/89)
(2) ACGIH Threshold Limit Value (1988-89 Edition)
(3) Both the OSHA PEL and ACGIH TLV
(4) Recommended by the Manufacturer

IV. FIRE AND EXPLOSION HAZARD DATA

FLASH POINT
Tag Open Cup: Not determined
Pensky-Martens Closed Cup: -49°F

AEROSOL FLAME EXTENSION
Greater than 18 inches

FLASHBACK
Yes

AEROSOL FIRE PROTECTION LEVEL
Level 3 Aerosol (NFPA 30B)

FLAMMABLE LIMITS IN AIR, % BY VOLUME
LOWER: 1.85
UPPER: 36.5

AUTOIGNITION TEMPERATURE
180°C

EXTINGUISHING MEDIA
Foam, alcohol foam, carbon dioxide, and dry chemical. Water may be unsuitable except as cooling medium.

SPECIAL FIRE FIGHTING PROCEDURES
Use self-contained breathing apparatus. Toxic fumes may be emitted.

UNUSUAL FIRE AND EXPLOSION HAZARDS
Extremely flammable contents, pressurized containers. Vapors are heavier than air and may travel or be moved by air currents and be ignited by pilot lights, other flames, smoking, sparks, heaters, electrical equipment, static discharges or other ignition sources at locations distant from product handling point.

V. HEALTH HAZARD DATA

EFFECTS OF SINGLE OVEREXPOSURE

SWALLOWING	May cause signs and symptoms of systemic intoxication, with incoordination, blurred vision, headache, analgesia, unconsciousness and respiratory failure due to depression of the central nervous system. Due to high volatility, may rapidly distend the stomach, causing discomfort and may make breathing difficult. May also cause pneumonitis if aspirated.
SKIN ABSORPTION	Significant absorption not expected.
INHALATION	Acts as a narcotic or general anesthetic. May cause irritation of the respiratory tract with cough and also signs and symptoms of intoxication, with incoordination, blurred vision, headache, analgesia, unconsciousness, cardiac irregularities, and respiratory failure due to depression of the central nervous system. Breathing high vapor concentrations may cause heart rate irregularities, possibly fatal, particularly in persons with heart disease.
SKIN CONTACT	May cause mild irritation, experienced as local redness.

EYE CONTACT	Exposure to liquid or high concentrations of vapor may cause irritation. experienced as redness, excess tearing, and possible swelling of the conjunctiva.

EFFECTS OF REPEATED OVEREXPOSURE

Repeated skin exposure can cause cracking and drying. Repeated inhalation may cause loss of appetite, exhaustion, headaches, drowsiness, dizziness, cardiac arrhythmia, central nervous system excitability, and psychic disturbances.

OTHER EFFECTS OF OVEREXPOSURE

May cause albuminuria and polycythemia.

MEDICAL CONDITIONS AGGRAVATED BY OVEREXPOSURE

Because of its irritating and defatting properties, this material may aggravate an existing dermatitis. Existing cardiac conditions may be aggravated if inhaled in high concentrations and may be fatal as a result of serious arrhythmia and cardiac decompensation.

SIGNIFICANT LABORATORY DATA WITH POSSIBLE RELEVANCE TO HUMAN HEALTH HAZARDS

None currently known.

EMERGENCY AND FIRST AID PROCEDURES

SWALLOWING	Give at least 2 glasses of milk or water if the patient is conscious. Do not induce vomiting. Call a physician immediately.
SKIN	Wash with soap and water.
INHALATION	Remove to fresh air. Give artificial respiration if not breathing. CPR may be required if cardiac arrest occurs. Oxygen may be given if necessary. Call a physician.
EYES	Immediately flush eyes with plenty of water for least 15 minutes. Seek medical attention, preferably an ophthalmologist.
NOTES TO PHYSICIAN	May produce arrhythmia, especially in a person with an irritable myocardium. Because of possible arrhythmogenic effects, sympathomimetics should be used with caution. Avoid the use of epinephrine.

There is no specific antidote. Treatment of overexposure should be directed at the control of symptoms and the clinical condition. Artificial ventilation may be required if coma is deep and breathing shallow.

VI. REACTIVITY DATA

STABILITY Stable.

HAZARDOUS POLYMERIZATION
Will not occur.

CONDITIONS TO AVOID Heat, sparks and open flames.

INCOMPATIBILITY (Materials to Avoid)
Strong oxidizing agents.

HAZARDOUS COMBUSTION OR DECOMPOSITION PRODUCTS
Extremely flammable. Will burn to form carbon dioxide, carbon monoxide. May form oxides of nitrogen.

VII. SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED
Wear appropriate personal protective equipment and remove all sources of ignition. Contain spill using absorbent material and collect material for disposal in a container suitable for flammable waste. See Section IV, "Unusual Fire and Explosion Hazards."

WASTE DISPOSAL METHOD
Waste material is a RCRA hazardous waste due to ignitability if discarded in its purchased form. Incineration, treatment or landfilling should be carried out in accordance with applicable RCRA Federal, State, and Local regulations.

APPENDIX B

SPECIFIC HEALTH AND SAFETY PROCEDURES

1. OBJECTIVE

OHM Remediation Services Corp. (OHM) and its contractors will strive to provide a safe workplace when conducting construction/demolition activities. All construction/demolition activities will be performed in compliance with this procedure, this manual, and all applicable regulations.

2. PURPOSE

This procedure provides fundamental safety rules specifically addressing construction/demolition projects.

3. REGULATORY REQUIREMENTS

This procedure is an overview of 29 CFR 1910, 29 CFR 1926 Subpart T, and the National Association of Demolition Contractor's (NADC) Demolition Safety Manual, Revised 1989. In the case of United States Army Corp of Engineers projects, the guidelines of EM 385-1-1, Section 33, will be observed. In the event of a conflict between these standards, the more stringent will prevail.

4. JOB SAFETY PLANNING

4.1 In preparing the estimate, a realistic sum of money for safety requirements in accordance with conditions, OHM safety policies, federal and state safety and health regulations, owner, and other regulatory agency specifications is to be included.

4.2 A pre-job planning meeting will be held soon after contract award to discuss:

4.2.1 Client and regulatory agency requirements.

4.2.2 Hazards and control measures involving OHM employees, equipment and materials and specific requirements to include the following topics:

- Personal protective equipment required.
- Lighting for night operations.

- Fire prevention, fire fighting equipment.
- Ladders, scaffolds, safety nets, fall protection, overhead protection and other temporary structure safety requirements.
- First aid and medical requirements.
- Traffic patterns, haul road layout, designated parking areas.
- Sanitary requirements, drinking water.
- Security.

4.3 Hazards and control measures involving members of the surrounding public will address the following:

- Public vehicular traffic exposure - need for signs, barricades, flashers, flagmen, detours, traffic lights.
- Public pedestrian and children - need for temporary walkways, overhead protection, watchmen, securing equipment, fencing and other methods of protection and denial of access.
- Railroad - protection required, notification to railroads of our operation, securing train schedules, flagmen, signs, warning signals, reduced speed, special insurance
- Utilities - underground and overhead-locating and marking, notification of schedules, special insurance.
- Use of flashing yellow lights on equipment working in and around traffic.

5. SITE HEALTH AND SAFETY PLAN

5.1 A site health and safety plan will prepared which will address the anticipated chemical, physical, and environmental hazards expected to be encountered during the course of site activity.

5.2 Each employee, including all subcontract employees will be required to read the site health and safety plan and sign an acknowledgement form to verify that they have read and understand the provisions of the plan.

5.2.1 All new employees to the site shall be provided indoctrination which will include reviewing the site health and safety plan and any specific job site rules pertaining to their job assignments prior to beginning work. This orientation shall be conducted by the site supervisor or site safety officer.

6. PROTECTION OF THE PUBLIC

All necessary precautions shall be taken to prevent injury to the public or damage to property of others. Precautions to be taken shall include, but are not limited to the following:

6.1 Work shall not be performed to any area occupied by the public unless specifically permitted by the contract or in writing by the construction manager.

6.2 When it is necessary to maintain public use of work areas involving sidewalks, entrances to buildings, lobbies, corridors, aisles, stairways and vehicular roadways, trade contractors shall protect the public with appropriate guardrails, barricades, temporary fences, overhead protection, temporary partitions, shields and adequate visibility.

6.3 Sidewalks, entrances to buildings, lobbies, corridors, aisles, doors or exits shall be kept clear of obstructions to permit safe entrance and exit of the public at all times.

6.4 Appropriate warnings and instructional safety signs shall be conspicuously posted where necessary. In addition, a signalman shall control the movement of motorized equipment in areas where the public might be endangered.

6.5 Sidewalks, sheds, canopies, catch platforms and appropriate fences shall be provided when it is necessary to maintain public pedestrian traffic adjacent to the erection, demolition or structural alternation of outside walls on any structure.

6.6 A temporary fence shall be provided around the perimeter of above ground operation adjacent to public areas. Perimeter fences shall be at least six feet high. They may be constructed of wood or metal frame and sheathing, wire mesh, or a combination of both. When the fence is adjacent to a sidewalk near a street intersection, at least the upper section of fence shall be open wire mesh from a point not over four feet above the sidewalk and extending at least 25 feet in both directions from the corner of the fence or as otherwise required by local conditions.

Guardrails shall be provided on both sides of vehicular and pedestrian bridges, ramps, runways, and platforms. Pedestrian walkways elevated above adjoining surfaces, or walkways within six feet of the top of excavated slopes or vertical banks shall be protected with guardrails. Guardrails shall be made of rigid materials capable of withstanding a force of at least 200 pounds applied in any direction at any point in their structure. Their height shall be approximately 42 inches. Top rails and posts may be two inch by four inch (2x4) nominal size construction grade lumber or equivalent. Intermediate horizontal rails at mid-height and toe boards at platform level may be 1x6 inch wood or the equivalent. Posts shall not be over eight feet apart.

6.7 Barricades where required shall be secured against accidental displacement and shall be maintained in place except where temporary removal is necessary to perform the work. During the period a barricade is temporarily removed for the purpose of work, a watchman shall be placed at all openings.

6.8 Temporary sidewalks shall be provided when a permanent sidewalk is obstructed by the trade contractor's operation. They shall be installed in accordance with the requirements listed above.

6.9 Warning lights shall be maintained from dusk to sunrise around excavations, barricades or obstructions in plant areas. Illumination shall be provided from dusk to sunrise for all temporary walkways in both plant and construction areas.

7. HOUSEKEEPING

A basic concept in any effective prevention endeavor is good housekeeping. No one item has a greater impact on the overall success of a safety program for a construction project.

The importance of good housekeeping must be planned for from the beginning to the final clean-up. The degree of attention given to housekeeping will normally be reflected in the project accident rate, as well as in construction efficiency.

7.1 During the course of construction, work areas, passageways, and stairs in and around buildings and structures shall be kept clear of debris. Construction materials shall be stored in an orderly manner. Storage areas and walkways on the site shall be maintained free from dangerous depressions, obstructions and debris.

7.2 The essential elements of good housekeeping are:

- Orderly placement of materials, tools, and equipment.
- Placing receptacles at appropriate locations for the disposal of miscellaneous rubbish.
- Prompt removal and disposal of trash and waste materials.
- Locating air and water lines, welding leads, and burning hose in positions that eliminate tripping hazards.

8. SCAFFOLDING

8.1 The footings and anchorage for scaffolds shall be sound, rigid, and capable of carrying the maximum intended load without settling or displacement.

8.2 A safe means of access to and egress from the work level must be provided. Ladders used for access/egress must be secured at top and bottom. Ladder frame scaffolds must not be offset or used with other scaffold frames.

8.3 No scaffold shall be erected, moved, dismantled, or altered, except under the supervision of competent persons.

8.4 Scaffolds and their components shall be capable of supporting without failure at least four times their maximum intended load.

8.5 Guardrails and toeboards shall be installed on all open sides and ends of platforms more than 10 feet above the ground or floor.

8.6 Planking shall extend a minimum of 6 feet not more than 12 inches over their end supports.

9. WORK AREA PROTECTION

9.1 Open sided floors and roofs: Any open area four or more feet above adjacent surfaces shall be protected by a substantial guardrail able to resist 200 lbs. of horizontal force, a steel perimeter cable, or a warning system such as flagging or caution tape installed a minimum of six feet from the surface's exposed edge.

9.2 Floor openings: Floor openings through which personnel or material can pass should be protected by a cover or barricade, substantial enough to withstand an anticipated load. Covers shall be anchored and identified to prevent accidental removal or displacement.

9.3 Hazard signs: Warning signs, barricades, and flagging are to be used to warn personnel of potential or hidden hazards or advise of intermittent activities which might endanger outside personnel. They are not to be used in lieu of more effective protection.

9.4 Ventilation: Adequate ventilation or localized exhaust may be required to satisfy the work environment requirement of OSHA (1926.55, 57). Real-time air monitoring shall be used to verify the need for ventilation.

9.5 Illumination: All construction/demolition work areas, aisles, stairs, ramps, runways, corridors, offices, shops, and storage areas where work is in progress shall be lighted with either natural or artificial illumination. Minimum illumination intensities for general construction areas shall be 5 foot-candles.

9.6 Vertical rebar: Employees shall not be permitted to work above vertically protruding reinforcing steel unless it has been covered or protected to eliminate the hazard of persons falling on it and being impaled.

1. OBJECTIVE

OHM Remediation Services Corp. (OHM) will control the hazards posed by open excavation through strict compliance with this procedure and the provisions of the excavation permit.

2. SCOPE, APPLICATION AND PURPOSE

This procedure outlines requirements for all open excavations made in the earth's surface. Excavations are defined to include trenches. This policy is intended to protect personnel from the hazards of collapse.

3. REGULATORY REQUIREMENTS

This procedure will follow the guidelines of 29 CFR 1926, Subpart P - Excavations. In the case of United States Army Corp of Engineers projects, the requirements of EM 385-1-1, Section 23 will be observed. In the event of a conflict between these referenced standards, the more stringent will prevail.

4. GENERAL REQUIREMENTS

Safety operations while working in and around excavations involve many factors. Factors to be evalnated and discussed before starting work at daily safety meetings include:

4.1 Surface Encumbrances

All surface encumbrances that are located so as to create a hazard to employees shall be removed or supported, as necessary to safeguard employees.

4.2 Underground Installations/Utility Locations

The estimated location of utility installations, such as sewer, telephone, fuel, electric, water lines, or any other underground installations that reasonably may be expected to be encountered during excavation work, shall be determined prior to opening an excavation.

4.2.1 Utility companies or the state utility protection service shall be contacted at least two (2) working days prior to excavation activities to be advised of the proposed work, and asked to establish the location of the utility underground installations prior to the start of actual excavation.

4.2.2 OHM personnel and sub-contractors should be careful to protect and preserve the markings of approximate locations of facilities until the markings are no longer required for safe and proper excavations.

4.2.3 If the markings of utility locations are destroyed or removed before excavation commences or is completed, the OHM competent person must notify the utility company or utility protection service to inform them that the markings have been destroyed. Normally, it will take two (2) working days of the notice for the utility protection service to remark the locations.

4.2.4 OHM equipment operators shall maintain a reasonable clearance between any underground utility and the cutting edge or point of powered equipment.

4.2.5 When excavating with powered equipment within 18 inches of the markings of underground facilities, personnel should conduct the excavation in a careful and prudent manner, excavating by hand to determine the precise location of the facility/utility and to prevent damage.

4.2.6 While the excavation is open, underground installations shall be protected, supported or removed as necessary to safeguard employees.

4.3 ACCESS AND EGRESS

4.3.1 Structural Ramps

Structural ramps that are used solely by employees as a means of access or egress from excavations shall be designed by a competent person. Structural ramps used for access or egress of equipment shall be designed by a competent person qualified in structural design, and shall be constructed in accordance with the design.

Ramps and runways constructed of two or more structural members shall have the structural members connected together to prevent displacement.

Structural members used for ramps and runways shall be of uniform thickness.

Cleats or other appropriate means used to connect runway structural members shall be attached to the bottom of the runway or shall be attached in a manner to prevent tripping.

Structural ramps used in lieu of steps shall be provided with cleats or other surface treatments on the top surface to prevent slipping.

4.3.2 Means of Egress from Trench Excavations

A stairway, ladder, ramp or other safe means of egress shall be located in trench excavations that are 4 feet or more in depth so as to require no more than 25 feet of lateral travel for employees.

4.4 EXPOSURE TO VEHICULAR TRAFFIC

Employees exposed to public vehicular traffic shall be provided with and shall wear, warning vests or other suitable garments marked with or made of reflectorized or high-visibility material.

4.5 EXPOSURE TO FALLING LOADS

No employee shall be permitted underneath loads handled by lifting or digging equipment. Employees shall be required to stand away from any vehicle being loaded or unloaded to avoid being struck by any spillage or falling materials. Operators may remain in the cabs of vehicles being loaded or unloaded when the vehicles are equipped, in accordance with 29 CFR 1926.601(b)(6), to provide adequate protection for the operator from falling objects during loading and unloading operations.

4.6 WARNING SYSTEM FOR MOBILE EQUIPMENT

When mobile equipment is operated adjacent to an excavation or when such equipment is required to approach the edge of an excavation, and the operator does not have a clear and direct view of the edge of the excavation, a warning system shall be utilized such as barricades, hand or mechanical signals or stop logs. If possible, the grade should be away from the excavation.

4.7 HAZARDOUS ATMOSPHERES

4.7.1 Testing and Controls

In addition to the requirements set forth, 29 CFR 1926.50 - 1926.107; to prevent exposure to harmful levels of atmospheric contaminants and to assure acceptable atmospheric conditions, the following requirements shall apply:

Where oxygen deficiency (atmospheres containing less than 19.5 percent oxygen) or a hazardous atmosphere exists or could reasonably be expected to exist, such as in excavations in landfill areas or excavations in areas where hazardous substances are suspected, the atmospheres in the excavation shall be tested before employees enter excavations greater than 4 feet in depth.

Adequate precautions shall be taken, to prevent employee exposure to atmospheres containing less than 19.5 percent oxygen and other hazardous atmospheres. These precautions include providing proper respiratory protection or ventilation as needed.

Adequate precaution shall be taken such as providing ventilation, to prevent employee exposure to an atmosphere containing a concentration of a flammable gas in excess of 10 percent of the lower explosive limit (LEL) of the gas or vapor. When controls are used that are intended to reduce the level of atmospheric contaminants to acceptable levels, testing shall be conducted as often as necessary to ensure that the atmosphere remains safe.

4.7.2 Emergency Rescue Equipment

Emergency rescue equipment, such as self contained breathing apparatus (SCBA), a safety harness and line, or a basket stretcher, shall be readily available where hazardous atmospheric conditions exist or may reasonably be expected to develop during work in an excavation. This equipment shall be attended when in use.

Employees entering bell-bottom pier holes or other similar deep and confined excavations, shall wear a harness with a life-line securely attached to it. The lifeline shall be separate from any line used to handle materials, and shall be individually attended at all times while the employee wearing the lifeline is in the excavation.

4.8 PROTECTION FROM HAZARDS ASSOCIATED WITH WATER ACCUMULATION

Employees shall not work in excavations in which there is accumulated water, or in excavations in which water is accumulating, unless adequate precautions have been taken to protect employees against the hazards posed by water accumulation. The precautions necessary to protect employees adequately vary with each situation, but could include special support or shield systems to protect from cave-ins, water removal to control the level of accumulating water, or use of a safety harness and lifeline.

If water is controlled or prevented from accumulating by the use of water removal equipment, the water removal equipment and operations shall be monitored by a competent person to ensure proper operation.

If excavation work interrupts the natural drainage of surface water (such as streams); diversion ditches, dikes, or other suitable means shall be used to prevent surface water from entering the excavation and to provide adequate drainage of the area adjacent to the excavation. Excavations subject to run-off from heavy rains will require an inspection by a competent person.

4.9 STABILITY OF ADJACENT STRUCTURES

Where the stability of adjoining buildings, walls, or other structures is endangered by excavation operations, support systems such as shoring, bracing, or underpinning shall be provided to ensure the stability of such structures for the protection of employees.

Excavation below the level of the base or footing of any foundation or retaining wall that could be reasonably expected to pose a hazard to employees shall not be permitted except when:

4.9.1 A support system, such as underpinning, is provided to ensure the safety of employees and the stability of the structure; or

4.9.2 The excavation is in stable rock; or

4.9.3 A registered professional engineer has approved the determination that the structure is sufficiently removed from the excavation so as to be unaffected by the excavation activity; or

4.9.4 A registered professional engineer has approved the determination that such excavation work will not pose a hazard to employees.

4.9.5 Sidewalks, pavements, and other structures shall not be undermined unless a support system or another method of protection is provided to protect employees from the possible collapse of such structures.

4.10 PROTECTION OF EMPLOYEES FROM LOOSE ROCK OR SOIL

Adequate protection shall be provided to protect employees from loose rock or soil that could pose a hazard by falling or rolling from an excavation face. Such protection shall consist of scaling to remove loose material; installation of protective barricades at intervals as necessary on the excavation face to stop and contain falling material; or other means that provide equivalent protection.

Employees shall be protected from excavated or other materials or equipment that could pose a hazard by falling or rolling into excavations. Protection shall be provided by placing and keeping such materials or equipment at least 2 feet from the edge of excavations, or by the use of retaining devices that are sufficient to prevent materials or equipment from falling or rolling into excavations, or by a combination of both if necessary.

4.11 INSPECTIONS

Daily inspections of excavations, the adjacent areas, and protective systems shall be made by a competent person for evidence of a situation that could result in possible cave-ins, indications of failure of protective systems, hazardous atmospheres, or other hazardous conditions. An inspection shall be conducted by the competent person prior to the start of work and as needed throughout the shift. Inspections shall also be made after every rainstorm or other hazard increasing occurrence. These inspections are required when employee exposure can be reasonably anticipated. An Excavation/Trenching Permit must be completed by the competent person to document the inspections.

Where the competent person finds evidence of a situation that could result in a possible cave-in, indications of failure of protective systems, hazardous atmospheres, or other hazardous conditions, exposed employees shall be removed from the hazardous area until the necessary precautions have been taken to ensure their safety.

4.12 FALL PROTECTION

Where employees or equipment are required or permitted to cross over excavations; walkways, or bridges with standard guardrails shall be provided.

Adequate barrier for physical protection shall be provided at all remotely located excavations. All wells, pits, shafts, etc. shall be barricaded or covered. Upon completion of exploration and similar operations, temporary wells, pits, shafts, etc., shall be covered or backfilled.

5. SOIL CLASSIFICATION

OSHA Soil Classification (Appendix A to Subpart P)

5.1 Type A means:

Cohesive soils with an unconfined compressive strength of 1.5 ton per square foot (tsf) (144 kPa) or greater. Examples of cohesive soils are: clay, silty clay, sandy clay, clay loam and, in some cases, silty clay loam and sandy clay loam. Cemented soils such as caliche and hardpan are also considered Type A. However, no soil is Type A if:

5.1.1 The soil is fissured; or

5.1.2 The soil is subject to vibration from heavy traffic, pile driving, or similar effects; or

5.1.3 The soil has been previously disturbed; or

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

5.1.5 The material is subjected to other factors that would require it to be classified as a less stable material.

5.2 Type B means:

5.2.1 Cohesive soil with an unconfined compressive strength greater than 0.5 tsf (48 kPa) but less than 1.5 tsf (144 kPa); or

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

5.2.3 Previously disturbed soils except those which would otherwise be classed by Type C soil.

5.2.4 Soil that meets the unconfined compressive strength or cementation requirements for Type A, but is fissured or subjected to vibration; or

5.2.5 Dry rock that is not stable; or

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

5.3 Type C means:

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

5.3.2 Granular soils including gravel, sand, and loamy sand; or

5.3.3 Submerged soil or soil from which water is freely seeping; or

5.3.4 Submerged rock that is not stable; or

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

6. TIMBER SHORING, ALUMINUM HYDRAULIC AND ALTERNATIVES TO SHORING

Refer to 29 CFR 1926 Subpart P (Appendices C, D, and E) for details on shoring, shields, and trench boxes.

7. SELECTION OF PROTECTIVE SYSTEMS

Refer to 29 CFR 1926 Subpart P (Appendix F) for the decision logic in selecting protective systems.

8. PERMITS

An Excavation/Trenching Permit must be completed by the competent person each day that an excavation is open and personnel may be required to enter the excavation. The excavation permit follows this procedure.

OHM Corporation

EXCAVATION/TRENCHING PERMIT

PERMIT NO.____

Good on This Date Only:_____ From:_____ AM___ PM___
Project Name:_____ Project Number:_____
Project Location:_____
Name of Competent Person:_____ – A competent person means one who is capable of identifying existing and predictable hazards in the surroundings, or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them. The competent person shall also be capable of classifying soil types.

Description of Job or Special Procedures:_____

_____

EMPLOYEE TRAINING AND PRE-EXCAVATION BRIEFING

1. Safe Excavation and Rescue Training Conducted on: _____ (DATE)
2. Mandatory pre-excavation briefing conducted on: _____ (DATE)
3. Does this job require special training: YES___ NO___

ELECTRICAL SAFETY

1. Are all electrical devices grounded, double insulated, or GFCI protected? YES___ NO___ N/A___
2. Have all power cords and tools been visually inspected? YES___ NO___ N/A___

SURFACE ENCUMBRANCES

1. Have all surface encumbrances that are located so as to create a hazardto employees been removed or supported, as necessary, to safeguard employees? YES___ NO___ N/A___

UNDERGROUND INSTALLATIONS

1. Have the estimated locations of all underground installation been determined prior to excavation? YES___ NO___ N/A___
2. Have utility companies been contacted and advised of proposed work? YES___ NO___ N/A___
3. Are underground installations protected, supported or removed while excavations are open? YES___ NO___ N/A___

ACCESS AND EGRESS

1. Are structural ramps that are used solely by personnel as a means of access or egress from excavations designed by a competent person? YES___ NO___ N/A___
2. Are structural ramps that are used for access and egress of equipment designed by a competent person qualified in structural design and constructed in accordance with the design? YES___ NO___ N/A___
3. Are ramps and runways constructed so structural members are connected to prevent displacement? YES___ NO___ N/A___

4. Are structural members used for ramps and runways of uniform thickness? YES___ NO___ N/A___
5. Are cleats used in connecting runway structural members attached in a manner to prevent tripping? YES___ NO___ N/A___
6. Are structural ramps used in lieu of steps provided with cleats or other surface treatment to prevent slipping? YES___ NO___ N/A___

MEANS OF EGRESS FOR TRENCHES DEEPER THAN 4 FEET

1. Are stairways, ladders, or ramps provided every 25 feet? YES___ NO___ N/A___

EXPOSURE TO VEHICULAR TRAFFIC

1. Are personnel exposed to public vehicular traffic wearing reflectorized or high visibility vests? YES___ NO___ N/A___

EXPOSURE TO FALLING LOADS

1. Are employees prohibited from standing underneath loads handled by lifting or digging equipment? YES___ NO___ N/A___
2. Are employees prohibited from standing next to vehicles being loaded or unloaded? YES___ NO___ N/A___

WARNING SYSTEMS FOR MOBILE EQUIPMENT

1. Are warning systems such as barricades, hand or mechanical signals, or stop logs utilized when mobile equipment is operated adjacent to or at the edge of an excavation? YES___ NO___ N/A___

TESTING FOR HAZARDOUS ATMOSPHERES

1. Are the atmospheric hazards that can be reasonably expected to exist in excavations greater than 4 feet deep tested and controlled? YES___ NO___ N/A___

	READING:	TIME:	INITIAL:
2. Test for Oxygen Content:	_____ % 02 (19.5% Minimum)	_____	_____
3. Test for Flammable Concentrations:	_____ % LEL (10% Maximum)	_____	_____
4. Test for Toxic Concentration:	_____ PPM of _____	_____	_____

5. Is testing conducted as often as necessary to ensure safety or personnel? YES___ NO___ N/A___

EMERGENCY RESCUE EQUIPMENT

1. Is emergency rescue equipment such as SCBA, safety harness and line, or basket stretcher readily available and attended when hazardous atmospheric conditions exist? YES___ NO___ N/A___
2. Are employees who enter bell-bottom pier holes or other similar deep and confining excavations wearing a body harness with a life-line? YES___ NO___ N/A___

PROTECTION FROM HAZARDS ASSOCIATED WITH WATER ACCUMULATION

1. Are employees prohibited from entering excavations that have accumulated water?	YES___	NO___	N/A___
2. Is water being controlled or prevented from accumulating in excavation by the use of water removal equipment?	YES___	NO___	N/A___
3. Is water control equipment operation being monitored by a competent person?	YES___	NO___	N/A___
4. Are diversion ditches, dikes, or other suitable means used to prevent surface water from entering excavation?	YES___	NO___	N/A___
5. Are excavations subjected to run-off from heavy rain immediately re-inspected by a competent person?	YES___	NO___	N/A___

STABILITY OF ADJACENT STRUCTURES

1. Are support systems such as shoring, bracing, or underpinning provided to ensure stability of adjoining structures (i.e., buildings, walls) endangered by excavation activities?	YES___	NO___	N/A___
2. Has any excavation below the level of the base or footing of foundations or retaining walls been:			
- Provided with a support system such as under pinning to ensure the safety of employees and stability of the structure	YES___	NO___	N/A___
- Performed in stable rock	YES___	NO___	N/A___
- Determined by a registered professional engineer that the structure is sufficiently removed from the excavation so as to be unaffected by the excavation activity	YES___	NO___	N/A___
- Determined by a registered professional that the excavation work will not pose a hazard to employees	YES___	NO___	N/A___
3. Is the undermining of sidewalks and pavement structures prohibited?	YES___	NO___	N/A___

PROTECTION OF EMPLOYEES FROM LOOSE ROCK OR SOIL

1. Is adequate protection provided to protect employees from loose rock or soil that could pose a hazard by falling or rolling from an excavation face?	YES___	NO___	N/A___
2. Are employees protected from excavated or other material and equipment by placing this material a minimum of two (2) feet from the edge of excavations or by the use of retaining devices?	YES___	NO___	N/A___

INSPECTIONS

1. Are daily inspections of excavations where employee exposure can be reasonably anticipated being done by the competent person?	YES___	NO___	N/A___
2. Are inspections being performed by a competent person after every rainstorm or other hazard increasing occurrence?	YES___	NO___	N/A___
3. Are employees removed from the excavation if the competent person finds evidence at any time of a situation that could result in a possible cave-in, protective system failure, hazardous atmosphere or other hazardous condition?	YES___	NO___	N/A___

FALL PROTECTION

1.	Are standard guardrails provided on walkways and bridges that cross over excavations?	YES___	NO___	N/A___
2.	Are all remotely located excavations adequately barricaded or covered?	YES___	NO___	N/A___
3.	Are temporary wells, pits, shafts and similar exploratory operations backfilled upon completion?	YES___	NO___	N/A___

I have inspected the excavation described in this permit:

_____ _____

(Signature of Competent Person) (Date)

1. OBJECTIVE

OHM Remediation Services Corp. (OHM) personnel who have been trained in the proper set-up, use, and care of high pressure washers will be authorized to operate this equipment.

2. PURPOSE

This procedure describes requirements for the safe operation of the high-pressure washer.

3. PERSONAL PROTECTIVE EQUIPMENT

The following equipment will be worn by operators and assistants:

- Safety shoes or boots
- Metal foot and shin guards
- Eye protection (goggles and face shield)
- Hard hat
- Heavy duty PVC rain suit or equivalent
- Heavy chemical resistant gloves

4. OPERATION PROCEDURE

- Only trained, authorized personnel will operate the high-pressure washer.
- The lance must always be pointed at the work area.
- The operator must maintain good footing.
- The operator must have an assistant to aid in moving the hose to different areas and backing up the operator. The assistant must remain in back of the operator.

- Non-operators must remain a safe distance from the operator. The distance must be a minimum of 25 feet.
- The operating pressure should never exceed that which is necessary to complete the job.
- No unauthorized attachment may be made to the unit. (The trigger should never be tied down.)
- The operator should be changed at frequent intervals to avoid fatigue (at least hourly).
- Equipment should be cleaned often to avoid oil or dirt build-up, especially around the trigger and guard area.
- An assistant should always be standing by at the pressure generator to shut down the equipment and monitor the pressure.
- All users must be trained in emergency shut down procedures and general equipment maintenance.
- All lances must be made of seamless stainless steel. Do not use carbon steel which can corrode and result in weakening of the lance.
- DO NOT MODIFY THE LANCE. The lance barrel, from trigger block to the tip, should not be less than 48 inches as recommended by manufacturers of hydroblasting equipment.
- Always increase pressure slowly to inspect for leaks. All leaks or malfunctioning equipment must be repaired immediately or the unit taken out-of-service. Never exceed the operating pressure necessary to do the job.
- Attach a cable which connects the water supply hose to the laser wand to prevent whipping should they accidentally disconnect.
- A serious risk of infection and further complications is possible from a hydroblasting laceration. If an injection injury is suspected, the treating physician should be informed so he/she can request a surgeon who specializes in injection injuries. The specialist may have to perform surgery on the affected body part in order to remove the material (oil, particles) that was injected directly through the skin.

1. OBJECTIVE

All OHM Remediation Services Corp. (OHM) employees will use the proper lifting techniques and will utilize mechanical means when an objects' weight or bulk cannot be safely lifted by manual means.

2. PURPOSE

This procedure provides the proper lifting technique to be used by OHM employees. By utilizing proper technique, OHM employees can avoid debilitating lower back injuries.

3. REQUIREMENTS

3.1 Use mechanical material handling equipment whenever practical; however, mechanical lifting equipment shall be used only by qualified personnel.

3.2 If the material must be lifted manually, the following procedures apply:

3.2.1 Make certain that the load lifted can be safely handled. Consider the size, weight, and shape of the load. If necessary, get help.

3.2.2 Warm up for the lift by bending, stretching, and turning.

3.2.3 Do not attempt to lift more than 60 pounds.

3.2.4 Ensure proper lifting technique as follows.

- Place feet about shoulder width apart.
- Place one foot alongside the object being lifted and the other foot in front of the object.
- Bend at the knees to grasp the load.
- Maintain slight arch in the back when positioning over load.
- Draw the load close to the body, keeping the arms and elbows tucked into the side of the body.

- Take a firm hold on the load with the palms of the hands, not just the fingers.
- Maintain same slight arch in the back.
- Lift gradually, using your leg muscles. Make sure you draw the load close to your body.
- Do not twist the body when lifting. If you have to change direction, turn with your feet, not your trunk.
- Carry the object close to the body and watch where you are going. Do not carry objects in a manner that obstructs your vision.
- Avoid throwing or dropping objects. When lowering, maintain a firm grip. Watch out for pinching of the fingers. Use your leg muscles to lower the object by bending at the knees and keeping your back straight.

1. OBJECTIVE

No individual will enter an area where the use of respiratory protective equipment is required unless the person has been trained in the selection, use, care and limitations of the respirators, and the proper respirator has been selected for the task and fit tested.

2. PURPOSE

The purpose of this procedure is to provide information and guidelines for the selection, use, and care of respiratory protective equipment for all OHM Remediation Services Corp. (OHM) and contractor personnel. This procedure complies with the requirements of 29 CFR 1910.134.

3. GENERAL

3.1 The use of engineering controls should be the primary respiratory hazards method to limit employee exposure to respiratory hazards.

3.2 Respirators shall be worn when engineering controls are unsuccessful and:

- When the PEL (Permissible Exposure Limit), TLV (threshold limit value), or ceiling limit for the material exposure is approached or exceeded, as measured by sampling.
- As deemed appropriate by the regional health and safety manager.

3.3 Respirators can only be worn by individuals who have been properly trained and fit tested.

3.4 The regional health and safety manager will evaluate annually the effectiveness of the respirator program and report his findings to the vice president of health and safety.

3.5 The respirator program coordinator for each region will be the regional health and safety manager.

3.6 Only respirators approved by the National Institute for Occupational Safety and Health (NIOSH) and the Mine Safety and Health Administration (MSHA) which are appropriate for the potential hazard shall be worn.

4. SELECTION OF RESPIRATORS

4.1 Engineering controls should always be the primary control of contaminated air (i.e. elimination of source of contamination, ventilation equipment, barriers, etc).

4.2 Once the need for respirators has been established, the respirators shall be selected on the basis of the hazards to which the worker is exposed.

4.1.1 Selection criteria should include:

- The concentration of the contaminant.
- Whether the contaminant may be sufficiently toxic to be immediately dangerous to life or health (IDLH).
- The possibility of oxygen deficiency.
- The useful life of the respirator or cartridge.
- The escape routes available.
- Whether the equipment is intended for emergency use, for periodic use, or for stand-by purposes.

4.3 Characterization of the hazard and proper respirator data will be performed to determine what type respirator will be used.

5. MEDICAL SCREENING

5.1 Prior to assigning personnel tasks requiring the use of respirators, the employee shall be medically evaluated in compliance of requirements of 29 CFR 1910.134(a)(10).

5.2 Employees not physically and psychologically capable of wearing respirators shall not be assigned to such work.

5.3 The medical status of each employee is to be reviewed as outlined in Procedure 10 and as may be deemed necessary if the physical status of the employee changes.

6. FIT TESTING

6.1 Fit testing will be performed in accordance with accepted fit test procedures by the regional health and safety manager or their designated employee who has been trained and qualified to do so.

6.2 Records of fit testing shall be maintained by the employee's division office and/or corporate human resources.

7. RESPIRATOR USE INSTRUCTIONS

7.1 Respirators must be used only by those employees who have been properly trained and qualified on the specific type of respirator to be worn.

7.2 All employees whose job assignment requires the use of respirators shall be given respirator training at the time of fit testing before being assigned to the job. Retraining must be performed annually on each type of respirator worn by the individual. Training records must be kept.

7.3 Only respirators and cartridges approved for the hazardous atmosphere to be encountered will be used.

7.4 Only NIOSH/MSHA approved, respirators will be worn by an individual.

7.5 CAUTION: Full face piece or one-half face piece air-purifying respirators are not to be used where there is an oxygen deficiency. Only air-supplied full-face respirators with an emergency escape cylinder or self-contained breathing apparatus will be worn when an oxygen deficiency exists.

7.6 CAUTION: A respirator does not protect against excessive heat or against hazardous substance that can attack the body through the skin.

7.7 Contact lenses shall not be worn with full-face respirators.

7.8 A person wearing a respirator must be clean-shaven in the area of the face piece seal. Long hair, sideburns, and skull caps that extend under the seal are not allowed. Glasses with temple pieces extending under the seal are not allowed. Persons with facial conditions that prevent a proper seal are not allowed to wear a full-face piece respirator until the condition is corrected. Facial conditions which may cause a seal problem include missing dentures, scars, severe acne, etc.

8. RESPIRATOR INSPECTION

8.1 Respirators shall be inspected by the user before and after each day's use and those not used routinely shall be inspected once a month.

8.2 Inspection procedure air purifying respirators (full-face piece and one half-face piece cartridge/canister respirators)

8.2.1 Examine the face piece for:

- Excessive dirt
- Cracks, tears, holes, or distortion from improper storage.
- Inflexibility
- Cracked or badly scratched lenses.
- Incorrectly mounted lens or broken or missing mounting clips.
- Cracked or broken air purifying element holder, badly worn threads, or missing gaskets.

8.2.2 Examine the head straps or head harness for:

- Breaks or cracks
- Broken or malfunctioning buckles. Excessively worn serrations on the head harness which may permit slippage.

8.2.3 Examine exhalation valve for the following after removing cover:

- Foreign material
- Cracks, tears, or distortion in the valve material.
- Improper insertion of the valve body in the face piece.
- Cracks, breaks, or chips in the valve body, particularly in the sealing surface.
- Missing or defective valve cover.
- Improper installation of the valve in the valve body.

8.4 A record of respirator inspections including date and inspectors initials and maintenance will be maintained for all pieces of respiratory protective equipment designated for emergency response. The SCBA inspection form follows this procedure.

9. CLEANING OF RESPIRATORS

9.1 Respirators assigned and worn by one individual must be cleaned after each day's use. Visitors's or multi-assigned respirators must be cleaned and disinfected after each use.

9.2 Extreme caution must be exercised to prevent damage from rough handling during the cleaning procedure.

9.3 After cleaning, respirators must be reassembled.

9.4 A respirator spray disinfectant is approved as disinfectant between continuous use but not for cleaning and sanitizing after each day's use.

9.5 Cleaning Procedure for Individually assigned Respirators

9.5.1 Washing: The respirator must be disassembled and washed with a mild liquid detergent in warm water. A brush should be used. To avoid damaging the rubber and plastic in respirator face pieces, use a soft bristle brush and a cleaner/water solution between 90 and 100°F.

9.5.2 Rinsing: The respirator should be rinsed thoroughly in clean water (140°F maximum) to remove all traces of detergent. This is very important to prevent dermatitis.

9.5.3 Drying: The following drying methods may be used: draining and drying on a clean surface; draining and drying when hung from racks (take care to prevent damage); towel drying with soft clothes or paper towels.

9.6 Cleaning Procedure for Visitor or Multi-Assigned Respirators

9.6.1 Washing: The respirator must be disassembled and washed with a brush in a cleaning solution in warm water. To avoid damaging the rubber and plastic in respirator face pieces, use a soft bristle brush and a cleaner/water solution between 90 and 100°F.

9.6.2 Rinsing: The respirator must be immersed in a disinfectant solutions noted below for at least 2 minutes and then rinsed in clean water at 140°F maximum.

9.6.3 Disinfection: 50 ppm of chlorine in a hypochloride solution made from household bleach (2 ml. to one liter of water).

9.6.4 Drying: The following drying methods may be used: draining and drying on a clean surface; draining and drying when hung from racks (take care to prevent damage); and drying in steel storage cabinets with built-in circulation fans. (Solid shelves should be replaced with steel mesh).

10. MAINTENANCE OF RESPIRATORS

10.1 Respirator maintenance shall only be performed by qualified personnel, for example site supervisors and site safety officers.

10.2 Approved replacement parts must be used. Substitution of parts from a different brand or type of respirator invalidates the technical approval of the respirator.

10.3 Maintenance performed on a self-contained breathing apparatus shall be done only by an individual who has been certified by the manufacturer.

11. STORAGE OF RESPIRATORS

11.1 When not in use, respirators must be stored to protect them from dust, sunlight, heat, extreme cold, excessive moisture, damaging chemicals, and physical damage.

11.2 Respirators must be stored in reusable plastic bags between shifts.

11.3 The respirator storage environment must be clean, dry and away from direct sunlight. Upright cabinets and wall-mounted cases are suggested.

12. BREATHING AIR

Breathing air shall meet at least the requirements of the specification for Grade D breathing air or better (D, E, or G not A, K, or L) as described in the American National Standard Commodity Specification for Air ANSI/CGA G-71-1989.

13. COLOR CODE

NIOSH recognizes the following standard color codes for respirator cartridges. The color codes can be used as a general guideline, however, personnel should refer to the NIOSH technical certification (TC) to verify adequate protection.

Acid gases	White
Organic vapors	Black
Ammonia gas	Green
Acid gases and organic vapors	Yellow
High Efficiency Particulate Air (HEPA) Dust, fumes, and mists (including asbestos and radioactive materials)	Magenta (Purple)
Dusts, fumes, and mists (other than asbestos and radioactive materials)	Orange

OHM Corporation

RESPIRATOR FIT TEST RECORD

Name: _____

Employee Number: _____

Date of Test: _____

Expiration Date: _____

Type of Fit Test:

☐ Quantitative
Protective Factor _____

☐ Qualitative

TESTING AGENT:

Isoamyl Acetate (Banana Oil) ☐

Irritant Smoke ☐

Saccharin ☐

RESPIRATOR DESCRIPTION

Manufacturer: _____

Model: _____

Size: _____

Test Conducted by: _____
(Please print)

Signature of Conductor: _____

I certify that I have been trained on the proper use, instructed on maintenance procedures, and have passed a respirator fit test as described above.

SIGNATURE OF EMPLOYEE: _____

COPY TO: Employee Home Division
Corporate Personnel Office (FAX Number: 419-425-6069)

OHM Corporation

SCBA MONTHLY INSPECTION CHECKLIST

SCBA ID NO._____ YEAR_____

ITEM INSPECTED	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Connections are tight												
Face-piece in good condition												
Rubber parts pliable												
Regulator functions properly												
Alarm bell functions properly												
Cylinder fully charged												
Cylinder hydrotest current (within 3 years)												
Unit is clean												
Emergency bypass functions properly												
Inspectors initials and employee number												

DEFICIENCIES IN ABOVE ITEMS REQUIRE UNIT TO BE TAGGED AND REMOVED FROM SERVICE.

1. OBJECTIVE

OHM Remediation Services Corp. (OHM) is greatly concerned about safe operation of motor vehicles. Motor vehicle usage presents the most significant work risk to employees. United States Department of Labor statistics indicate that motor vehicle deaths and injuries continue to be the number one cause of work-related death and serious injury. Accordingly, it is essential that OHM have an effective vehicle safety program.

2. PURPOSE

This section establishes requirements for safe operation of vehicles and equipment. This procedure is an overview of the guidelines in the proposed OSHA Motor Vehicle Safety Standard 29 CFR 1910.140.

3. RESPONSIBILITIES

3.1 The driver of a Company owned, rented or leased vehicle is responsible for:

- Operating the vehicle in a safe and legal manner.
- The safety of passengers.
- Reporting immediately any motor vehicle that is found to be defective or not operating properly.

3.2 The regional health and safety manager or site safety officer (SSO) is responsible for the following:

- Ensuring that all vehicle accident reports are processed and the required number of copies submitted to local, state, and federal agencies, to the resource manager and to the insurance carrier.
- Assuring that appropriate individuals, including the corporate vice president of health and safety are notified by telephone of accidents that involve fatalities or multiple serious injuries.

- Assuring that all accidents are documented and investigated. The investigation should be of sufficient depth to determine the cause and action required to prevent recurrence. Copies of all motor vehicle investigations shall be forwarded to the regional resource manager.

- Ensuring that during the selection process for leased or purchased vehicles, consideration is given to obtaining vehicles with essential safety devices. Such devices include anti-locking brakes, air bags, both front and rear seat shoulder harnesses, and all season traction tires. Each motor vehicle must be equipped with safety kits. Shoulder safety belts must not be attached to doors.

4. SEAT BELTS

OSHA has determined that the use of seat belts in motor vehicles can significantly reduce the number and seriousness of occupational motor vehicle accidents, including crashes, by requiring employers to ensure that each employee uses occupant safety belts. Accordingly, all OHM employees driving motor vehicles on company business (including rental cars, pick-up trucks, personal vehicles which are used for company compensated business travel, etc.) shall ensure that all occupants use seat belts at all times.

5. STATE AND LOCAL LAWS

5.1 All drivers shall drive OHM vehicles in accordance with the law.

5.2 Drivers shall not operate OHM vehicles which are known to be defective or not in compliance with the law.

5.3 Drivers of OHM vehicles are personally liable and responsible for the consequences of state and community violations.

5.4 The use of devices designed to identify active police speed detection systems (i.e. radar detectors) is prohibited in all OHM owned, leased and rented vehicles and in personal vehicles used for company compensated business travel.

6. SAFE DRIVING PRACTICES

6.1 Personnel shall operate vehicles in a defensive manner, i.e., being always on the alert and trying to anticipate what might occur under the existing conditions and driving in such a manner as to avoid hazards.

6.2 Personnel operating vehicles shall be considerate of, and courteous to, the traveling public and/or pedestrians and should yield the right-of-way to avoid accidents.

6.3 Personnel shall drive at speeds consistent with posted speed limits and prevailing conditions, such as weather, traffic and road conditions.

6.4 Personnel shall drive at all times with sufficient space around the vehicle to provide time to see conflicts arising, to react quickly, and to stop. The five keys to defensive driving will help accomplish a good space cushion.

- Aim high in steering.
- Get the big picture.
- Keep your eyes moving.
- Leave yourself an out.
- Make sure they see you.

7. GENERAL SAFETY RULES

7.1 Blind Curves - Slow down and sound horn when approaching a blind curve.

7.1 Driver's License - Operation of a vehicle without a valid operator's license is prohibited. Personnel operating vehicles regulated by the United States Department of Transportation (DOT) shall have a current commercial drivers license (CDL).

7.3 School Buses - Obey school bus laws. Slow down and prepare to stop when approaching school buses, children on foot or on bicycles.

7.4 Emergency Vehicles - Give ambulances, fire fighting equipment and other vehicles the right-of-way during emergencies and lend assistance if required.

7.5 Gasoline - Gasoline and other flammable/combustible liquids shall not be carried in or on vehicles other than in permanent gas tanks or in approved safety cans. Approved safety containers must be properly secured when being carried in the back of pick-up trucks.

7.6 Laws and Regulations - Learn and obey all local, state, and federal laws.

7.7 Parking - Equipment and vehicles shall be parked off roads and highways whenever possible. When it is not possible, the vehicle shall be marked by red lights or flares at night and red flags during the day. Wheels should be blocked or chocked.

7.8 Passing - Do not pass when visibility is restricted for any reason.

7.9 Pedestrians - Be constantly alert for pedestrians. Remember they have the right-of-way.

7.10 Slow Down - Slow down and use caution at blind intersections and crossings when visibility is limited or when passing work crews.

7.11 Smoking - Smoking is prohibited in all OHM owned, leased or rented vehicles.

7.12 Speeding - Speeding is strictly prohibited.

7.13 Thumbs Up - Keep thumbs up when driving. Do not grasp the steering wheel with thumbs inside the spokes.

7.14 Visibility - Make sure all windshields, side and rear windows, mirrors and lights are clean before moving vehicles.

7.15 Warning Signs and Traffic Signals - Be alert for and strictly obey all directional and warning signs and signals.

7.16 Seat Belts - If unit is equipped with seat belts, operator and passengers must keep seat belts fastened at all times during operations.

8. DOT REGULATED VEHICLES

8.1 All OHM personnel operating a DOT regulated vehicle must hold a valid CDL from their state of residence.

8.2 Air Hose and Couplings - Periodically check air hoses and couplings and compressor hoses for worn or damaged parts. Do not crimp air hose to disconnect couplings; shut off air at the valve.

8.3 Backing Up - Never start or back up equipment or vehicles until you are sure the way is clear. If necessary, have another person guide you safely. Back up alarms, when required, must be working and audible over the surrounding noise.

8.2.4 Examine the air purifying elements for:

- Missing cartridge adapter gasket
- Incorrect cartridge/canister, or filter for the hazard.
- Incorrect installation, loose connections, missing or worn gaskets, or cross threading in the holder.
- Cracks or dents in outside case or threads of filter or cartridge/canister.

8.2.5 If the device has a corrugated breathing tube, examine it for:

- Broken or missing end connections.
- Missing or loose hose clamps.
- Deterioration, determined by stretching the tube and looking for cracks.

8.3 Inspection procedure air-supplied respirators (full-face piece air line respirators and self contained breathing apparatus (SCBA)) should be inspected as follows:

8.3.1 If the device has a tight-fitting face piece, use the procedures outlined for air purifying respirators will be followed, except those pertaining to the air purifying elements.

8.3.2 The inspection of air-supplied respirators should include checks on the following items:

- Tightness of connections
- Condition of all rubber parts
- Air cylinder (SCBA & egress) must be fully charged and the hydrotest certification must be current (SCBA cylinders-3 years/egress cylinders 5 years).
- Regulators and warning devices function properly.
- Does each unit (SCBA & egress) have a distinct identification number permanently affixed or engraved on the regulator?

8.4 Ear Protection - Ear plugs or other approved ear protection shall be worn when necessary. Use of ear plugs in cars or trucks on public highways may be against local laws.

8.5 Fueling and Repair - No fueling or repair shall be made to equipment while it is in operation. The motor shall be turned off and the bucket, blade, gate or boom shall be lowered to the ground or blocks.

8.6 Housekeeping - Operators should keep deckplates, steps, rung and hand rails on equipment free of grease, oil, ice, and mud. The inside of the cabs shall also be kept clean and free of flammable items.

8.7 Inspections - Equipment and vehicles shall not be used until known defects or discrepancies are corrected. Inspections shall be made at the start of each shift and defects or discrepancies shall be reported to the supervisor immediately.

8.8 Jumping - Jumping on or off equipment is prohibited. When climbing on or off equipment or vehicles, face the unit and use secure hand and foot holds to prevent slips and falls. Always look where you are stepping.

8.9 Know your Equipment or Vehicle - It is your responsibility to be thoroughly familiar with all features and manuals and if you are in doubt as to correct operating techniques or safety features, ask your supervisor at once.

8.10 Overloading - Avoid overloading vehicle beds and equipment buckets and beds. Excessive material can damage the unit and falling material can cause serious injury.

8.11 Power Lines - When operating trucks, cranes, shovels or other units, always use caution around power lines and maintain a minimum safe clearance of 10 feet or more depending upon the voltage.

8.12 Riders - Only authorized persons will be permitted to ride in equipment or vehicles.

8.13 Securing Loads - The operator of the vehicle is responsible for ensuring that their load is secure and will not shift during transport.

8.14 Long Hauls - On long hauls, binders should be checked periodically (at least during each rest or service stop) to make sure they are still secure and tight.

8.15 Overhanging and Oversize Loads - When it is necessary to transport overhanging or oversize loads, the appropriate signs and red flags and red lights will be used. When necessary, use flag cars.

8.16 Safety Chains - Safety chains of sufficient size and strength shall be installed on all trailers being towed.

8.17 Safety Hooks - Use safety hooks with latches on all winch truck cables.

8.18 Side Roads and Railroad Tracks - Stop and look both ways before crossing railroad tracks or before driving onto a highway from a side road.

8.19 Stopping - Do not stop vehicles in the middle of the road to talk to occupants in another vehicle. Always pull to the side or off the road to maintain a clear, safe road.

8.20 Turn signals - Always use turn signals, emergency and other signals as appropriate when turning, stopping, passing, or performing other vehicle operations.

8.21 Vehicle Maintenance - It is the driver's responsibility to see that his vehicle is in good mechanical condition before and during operation. Special emphasis should be placed on ensuring the brakes, lights, horn, windshield wiper, tires and steering assembly are in good order. Defects must be reported and corrected immediately.

1. OBJECTIVE

Air monitoring will be conducted on all projects involving hazardous materials in order to determine the appropriate level of dermal and respiratory protection, to alert personnel of potentially explosive hazardous conditions, and to ensure sufficient oxygen for work if in confined spaces. Monitoring programs for activities conducted on United States Army Corp. of Engineers project sites will conform to the requirements in EM 385-1-1, 07.B.05., and 08.A.04.,05., 06., as well as the above. Air monitoring results must be posted for employee information and results entered into employee medical files.

2. PURPOSE

The purpose of this procedure is to describe air monitoring procedures which will be implemented at OHM Remediation Services Corp. (OHM) project sites to determine personnel exposures, potentially hazardous atmospheres, and off-site migration of contaminants.

3. REQUIREMENTS

3.1 Direct reading instruments will be used on sites involving hazardous materials. The instrument to be utilized will be specified in the site health-and-safety plan.

3.2 Instruments available can include portable organic vapor analyzers (OVA), photoionization detectors (PID), combustible gas indicator/oxygen meter CGI/O_2, hydrogen sulfide monitors, hydrogen cyanide monitors, carbon monoxide monitors, Drager tubes, miniature random aerosol monitor (Mini-Ram), and portable radiological survey meter.

3.3 An action level will be established in the site health-and-safety plan for each suspected airborne contaminant.

4. PERIMETER SAMPLING ACTION LEVELS

In order to maintain environmental air quality, concentrations of organic vapors, fugitive dust, and other materials will be kept as low as possible. Any elevated reading should be investigated and the appropriate actions taken to control the emission.

5. ESTABLISHMENT OF BACKGROUND CONCENTRATIONS

A "competent person" as defined in 29 CFR 1926.32 is one who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them. With this definition in mind, a "competent person" will perform a site survey prior to site operations to determine the concentration for "contaminants" in non-contaminated areas (generally up wind from the site). This is referred to as a background concentration and will be subtracted from measurements made during actual measurements in potentially contaminated areas.

6. AIR MONITORING LOG

The site supervisor will ensure that all air monitoring data is logged into a monitoring notebook. Data will include instrument used, calibration, wind direction, work process, etc. A sample Real Time Air Monitoring Log and an Area Time Weighted Sampling Data Sheet is attached to this procedure.

7. CALIBRATION AND MAINTENANCE REQUIREMENTS

All direct reading instruments, air monitoring pumps and any other instruments used to monitor air contamination will be calibrated daily prior to use. A separate log will be kept detailing date, time, calibration gas or other standard, and name of person performing the calibration. Maintenance of the instruments will be as in detailed in the manufacturer's reference manuals. Sample calibration data sheets are attached to this procedure.

8. PERIMETER MONITORING

Sampling stations may be established around the active work area or spill site (i.e., exclusion zone) for perimeter monitoring. The intent of perimeter monitoring is to collect upwind and downwind measurements to determine if site operations are affecting the quality of air migrating off site. While exclusion zones are rarely perfectly circular and access to all areas surrounding these zones is never easily accomplished, the general plan will be to establish four monitoring stations; upwind, downwind, and two crosswind.

9. PERSONAL AIR MONITORING

Personal air monitoring shall be performed on personnel who are working in USEPA Levels C and D protection that have the highest potential for exposure to hazardous substances or health hazards above permissible exposure limits.

Direct reading instrumentation and fixed media/integrated sampling shall be used to determine if and when this type of monitoring is needed. OSHA or NIOSH methods will be used to collect the chosen analyte. An American Industrial

Hygiene Association (AIHA) accredited laboratory will be used to analyze the samples with the most expedient analysis time ordered.

All personal air monitoring results shall be entered into the employee's medical records. A Personal Sampling Data Sheet for recording personal sampling data is attached to this procedure.

10. POSTING OF AIR MONITORING RESULTS

All personal air monitoring results will be posted in an area where the employees have direct access to the information. At the request of the employee, the results will be explained. If any results are elevated, the site safety officer will investigate, identify the cause and take corrective action.

11. AIR MONITORING FREQUENCY

Air monitoring shall be conducted at least twice daily (once during the beginning of daily activity and once during peak activity) and;

- When work begins on a new phase or portion of a site
- When contaminants other than those previously identified are being handled
- When different types of activities occur (e.g. drum opening as opposed to exploratory well drilling)
- When employees are handling leaking drums or are exposed to obvious contamination
- Upon determination by the site safety officer, monitoring can be conducted continuously, daily or hourly.

1. OBJECTIVE

OHM Remediation Services Corp. (OHM) will inspect all equipment before use to ensure that it is proper working order and free from all safety deficiencies.

2. PURPOSE

The procedure provides for the systematic inspection of tools and equipment thereby ensuring periodic maintenance and if necessary, the removal from service units which are found to be defective. OHM shall maintain a comprehensive equipment inspection plan that meets the requirements for portable tools and heavy equipment as found in 29 CFR 1926, Subpart I (1926.300 -.305) and 29 CFR 1910, Subpart P (1910.241-.247) and 29 CFR 1926, Subpart O.

3. PORTABLE TOOL REQUIREMENTS

3.1 All hand and power tools used at OHM facilities or project sites, whether furnished by OHM or the employee, shall be maintained in a safe condition. Each OHM supervisor is responsible for periodically inspecting all tools in the work area.

3.2 All tools shall be used in strict compliance with the manufacturer's instructions and only for the use intended.

3.3 Power tools shall be equipped and used with guards in place.

3.4 Any tools having reciprocating, rotating, or moving parts shall be guarded.

3.5 OHM supervisors shall ensure that unsafe hand tools are removed from service. Unsafe tools include, but are not limited to:

- Wrenches, with jaws sprung which slip when used.
- Impact tools (hammers, drift pins, wedges, chisels) with mushroomed heads.
- Wooden handles which are cracked, splintered, duct taped, and/or loose on the tool.

3.6 Electric power operated tools shall be approved double insulated, or grounded. Electric cords shall not be used for hoisting or lowering electric tools.

3.7 Pneumatic power tools shall be secured to the hose by a positive means to prevent accidental disconnection. Pneumatic hoses shall not be used for hoisting or lowering tools.

3.8 Fuel powered tools shall be stopped while being refueled, serviced or, maintained. When fuel powered tools are used in confined spaces, adequate ventilation shall be provided.

3.9 Tools which are not serviceable shall be immediately removed from service and repaired, or destroyed.

4. HEAVY EQUIPMENT REQUIREMENTS

The equipment operator is responsible to make daily inspections of their equipment and to note any deficiencies. These deficiencies, no matter how small, should be reported immediately to the site supervisor. In this way, many potential breakdowns of your machine or safety hazards can be avoided by corrective maintenance.

4.1 Check the engine oil level. If low, add enough to bring the level to the full mark.

4.2 Check the coolant level. Add water coolant if level is low.

4.3 Check fuel level. Refill if necessary.

4.4 Check tires for proper inflation, worn spots, cuts or breaks and objects imbedded in or between the tires. Correct or report conditions when found.

4.5 Check under the vehicle for signs of oil, water, fuel, or other leaks. If leaks are seen, report them to your supervisor.

4.6 Check head, tail, and clearance lights. If any are burned out, damaged, or missing, report them at once.

4.7 Check batteries at least once a week for proper electrolyte level, leaks, and loose connections.

4.8 Report any change in steering play or vibration in the steering mechanisms.

4.9 Check the horn. If inoperative, have it repaired.

4.10 Check the condition of the windshield, rear view mirrors and other glass. Report broken, cracked or missing glass. Clean all dirty or wet glass. Adjust rear view mirrors.

4.11 Check belts on air compressor, generator, water pump, and any other. If loose or torn, report to your supervisor.

4.12 Check special equipment such as wrenches, jacks, fire extinguisher, etc. Report any that are missing or unserviceable.

4.13 Check the tracks for any loose bolts, nuts, proper adjustment, unusual wear patterns, cracks etc.

4.14 Check for any worn or frayed cables.

4.15 Check the boom, buckets and gantry for cracks, bent members, worn teeth and cutting edges.

4.16 Check fluid level of the hydraulic system.

4.17 Check for dirty or inoperative air cleaners and filters.

4.18 Check for proper brake operation.

4.19 Check to make sure the equipment is equipped with a back-up alarm and the alarm is working properly.

4.20 Make a complete walk-around inspection of your unit. In this manner you may detect damage before you put the machine to work.

4.21 When walking up to or around the unit, observe its condition and notice if anyone or anything is on or under it. By checking now, you may prevent injury or damage when you start out.

4.22 If applicable, drain water off of the lubricating oil sump daily.

4.23 In cold-weather, bleed the air tank and, if equipment is equipped, use the alcohol injector pump.

OHM Corporation	HEALTH &SAFETY PROCEDURES
	BLOODBORNE PATHOGEN – 29 CFR 1910.1030
	PROCEDURE NUMBER 1 PAGE 1 OF 4
	LAST REVISED ?? APPROVED BY: ??

A. INTRODUCTION

On December 6, 1991, the Occupational Safety and Health Administration (OSHA) published the Occupational Exposure to Bloodborne Pathogens standard (29 CFR 1910.1030). It became effective March 6, 1992. The purpose of this regulation is to "eliminate or minimize exposure to Hepatitis B Virus (HBV), Human Immunodeficiency Virus (HIV), and other Bloodborne Pathogens.

OHM Corporation has been tasked with creating an exposure control plan. This plan describes how OHM will comply with the Bloodborne Pathogens Standard and protect employees from hazards presented by bloodborne pathogen encountered in the work place.

B. OBJECTIVE

This training program is designed to present information on the nature of bloodborne diseases and to help OHM employees reduce or eliminate potential exposure to bloodborne pathogens in their work environment.

C. BLOODBORNE PATHOGEN COMPLIANCE – INFORMATION AND TRAINING

In a surprise decision, OSHA has exempted the construction industry from the requirements of the Bloodborne Pathogen Standard. However, on several occasions, OSHA has questioned OHM about their Exposure Control Plan, and how personnel will protect themselves from bloodborne pathogen. To this end, OHM has drafted an Exposure Control Plan, which will only address the OHM occupational health nurse and OHM employees who render aid to injured employees.

1. Regulation Availability – A copy of the Bloodborne Pathogen Standard is always available to all employees. OHM employees will be able to review the standard and obtain a copy anytime at the following location.

   - Occupation Health Nurse's Office, Findlay
   - Corporate Health and Safety Training Coordination Office, Findlay
   - Regional Health and Safety Manager's Office
   - Regional/Divisional Trainers
   - Site Safety Officers

2. Modes of Transmission of Bloodborne Pathogen – Illness or disease related to bloodborne pathogens are transmitted through blood and other body fluids including semen, vaginal secretions, loose skin, and body tissue. OHM personnel must recognize that these products are potentially harmful and take precautions to protect themselves.

   Occupational exposure to bloodborne disease are most often transmitted through breaks in the skin or mucous membranes. This usually occurs through needlesticks or other contaminated broken sharp objects, human bites, or having blood or other body fluids get into existing cuts or abrasions.

3. Task Hazard Analysis – Generally, OHM personnel are at a low risk for exposure to Bloodborne pathogens. However, there are some situations in which OHM personnel may come into contact with potentially infectious contaminated material. These tasks include:

   - CPR and First-Aid at OHM project site
   - Response to blood or medical waste emergency
   - First-aid provided by the Occupational Health Nurse

4. Personal Protective Equipment – The personal protective equipment (PPE) required by the Bloodborne Pathogen Standard is available at all OHM facilities and project sites. The PPE required for protection against bloodborne pathogens includes:

   - Sample gloves
   - Safety glasses (minimum)
   - Liquid goggles (preferred)
   - Full-face shield (if potential to splash on face and in mouth)
   - CRP mask with one-way exhalation valve

5. Hepatitis B Vaccination – Because OHM personnel are at low risk for exposure to bloodborne pathogens, post-exposure Hepatitis B vaccination and medical evaluations will be implemented. Post-exposure vaccinations and medical evaluations are available to all employees who have had an exposure incident.

   Confidential medical evaluations and follow-ups will be made available to all affected employees following the report of an exposure incident. The medical evaluations will include the following elements:

   - Documentation of exposure routes and circumstances of exposure
   - Identification and documentation of source individual
     - The source individuals blood will be tested as soon as feasible after consent is obtained in order to obtain the person's HIV/HBV status.

6. Emergency Procedures – The Bloodborne Pathogen Standard dictates that Universal Precautions must be following by employees at all times whenever contact with potentially infectious materials is possible. Universal Precautions is a concept which is summarized as follows:

   ALL HUMAN BLOOD AND CERTAIN HUMAN BODY FLUIDS ARE TREATED AS IF KNOWN TO BE INFECTIOUS FOR THE HUMAN IMMUNODEFICIENCY VIRUS (HIV), THE HEPATITIS B VIRUS (HBV) AND OTHER BLOODBORNE PATHOGENS.

   There is always the potential for accidents in the work place and at project sites. When these accidents involve potentially infectious materials, protecting human health and safety is the primary consideration for all employees involved in the incident. Important steps to follow in this situation include:

   - Avoid all contact with blood or other bodily fluids (i.e., vomit, salvia)
   - Wear appropriate PPE when there is potential from contact with potentially infectious materials
   - Warn employees in surrounding area of potential hazard
   - Provide appropriate first aid, if trained to do so
   - Report all exposure incidents to your supervisor
   - Decontaminate all equipment and surfaces contaminated with blood or other body fluids

7. Bloodborne Pathogen Hazard Communication – Communication of the hazards associated with blood, blood products, or other potentially infectious material is extremely important.

   Warning labels must be affixed to containers of regulated waste. Labels must also be affixed to containers used to store, transport, or ship blood or other potentially infectious material. Labels must include the universal biohazard symbol and be fluorescent orange or orange-red with lettering or symbols in a contrasting color.

In most situations, OHM personnel will discard all potentially infectious material in red bags or red containers which may be substituted for labels. After an exposure incident occurs and potentially infectious material has been generated and containerized in red bags or containers, it will be the responsibility of the OHM project supervisor or shop foreman to contact the regional transportation and disposal coordinator for direction on the proper disposal of infectious or potentially infectious material.

8. Decontamination – Equipment and other surfaces which have been contaminated with blood or other body fluids must be decontaminated. Equipment and surfaces should be initially washed with a bleach/water solution, then rinsed with clear water until all visible blood and body fluids has been cleaned up. The water generated during the decontamination can be disposed in the sanitary sewer. All solid waste generated should be added to the "Red Bag" wastestream.

APPENDIX C

SAFETY PLAN ACKNOWLEDGEMENT

WORKER ACKNOWLEDGEMENT TO HEALTH-AND-SAFETY PLAN

I HAVE READ THE SITE-SAFETY PLAN FOR THIS SITE AND FULLY UNDERSTAND ITS CONTENTS.

NAME	DATE

APPENDIX D

HEALTH AND SAFETY FORMS

OHM Corporation

DAILY HEAVY EQUIPMENT SAFETY INSPECTION CHECKLIST

EQUIPMENT I.D. NO.: _____ EQUIPMENT NAME: _____ WEEK OF: _____

ITEM INSPECTED	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY
Falling Object Protective Structure (FOP)							
Roll-Over Protective Structure (ROP)							
Seat Belts							
Operator Seat Bar(s)							
Side Shields, Screens or Cab							
Lift Arm Restraining Device							
Grab Handles							
Back-Up Alarm - Working							
Lights							
Guards							
Horn							
Anti-Skid Tread Steps Clear of Mud							
Safety Signs (i.e. counterbalance swing area)							
Fire Extinguisher							
General Condition							
Fuel Connection							
Oil (full and no leaks)							
Clear Of Extra Materials							
Controls function properly							
Damaged Parts							
Hydraulic System (full and no leaks)							
Parking brake							
Lift Arm and Bucket							
Tires/Tracks							
Steering							
Inspectors Name and Employee No.							

INSTRUCTIONS - Inspect all applicable items indicated, each shift. If an unsatisfactory condition is observed, suspend operation of the equipment and report the unsatisfactory condition to the site supervisor immediately.

OHM Corporation

ACCIDENT/INJURY/ILLNESS REPORT FORM

Form [illegible]
H & S Dept.
6/91

☐ Accident	☐ Injury	☐ Illness
Property Damage	☐ Yes	☐ No
Vehicle Involved	☐ Yes	☐ No

Health & Safety Use Only

Case # _____

- ☐ First Aid Only
- ☐ Medical Treatment
- ☐ Lost Workdays – Restricted Activity
- ☐ Lost Workdays – Away from Work
- ☐ Fatality

Exact Date and Time of Incident _____ ____ a.m. ____ p.m. Shift ☐ 1st ☐ 2nd ☐ 3rd

OHM CORPORATION _____
(Employee's Home Division/Regional Office/Subsidiary)

Address _____
City State

PROJECT IDENTIFICATION (Project Related Incidents Only)

Project No. _____ Project Start Date _____ Completion Date _____

Location (Full Address) _____

Telephone _____ Project Manager _____

EMPLOYEE INFORMATION

Employee's Full Name _____ Employee No. _____

☐ Regular Full Time ☐ Regular Part Time ☐ Temporary ☐ Non-Employee

Home Address _____

Date of Birth _____ Age ____ Social Security No. ___-___-___ Sex ☐ M ☐ F

Job Title _____ Department _____ Date Hired _____

Length of Employment ☐ In Training, ☐ ____ Mos. ☐ ____ Yrs. Time in Job Class ☐ In Training, ☐ ____ Mos. ☐ ____ Yrs.

Name of Employee's Direct Supervisor _____

Supervision at Time of Accident ☐ Directly Supervised ☐ Indirectly Supervised ☐ Not Supervised

Specific Location Where Incident Occurred _____

_____ ☐ OHM Facility ☐ Project Site ☐ Other _____

To Whom Was Incident Reported? _____ When? _____

Witness Name/Address _____

Witness Job Title/Reason in Area _____

Describe Employee's Job Duties Being Performed When Injured _____

_____

_____

Describe Fully the Events Which Resulted in the Accident/Injury/Illness _____

_____

_____

PLEASE CONTINUE ON BACK OF THIS FORM

(Use Extra Page if Needed)

Describe the Injury/Illness in Detail; Indicate Part of Body Affected _____

Name of Object/Substance Which Directly Injured Employee _____

Has/Will Employee Seek Treatment? ☐ Yes ☐ No Did Employee Die? ☐ Yes ☐ No

Name/Address of Hospital/Doctor _____

Describe Treatment Given _____

Was Employee Able To Return To Work? ☐ Yes ☐ No

If YES: ☐ Regular Work ☐ Work with Restricted Activities

Restriction _____

If NO: Date Lost Time Began _____ Date/Est. Date To Return _____

Identify Personal Protective Equipment Used by Injured Employee _____

What Training or Instruction Had Been Given? _____

How Could This Accident Have Been Prevented? _____

Corrective Action _____

Are You Reporting This Incident as an Industrial Injury/Illness? ☐ Yes ☐ No

Signature _____ (Employee) Date _____

Signature _____ (Supvr/Manager) Date _____

Signature _____ (Safety Officer) Date _____

Signature _____ (Proj. Manager) Date _____

Signing This Report does Not Constitute Certification of an Industrial Claim

DISTRIBUTION Original To: Division Secretary at Employee's Home Office

Copy To: ☐ Corporate Health & Safety ☐ Regional Health & Safety Manager
☐ Project Manager ☐ Site Safety File

OHM Corporation

Form 0035
H & S Dept.
6/91

INJURY/ILLNESS STATUS REPORT

Employee _____ Social Security No. ___ - ___ - ____

Home Address _____ Phone _____

Job Title _____ Home Division _____

Date/Time of Injury/Illness _____ ____ a.m. Location: ☐ OHM Facility ☐ Project Site

____ p.m. ☐ Other _____

Description of Injury/Illness _____

AUTHORIZATION TO RELEASE INFORMATION

I hereby authorize all physicians, hospitals, clinics and all persons to discuss with, and release to OHM Corporation and its authorized agents, any information or copies thereof acquired in the course of my examination or treatment for the injury identified above. This authorization shall not extend to any other medical condition, past or present, unless the same is causally or historically relevant or related to the injury referred to above.

Employee Signature _____ Date _____

PHYSICIANS OR MEDICAL PERSONNEL TO COMPLETE REMAINDER OF FORM

WORK STATUS

☐ Patient may return to work with no limitations

_____
Date

☐ Patient may return to work on _____
Date
with limitations indicated. These restrictions are in effect until _____ or until Reevaluation
Date
on _____
Date

Patient may work _____ hours in a work day.

☐ Patient is totally incapacitated at this time. Patient will be reevaluated on _____
Date

DEGREE

☐ Sedentary Work. Lifting 10 pounds maximum and occasionally lifting and/or carrying such articles as dockets, ledgers, and small tools. Although a sedentary job is defined as one which involves sitting, a certain amount of walking and standing is often necessary in carrying out job duties. Jobs are sedentary if walking and standing are required only occasionally and other sedentary criteria are met.

☐ Light Work. Lifting 20 pounds maximum with frequent lifting and/or carrying of objects weighing up to 10 pounds. Even though the weight lifted may be only a negligible amount, a job is in this category when it requires walking or standing to a significant degree or when it involves sitting most of the time with a degree of pushing and pulling of arm and/or leg controls.

☐ Medium Work. Lifting 50 pounds maximum with frequent lifting and/or carrying of objects weighing up to 25 pounds.

☐ Heavy Work. Lifting 100 pounds maximum with frequent lifting and/or carrying of objects weighing up to 50 pounds.

☐ Very Heavy Work. Lifting objects in excess of 100 pounds with frequent lifting and/or carrying of objects weighing 50 pounds or more.

LIMITATIONS

1. The patient may:
   a. Stand/walk
      ☐ None ☐ 1-4 hours
      ☐ 4-6 hours ☐ 6-8 hours
   b. Sit
      ☐ 1-3 hours ☐ 3-5 hours
      ☐ 5-8 hours
   c. Drive
      ☐ 1-3 hours ☐ 3-5 hours
      ☐ 5-8 hours
2. Patient may use hands for repetitive:
   ☐ Single grasping ☐ Pushing & pulling
   ☐ Fine manipulation
3. Patient may use feet for repetitive movement as in operating foot controls:
   ☐ Yes ☐ No
4. Patient is able to:

	Frequently	Occasionally	Not at All
a. Bend	☐	☐	☐
b. Squat	☐	☐	☐
c. Climb	☐	☐	☐

PHYSICIANS REPORT

Diagnosis _____

Prognosis _____

Other _____

_____

☐ Referred to company physician
☐ Patient referred/admitted:

To Whom _____

Address _____

Phone _____

Date _____ Time _____

Date of this Report _____ Physician's Signature _____

Address _____ Phone _____

White – OHM
Canary – Clinic Copy

16406 U.S. Route 224 E. • P.O. Box 551 • Findlay, OH 45839-0551 • (419) 425-6064

WITNESS FORM

NAME _____ AGE _____

ADDRESS _____

PHONE _____ MARITAL STATUS _____

OCCUPATION _____

DATE ACCIDENT WITNESSED _____ TIME _____

LOCATION OF ACCIDENT _____

MY POSITION AT TIME OF ACCIDENT _____

MY LOCATION AT TIME OF ACCIDENT _____

_____

NARRATIVE REPORT

Describe in your own words what happened. (What did you see, hear, smell, do, etc.):

_____

_____

_____

_____

_____

_____

_____

_____

_____

I have read the above report and it is true and correct to the best of my knowledge. I do not recall any other facts of this accident.

_____ _____ / / _____

(Signature of witness) (date)

OHM Corporation

AREA TIME WEIGHTED SAMPLING DATA SHEET

PROJECT # _____

DATE: _____
DAY: _____

PERFORMED BY: _____
TITLE: _____

SAMPLE NO.	LOCATION	TASK PERFORMED	ANALYSIS METHOD	SAMPLING MEDIA	FLOW RATE (L/MIN)			TIME		TOTAL TIME(MIN)
					PRE	POST	TOTAL VOL.(L)	START	STOP	

REMARKS:

OHM Corporation

COMBUSTIBLE GAS INDICATOR CALIBRATION DATA SHEET

_____

_____

PROJECT # _____

INSTRUMENT NO. _____
CALIBRATION GAS _____
CAL GAS 0_2CONCENTRATION _____

CALIBRATION GAS % LEL _____
CHEMICAL MONITORED _____
CONVERSION FACTOR _____

DATE	PERSON CALIBRATING	CGI READING (% LEL)	OXYGEN READING	TOX IN PPM	REMARKS

NOTE: METER READING x CONVERSION FACTOR = LEL OF ATMOSPHERE
(Conversion factor can be found in instrument manual)

OHM Corporation

HNU-PHOTOIONIZATION DETECTOR CALIBRATION DATA SHEET

_____

_____

PROJECT # _____

DATE:_____
INSTRUMENT NO. _____
LAMP TYPE: _____

CALIBRATION GAS: _____
CALIBRATION PERFORMED BY:_____

TIME	WEATHER CONDITIONS (TEMP/HUMIDITY)	SPAN SETTING	READING (PPM)	REMARKS

OHM Corporation

REAL TIME AIR MONITORING LOG

_____

_____

PROJECT # _____

DATE:_____
DAY:_____
BACKGROUND:_____
PID:_____
MINI-RAM:_____

TEMPERATURE:_____

REL. HUMIDITY:_____

PID NO._____
CGI/O_2#:_____
MONITOX#:_____
RAM#:_____
OTHER:_____

INSTRUMENT USED	TIME OF DAY	METER READING	SAMPLING DURATION	LOCATION	PPE	TASK PERFORMED

PERFORMED BY: _____

SIGNATUR _____

NOTES:

OHM Corporation

PERSONAL SAMPLING DATA SHEET

PROJECT # _____

DATE: _____ PERFORMED BY: _____

DAY: _____ TITLE: _____

					FLOW RATE (L/MIN)			TIME		
SAMPLE NO.	NAME	TASK PERFORMED	ANALYSIS METHOD	SAMPLING MEDIA	PRE	POST	TOTAL VOL.(L)	START	STOP	TOTAL TIME(MIN)

REMARKS:

12.

APPENDIX E

ACRONYM AND ABBREVIATION LIST

ACRONYM AND ABBREVIATION LIST

AOC	Area of Concern
ARAR	Applicable of Relevant and Appropriate Requirement
AST	Aboveground Storage Tank
AWQC	Ambient Water Quality Criteria
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
COC	Contaminant of Concern
cy	cubic yard
DoN	Department of the Navy
FDA	U. S. Food and Drug Administration
FFA	Federal Facilities Agreement
FS	Feasibility Study
gpm	gallons per minute
HI	Hazard Index
IAS	Initial Assessment Study
ICR	Incremental Cancer Risk
IRP	Installation Restoration Program
LEL	Lower Explosion Limit
MBI	Macroninvertebrates Biotic Index
MCB	Marine Corps Base
NCDEHNR	North Carolina Department of Environment, Health, and Natural Resources
NCP	National Contingency Plan
NPL	National Priorities List
NPW	Net Present Worth
NTR	Navy Technical Representative
OHM	OHM Remediation Services Corp.
O&M	Operation and Maintenance
OVA	Organic Vapor Analyzer
PAH	Polynuclear Aromatic Hydrocarbons
PCB	Polychlorinated Biphenyl
PCE	Tetrachloroethene
PID	Photoionization Detector
PRAP	Proposed Remedial Action Plan
RAA	Remedial Action Alternative
RI	Remedial Investigation

ROD	Record of Decision
ROICC	Resident Officer Charge of Construction
SVOC	Semivolatile Organic Compound
TCE	Trichloroethene
TCLP	Toxicity Characteristics Leaching Procedure
USEPA	United States Environmental Protection Agency
VOC	Volatile Organic Compound