HEALTH AND SAFETY PLAN ADDENDUM
FOR
OPERABLE UNIT 2 FIELD ACTIVITIES
EIELSON AIR FORCE BASE, ALASKA

October 4, 1994

Prepared By:

IT Corporation
1045 Jadwin Avenue, Suite C
Richland, Washington 99352
Reviews and Approvals

Project Manager
IT Corporation

Date

Health and Safety Representative
IT Corporation

Date

Office Manager
IT Corporation

Date
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<td>AFB</td>
<td>Air Force Base</td>
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<tr>
<td>AIDS</td>
<td>Acquired Immune Deficiency Syndrome</td>
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<tr>
<td>ANSI</td>
<td>American National Standards Institute</td>
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<tr>
<td>CFR</td>
<td>Code of Federal Regulations</td>
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<tr>
<td>CIH</td>
<td>Certified Industrial Hygienist</td>
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<tr>
<td>CPR</td>
<td>cardiopulmonary resuscitation</td>
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<tr>
<td>CRZ</td>
<td>contamination reduction zone</td>
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<tr>
<td>dBA</td>
<td>decibel</td>
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<tr>
<td>EZ</td>
<td>exclusion zone</td>
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<td>FADL</td>
<td>Field Activity Daily Log</td>
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<td>FID</td>
<td>flame ionization detector</td>
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<td>FR</td>
<td>Federal Register</td>
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<td>health and safety</td>
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<td>HBV</td>
<td>hepatitis B virus</td>
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<tr>
<td>HIV</td>
<td>human immunodeficiency virus</td>
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<td>Health and Safety Plan</td>
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<td>Material Data Safety Sheet</td>
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<td>National Institute of Occupational Safety and Health</td>
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<td>Occupational Safety and Health Administration</td>
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<td>OU-2</td>
<td>Operable Unit 2</td>
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<td>PID</td>
<td>photoionization detector</td>
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<td>personal protective equipment</td>
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<td>EPA</td>
<td>U.S. Environmental Protection Agency</td>
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<td>VOC</td>
<td>volatile organic compound</td>
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Site Health and Safety Plan Acknowledgement

I have read, understand and agree to abide by the provisions as detailed in this Site-Specific Health and Safety Plan prepared by IT Corporation. Failure to comply with these provisions may lead to disciplinary action and/or my dismissal from the work site.

Printed Name

Signature

Employee Number

Date
1.0 Introduction

1.1 Objectives
The following proposed field activities will be conducted at Operable Unit 2 (OU-2), Eielson Air Force Base (AFB), located near Fairbanks, Alaska:

- surface geophysical surveys (site clearance);
- groundwater well drilling, completion, and development;
- borehole geophysical logging;
- soil boring drilling, sampling, and abandonment;
- groundwater monitoring well abandonment;
- groundwater monitoring well sampling;
- floating-product recovery test;
- floating-product measurements;
- surveying;
- waste disposal; and
- decontamination.

This Health and Safety Plan (HSP) Addendum is to be used in conjunction with the Final Remedial Investigation/Feasibility Study Operable Unit 2 Management Plan (Eielson 1991) and the Site Management Plan (Eielson 1993).

1.2 Facility and Location Description
Operable Unit 2, Eielson AFB, Alaska.

1.3 Policy Statement
It is the policy of IT Corporation to provide a safe and healthful work environment for all its employees working at Eielson AFB. IT considers no phase of operations or administration to be of greater importance than injury and illness prevention. Safety takes precedence over expediency or shortcuts. At IT we believe every accident and every injury is preventable. We will take every reasonable step to reduce the possibility of injury, illness, or accident.

This HSP Addendum prescribes the procedures that must be followed during the activities at Eielson AFB.

Operational changes which could affect the health or safety (H&S) of personnel, the community, or the environment will not be made without the prior approval of the IT Project Manager, and the Project H&S Coordinator.
The provisions of this plan are mandatory for all IT personnel assigned to the project. IT requires all visitors to the work site to abide by the requirements of the plan.

This HSP Addendum complies with applicable Occupational Safety and Health Administration (OSHA) and the U.S. Environmental Protection Agency (EPA) regulations.

The contents of this plan are consistent with NIOSH, or supplement the following IT H&S policies and procedures:

- HS001 Safety Policy
- HS010 Employee Safety and Health Works Rules
- HS011 Contractor Safety and Health Rules
- HS013 Health and Safety Procedure Variances
- HS020 Accident Prevention Program: Reporting, Investigation, and Review
- HS021 Accident Prevention Program: Management Safety Audits and Inspections
- HS022 Accident Prevention Program: Review of New Proposals, Projects, Operations, and Construction
- HS041 Embryo-Fetus Protection Program
- HS050 Training Requirements
- HS051 Tailgate Safety Meetings
- HS052 Health and Safety Plans
- HS060 Hazard Communication Program
- HS090 OSHA Regulatory Inspections
- HS091 Serious Injury and Fatality Reporting Requirements
- HS100 Medical Policies and Procedures
- HS102 Access to Employee Exposure and Medical Records
• HS104  Employee Notification of Industry Hygiene Monitoring Results
• HS105  Occupational Injuries/Illnesses Procedures
• HS310  Hazardous Waste Operations at Uncontrolled Waste Sites
• HS311  Emergency Response Operations
• HS315  Control of Hazardous Energy Sources (Lockout/Tagout)
• HS401  Cold Stress
• HS402  Hearing Conservation Program
• HS511  Handling of Benzene and Benzene Contaminated Materials
• HS600  Personal Protective Equipment
• HS601  Respiratory Protective Program
• HS602  Eye Protection – Prescription Safety Glasses
• HS603  Maintenance of Survey Equipment
• HS604  Use and Maintenance of Portable Electrical Equipment
• HS800  Motor Vehicle Operation: General Requirements.

These procedures are available in the IT office.
2.0 Responsibilities

2.1 All Personnel
Each person is responsible for the H&S of themselves and their coworkers, for completing tasks in a safe manner, and reporting any unsafe acts or conditions to their Supervisor and/or the Site Supervisor. All personnel are responsible for continuous adherence to these H&S procedures during the performance of their work. No person may work in a manner that conflicts with the letter or the intent of, or the safety and environmental precautions expressed in these procedures. After due warnings, IT will dismiss from the site any person who violates safety procedures. IT's employees are subject to progressive discipline and may be terminated for blatant or continued violations. All onsite personnel will be trained in accordance with 29 CFR 1910.120 and this document.

2.2 Project Manager
The Project Manager is ultimately responsible for ensuring that all project activities are completed in accordance with requirements set forth in this plan. The Project Manager must perform at least one onsite safety review during the project. The Project Manager is responsible for ensuring all accidents and incidents on the project are reported and thoroughly investigated. The Project Manager must approve in writing any addenda or modifications of this HSP Addendum.

2.3 Project Health and Safety Coordinator
The Project H&S Coordinator is responsible for the preparation and modification of this HSP Addendum. Any changes to the HSP Addendum must be approved by the Project H&S Coordinator. The Project H&S Coordinator will advise the Project Manager on H&S issues, will establish and oversee the project air monitoring program, and will perform at least one comprehensive H&S audit during the project. The H&S Coordinator is the designated regulatory contact on matters related to occupational H&S.

2.4 Site Supervisor
The Site Supervisor will be responsible for field implementation of the HSP Addendum. This will include communicating site requirements to all onsite project personnel (both IT Corporation and subcontractor personnel) and consultation with the Project H&S Coordinator. As required by IT Policy and Procedure HS022, the Site Supervisor will be responsible for informing the Project H&S Coordinator and the Project Manager of any
changes in the work plan, so that those changes may be properly addressed. Other responsibilities include:

- Enforcing the requirements of the HSP Addendum. This includes performing daily safety inspections of the work site.
- Stopping work, as required, to ensure personal safety and protection of property, or where life or property-threatening noncompliance with safety requirements is found.
- Determining and posting routes to capable medical facilities and emergency telephone numbers (including poison control facilities) and arranging emergency transportation to medical facilities.
- Notifying local public emergency officers of the nature of the site operations, and posting of their telephone numbers in an appropriate location.
- Observing onsite project personnel for signs of chemical or physical trauma.
- Ensuring that all site personnel have been given the proper medical clearance, ensuring that all site personnel have met appropriate training requirements and have the appropriate training documentation on site, and monitoring all team members to ensure compliance with the HSP Addendum.

2.5 Subcontractors
Onsite subcontractors and their personnel are responsible for understanding and complying with all site requirements. Subcontractors are required to follow the guidelines established in IT's Safety Rules for Contractors, provided when qualified, and this HSP Addendum.

2.6 Onsite Personnel and Visitors
All IT and subcontractor personnel are required to read and acknowledge their understanding of this HSP Addendum. All site project personnel are expected to abide by the requirements of the plan and cooperate with site supervision in ensuring a safe and healthful work site. Site personnel are required to immediately report any of the following to the Site Supervisor:

- accidents and injuries, no matter how minor;
- unexpected or uncontrolled release of chemical substances;
- any symptoms of chemical exposure;
- any unsafe or malfunctioning equipment; and
- any changes in site conditions which may affect the H&S of project personnel.
3.0 Job Hazard Analysis

3.1 Scope of Work
In some of the source areas (SS10/ST14, ST18, ST19, and ST13/DP26) for OU-2 the following field activities will be conducted: groundwater monitoring well installation and sampling, soil boring installation and sampling, monitoring well abandonment, subsurface geophysical logging, surface geophysical logging (site clearance), floating-product recovery testing, and floating-product measurements. No confined space entries are anticipated during the conduct of the field investigation.

3.2 Job Hazard Assessment

3.2.1 Physical Hazards
The primary physical hazards for this project are associated with the use of the drilling rig and supporting vehicles. Additional anticipated physical hazards of concern include:

- heat (hot surfaces);
- cold;
- noise;
- fall, trip, slip;
- falling objects; and
- lifting.

The primary safety hazards for this project are associated with drilling and the use of sampling equipment and the collection of samples.

In addition to the potential exposure to site contaminants, the climate in this region poses physical hazards such as cold stress and frostbite.

Sampling. Field sampling operations consist of the collection of soil, product, and/or water samples for subsequent analysis and evaluation of potential site contamination. The physical hazards of this operation are primarily associated with the sample collection methods and procedures utilized.

During the course of this project, several different sampling methodologies may be utilized based on equipment accessibility and the types of materials to be sampled. These sampling methods may include California modified split-spoon sampling or liquid sampling. The
primary hazards associated with these specific sampling procedures are not potentially serious; however, other operations in the area, or the conditions under which samples must be collected, may present certain chemical and physical hazards. The hazards of these types of sampling procedures are generally limited to strains/sprains resulting from lifting.

In addition to the safety hazards specific to solid and liquid sampling operations, hazards associated with the operation of vehicles, particularly large vehicles, in a small area will be a concern. Of particular concern will be the backing up of trucks.

Utility Hazards. The presence of overhead utilities such as power lines requires careful positioning of the drill rig and excavator in order to maintain at least 20 feet of distance between the lines and the closest part of the equipment. Underground utilities must be marked and located prior to and during drilling activities.

Heat/Cold Stress. Wearing personal protective equipment (PPE) may put site personnel at considerable risk of heat stress. Heat stress effects range from transient heat fatigue to serious illness and death. Heat stress is caused by a number of interacting factors, including environmental conditions, clothing, workload, and the individual characteristics of the worker. Because heat stress is fairly common during summer and fall, preventive measures and alertness to the symptoms are vital.

Heat stress monitoring should commence when personnel are wearing PPE, including Tyvek coveralls, and the ambient temperature exceeds 70 degrees Fahrenheit (°F). If impermeable garments are not worn, heat stress monitoring should commence at 85°F.

Cold and/or wet environmental conditions can place workers at risk of a cold-related illness. Hypothermia can occur whenever temperatures are below 45°F, and is most common during wet, windy conditions, with temperatures between 40 to 30°F. The principal cause of hypothermia in these conditions is loss of insulating properties of clothing due to moisture, coupled with heat loss due to wind and evaporation of moisture on the skin.

Frostbite, the other illness associated with cold exposure, is the freezing of body tissue, which ranges from superficial freezing of surface skin layers to deep freezing of underlying tissue. Frostbite will only occur when ambient temperatures are below 32°F. The risk of frostbite increases as the temperature drops and wind speed increases.
IT Procedure HS401 mandates specific clothing and procedural requirements which are required in cold stress situations. This policy is incorporated by reference into this plan.

**Drilling.** Physical hazards specific to drilling are listed below.

**Slips.** Slips are toothed wedges positioned between the drill pipe and the master bushing/rotary table, to suspend the drill string in the well bore when it is not supported by the hoist. Most accidents associated with slip operations are related to manual materials handling; strained backs and shoulders are common.

**Tongs.** Tongs are large, counter-weighted wrenches used to break out the torqued couplings on drill pipe. Both sets of tongs have safety lines; when breakout force is put on the tongs, the tongs or the safety lines could break and injure an employee standing close to them. Another likely accident can occur when the driller actuates the wrong tong lever and an unsecured tong swings across the rig floor at uncontrolled velocity. A common accident attributable to tongs can occur when an employee has his hand or finger in the wrong place as he attempts to swing and latch the tong onto the drill pipe, resulting in crushing injuries or amputation of the fingers.

**Elevators.** Elevators are a set of clamps affixed to the bails on the swivel below the traveling block. They are used to clamp each side of a drill pipe and hold the pipe as it is pulled from the well bore. Accidents and injuries can occur during the latching and unlatching tasks; fingers and hands can get caught and crushed in the elevator latch mechanism. If the pipe is overhead when the latching mechanism fails, then the pipe may fall on employees working on the drill floor.

**Cat Lines.** Cat lines are used on drilling rigs to hoist material. Accidents that occur during cat line operations may injure the employee doing the rigging as well as injure the operator. Minimal hoisting control causes sudden and erratic load movements, which may result in hand and foot injuries.

**Working Surfaces.** The rig floor is the working surface for most tasks performed in well drilling operations. The surface is frequently wet from circulating fluid and/or water used to wash it down. Slippery work surfaces can increase the likelihood of back injuries, overexertion injuries, and slips and falls.
Derrick Operations. The derrick man on a well drilling operation performs his tasks from various elevated work platforms in the mast. He is exposed to falls when not utilizing fall protection equipment while climbing the derrick ladder, while working with the pipe stands, and while moving from the ladder to his platform station.

Materials Handling. The most common type of accident that occurs in material handling operations is the "caught between" situation when a load is being handled and a finger or toe gets caught between two objects. Rolling stock can shift and/or fall from a pipe rack or truck bed.

In addition to the specific hazards listed above, rig accidents can occur as a result of improperly placing the rig on uneven or unstable terrain, or failing to adequately secure the rig prior to the start of operations.

3.2.2 Heat Stress
Heat stress is not anticipated to be a significant problem at Eielson AFB. However, depending on the necessary PPE and the weather, heat stress could prevent a problem. Heat stress effects range from transient heat fatigue to serious illness and death. Heat stress is caused by a number of interacting factors, including environmental conditions, clothing, workload, and the individual characteristics of the worker. Because heat stress is one of the most common and potentially serious illnesses during drilling operations, preventive measures and alertness to the symptoms are vital.

Heat stress monitoring should commence when personnel are wearing PPE, including Tyvek coveralls, and the ambient temperature exceeds 70 °F. If impermeable garments are not worn, heat stress monitoring should commence at 85 °F. The symptoms of heat stress are discussed in Chapter 4.0.

3.2.3 Cold Stress
Cold and/or wet environmental conditions can place workers at risk of a cold-related illness. Hypothermia can occur whenever temperatures are below 45 °F, and is most common during wet windy conditions, with temperatures between 40 to 30 °F. The principal cause of hypothermia in these conditions is loss of insulating properties of clothing due to moisture, coupled with heat loss due to wind and evaporation of moisture on the skin.
Frostbite, the other illness associated with cold exposure, is the freezing of body tissue, which ranges from superficial freezing of surface skin layers to deep freezing of underlying tissue. Frostbite will only occur when ambient temperatures are below 32°F. The risk of frostbite increases as the temperature drops and wind speed increases.

IT Procedure HS401 mandates specific clothing and procedural requirements which are required in cold stress situations. This policy is incorporated by reference into this plan.

In addition to the safety hazards specific to drill rig operations, hazards associated with the operation of vehicles, particularly large vehicles in a small area, will be a concern. Of particular concern will be the backing up of trucks, drill rigs, and other support vehicles.

The potential for cold stress, frostbite, and hypothermia, is relatively high all year at Eielson AFB (see the Site Management Plan for a more detailed description). The highest potential is during the winter months when the average temperatures range from -14°F to 8°F. Extreme cold for a short period of time can cause severe injury to the surface of the body (frostbite) or result in profound generalized cooling of the body core (hypothermia) which can result in death.

Areas such as fingers, toes and ears have a high surface area due to volume ratio and are therefore more susceptible to the effects of cold. The two factors that influence the development of a cold injury are: ambient air temperature and wind velocity. Windchill is used to describe the chilling effect of moving air in combination with low temperature, and as a general rule the greatest incremental increase in chill occurs when a 5 mph wind increases to 10 mph.

3.3 Chemical Hazards

The following materials are known to be or are suspect of being present at this site:

- petroleum hydrocarbons such as oil, diesel, and grease residues;
- volatile organic compounds (VOC); and
- lead.

Floating product (i.e., petroleum hydrocarbons) are known to occur on the groundwater. The potential for skin contact exists, but inhalation potential is negligible due to low volatility. Representative Material Safety Data Sheets (MSDS) for these potential substances are given in Appendix A.
Groundwater samples to be collected and analyzed for VOC, benzene, toluene, ethylbenzene, and xylene, and lead are unlikely to be sufficiently contaminated to present a hazard to site workers. In addition, chemicals such as methanol and hexane will be used in limited quantities during equipment decontamination procedures.

3.3.1 Noise

Noise exposure at or above the OSHA action level (85 decibels [dBA]) is likely during all drilling operations. Exposure to noise levels in excess of 90 dBA, the OSHA permissible exposure limits for noise, is likely during any drilling operations involving percussion-type rigs, or drilling in hard-packed soil or rock. A hearing conservation program is required for drilling projects.

Exposure to noise over the OSHA action level can cause temporary impairment of hearing; prolonged and repeated exposure can cause permanent damage to hearing. The risk and severity of hearing loss increases with the intensity and duration of exposure to noise. In addition to damaging hearing, noise can impair voice communication; thereby, increasing the risk of accidents on site.

3.4 Anticipated Biological Hazards

Depending upon site conditions, various biological hazards may be present at the site. These may include moose and/or bear. The presence of these hazards and the need for control measures should be determined during the initial site assessment. Particular attention should be given areas where thick brush is present in which personnel may have to work.
4.0 Safety Program

The following work practices will be observed during all site activities.

4.1 General Practices

- At least one copy of this plan shall be available at the project site, in a location readily available to all personnel.

- Contaminated protective equipment, such as respirators, hoses, boots, etc., shall not be removed from the regulated area until it has been cleaned or properly packaged and labeled.

- Legible and understandable precautionary labels which comply with the hazard communication standard shall be affixed prominently to all containers of contaminated scrap, waste, debris, and clothing.

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

- No food or beverages shall be present or consumed in the regulated area.

- No tobacco products shall be present or used in the regulated area.

- Cosmetics shall not be applied within the regulated area.

- Contaminated materials shall be stored in tightly closed containers, in well-ventilated areas.

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

- Emergency equipment shall be located outside storage areas in readily accessible locations that will remain minimally contaminated in an emergency.

- All areas that have been determined as uncontaminated inside the regulated area will be clearly marked as such. No personnel, equipment, etc., shall be in these areas until they have been decontaminated.

- All crew personnel on site shall use the buddy system (working in pairs or teams). If protective equipment or noise levels impair communications, then prearranged hand signals shall be used for communication. Visual contact shall be maintained.
between crew members at all times, and crew members must observe each other for signs of toxic exposure. Indication of adverse effects include, but are not limited to:

- changes in complexion and skin coloration
- changes in coordination
- changes in demeanor
- excessive salivation and pupillary response
- changes in speech pattern.

- Employees shall inform their partners or fellow team members of nonvisible effects of overexposure to toxic materials. The symptoms of such overexposure may include:
  - headaches
  - dizziness
  - nausea
  - blurred vision
  - cramps
  - irritation of eyes, skin, or respiratory tract.

- Visitors to the site shall abide by the following:
  - All visitors shall be instructed to stay outside the contaminated zone (exclusion and decontamination zones) and remain within the clean zone during the extent of their stay. Visitors shall be cautioned to avoid skin contact with contaminated or suspected contaminated surfaces.
  - Visitors requesting to observe work conducted in the exclusion zone (EZ) must wear all appropriate PPE, prior to entry into that zone. If respiratory protective devices are necessary, visitors who wish to enter the contaminated zone must produce evidence that they have had a complete physical examination, training, and have been fit tested for a respirator within the past 12 months.
  - Visitor inspection of the contaminated area shall be at the discretion of the Site Supervisor.

4.2 Drilling Equipment Operations

Prior to the start of site work, the drilling subcontractor will inspect all drilling equipment in the presence of the Site Supervisor. The inspection will be documented in the field records. If field operations last longer than one week, the drilling equipment inspection must be repeated on a weekly basis.

The location of all underground utilities must be ascertained and confirmed prior to the start of drilling operations. In addition to obtaining the utility locations from the client, the IT
Geophysics Group or a qualified subcontractor will make a utility survey of each drilling point. The utility survey shall include both magnetometer and ground penetrating radar survey. Documentation that nearby utilities have been marked on the ground and that the drill site has been cleared shall be in the possession of the Site Supervisor (or his designee) prior to commencement of the intrusive investigation at that point of the site.

4.2.1 General Drilling Practices

- The departing driller should inform the oncoming driller of any special hazards or ongoing work that may affect the safety of the crew.

- Fire fighting equipment should not be tampered with and should not be removed for other than the intended fire-fighting purposes or for servicing.

- If lubrication fittings are not accessible with guards in place, machinery shall be stopped for oil and greasing.

- Rigging material equipment for material handling should be checked prior to use on each shift and as often as necessary to ensure it is safe. Defective rigging should be removed from service.

- The area around the derrick ladder should be kept clear to provide unimpeded access to the ladder.

- Work areas and walkways should not be obstructed.

- The rotary table of the rig floor shall be kept free of obstructions and free of undue accumulation of oil, water, ice, or circulating fluids.

4.2.2 Hoisting Operations

- The derrick must not be raised until the rig has been blocked, leveled, and chocked.

- Drillers should never engage the rotary clutch without watching the rotary table and ensuring it is clear of personnel and equipment.

- Unless the draw works is equipped with an automatic feed control, the brake should not be left unattended without first being tied down.

- Drill pipe or casing should not be picked up suddenly.

- Drill pipe should not be hoisted until the driller is sure that the pipe is latched in the elevator, or the derrick man has signaled that he may safely hoist the pipe.
During instances of unusual loading of the derrick or mast, such as when making an unusually hard pull, only the driller should be on the rig floor and no one should be on the rig or derrick.

The brakes on the draw works of every drilling rig should be tested by each driller, when he comes on shift, to determine whether they are in good order. The brakes should be thoroughly inspected by a competent individual each week.

A hoisting line with a load imposed should not be permitted to be in direct contact with any derrick member or stationary equipment, unless it has been specifically designed for line contact.

Workers should never stand near the well bore whenever any wire line device is being run.

Hoisting control stations should be kept clean and controls labeled as to their functions.

4.2.3 Riding Hoisting Equipment

Under no circumstances will personnel be permitted to ride the traveling block or elevators, nor will the cat line be used as a personnel carrier.

4.2.4 Cat Line Operations

Only experienced workers will be allowed to operate the cat head controls. The kill switch must be clearly labeled and operational prior to operation of the cat line.

The cat head area must be kept free of obstructions and entanglements.

The operator should not use more wraps than necessary to pick up the load. More than one layer of wrapping is not permitted.

Personnel should not stand near, step over, or go under a cable or cat line which is under tension.

Employees rigging loads on cat lines should:

- keep out from under the load
- keep fingers and feet where they will not be crushed
- be sure to signal clearly when the load is being picked up
- use standard visual signals only and not depend on shouting to coworkers
make sure the load is properly rigged, since a sudden jerk in the cat line will shift or drop the load.

4.2.5 Pipe Handling

- Pipe should be loaded and unloaded, layer by layer, with the bottom layer pinned or blocked securely on all four corners. Each successive layer should be effectively blocked or chocked.

- Workers should not be permitted on top of the load during loading, unloading, or transferring of pipe or rolling stock.

- Employees should be instructed never to try to stop rolling pipe or casing; they should be instructed to stand clear of rolling pipe.

- Slip handles should be used to lift and move slips. Employees should not be permitted to kick slips into position.

- When pipe is being hoisted, personnel should not stand where the bottom end of the pipe could whip and strike them.

- Pipe stored in racks, catwalks, or on flatbed trucks should be chocked to prevent rolling.

4.2.6 Derrick Operations

- The derrick climber should be used whenever climbing the derrick. Personnel on the derrick should be tied off, or otherwise protected from falling when working in an unguarded elevated position.

- All stands of pipe and drill collars racked in a derrick should be secured with rope or otherwise adequately secured.

- Tools, derrick parts, or materials of any kind should not be thrown from the derrick.

- The elevators must be properly clamped onto all pipe joints prior to the driller engaging the load.

4.2.7 Making and Breaking Joints

- Tongs should be used for the initial making up and breaking of the joint. The rotary table should not be used for the initial breaking of a joint.
Employees making or breaking joints should not be permitted to stand within the arc of the tong handles when the tong pull line is under tension. Employees should handle the tongs only by the appropriate handles.

Employees should be trained in the safe use of spinning chains. Spinning chains should not be handled near the rotary table while it is in motion.

4.3 Heat and Cold Illness Prevention

4.3.1 Heat Stress
One or more of the following control measures can be used to help control heat stress and are mandatory if any site worker has a heart rate (measure immediately prior to rest period) in excess of 110 beats per minute:

- Site workers will be encouraged to drink plenty of water throughout the day. They will be advised to slightly increase their salt intake by lightly salting their food.

- Onsite drinking water will be kept cool (50 to 60°F) to encourage personnel to drink frequently.

- A work regimen that will provide adequate rest periods for cooling down will be established, as required.

- All personnel will be advised of the dangers and symptoms of heat stroke, heat exhaustion, and heat cramps.

- Cooling devices such as vortex tubes or cooling vests should be used when personnel must wear impermeable clothing in conditions of extreme heat.

- Employees should be instructed to monitor themselves and coworkers for signs of heat stress and to take additional breaks as necessary.

- A shaded rest area must be provided. All breaks should take place in the shaded rest area.

- Employees shall not be assigned to other tasks during breaks.

- Employees shall remove impermeable garments during rest periods. This includes white Tyvek-type garments.

- All employees shall be informed of the importance of adequate rest, acclimation, and proper diet in the prevention of heat stress disorders.
The signs of heat stress disorders are given below.

**Heat Cramps.** Heat cramps are caused by heavy sweating and inadequate electrolyte replacement. Signs and symptoms include muscle spasms and pain in the hands, feet, and abdomen.

**Heat Exhaustion.** Heat exhaustion occurs from increased stress on various body organs. Signs and symptoms include:

- pale, cool, moist skin;
- heavy sweating;
- dizziness, nausea; and
- fainting.

**Heat Stroke.** Heat stroke is the most serious form of heat stress and should always be treated as a medical emergency. The body's temperature regulation system fails, and the body temperature rapidly rises to critical levels. Immediate action must be taken to cool the body before serious death or injury occurs. Signs and symptoms of heat stroke include:

- red, hot, usually dry skin;
- lack of, or reduced perspiration;
- nausea;
- dizziness and confusion;
- strong, rapid pulse and confusion; and
- coma.

### 4.3.2 Cold Stress

Most cold-related worker fatalities have resulted from failure to escape low environmental air temperatures, or from immersion in low temperature water. The single most important aspect of life-threatening hypothermia is a fall in the deep core temperature of the body.

Site workers should be protected from exposure to cold so that the deep core temperature does not fall below 36 degrees Celsius (°C). Lower body temperatures will very likely result in reduced mental alertness, reduction in rational decision making, or loss of consciousness with the threat of fatal consequences. To prevent such occurrence, the following measures should be implemented:

- Site workers should be provided with warm clothing, such as mittens, heavy socks, etc., when the air temperature is below 45°F. Protective clothing, such
as Tyvek or other disposable coveralls, may be used to shield employees from the wind.

- When the air temperature is below 35°F, clothing for warmth, in addition to chemical protective clothing, will be provided to employees. This should include:
  - insulated suits, such as whole body thermal underwear
  - wool socks or polypropylene socks to keep moisture off the feet
  - insulated gloves
  - insulated boots
  - insulated head cover such as hard hat, winter liner, or knit cap
  - insulated jacket, with wind and water resistant outer layer.

- At air temperatures below 35°F, the following work practices must be implemented:
  - If the clothing of a site worker might become wet on the job site, the outer layer of clothing must be water impermeable.
  - If a site worker's underclothing becomes wet in any way, the worker must change into dry clothing immediately. If the clothing becomes wet from sweating (and the employee is not uncomfortable), the employee may finish the task at hand prior to changing into dry clothing.
  - Site workers must be provided with a warm (65°F or above) break area.
  - Hot liquids such as soups or warm, sweet drinks shall be provided in the break area. The intake of coffee and tea should be limited, due to their circulatory and diuretic effects.
  - The buddy system shall be practiced at all times on site. Any site worker observed with severe shivering shall leave the work area immediately.
  - Site workers should dress in layers, with thinner lighter clothing worn next to the body.
  - Site workers should avoid overdressing when going into warm areas or when performing strenuous activities.
  - Employees handling liquids with a high vapor pressure, such as gasoline, methanol, or hexane, shall take special precautions to avoid soaking of gloves and clothing with those materials.

4.4 Hearing Conservation
All onsite IT and subcontractor personnel shall wear hearing protection, with a noise reduction rating of at least 20, when noise levels exceed 85 dBA. All site personnel who may be exposed to noise shall also receive baseline and annual audiograms and training as to the causes and prevention of hearing loss.
Whenever possible, equipment that does not generate excessive noise levels will be selected for this project. If the use of noisy equipment is unavoidable, wherever possible, barriers, or increased distance will be used to minimize worker exposure to noise.

4.5 Sanitation

4.5.1 Potable Water

The following rules apply for all project field operations:

- An adequate supply of potable water will be provided at each work site.
- Portable containers used to dispense drinking water shall be capable of being tightly closed, and shall be equipped with a tap dispenser. Water shall not be drunk directly from the container.
- Containers used for drinking water shall be clearly marked and not used for any other purpose
- Disposable cups will be supplied; both a sanitary container for unused cups and a receptacle for disposing of used cups shall be provided.

4.5.2 Non-potable Water

Outlets for non-potable water shall be identified to clearly indicate that the water is unsafe and is not to be used for drinking, washing, or cooking purposes. There shall be no cross connection (open or potential) between potable and nonpotable water systems. Non-potable and potable water systems shall be separated so as to minimize confusion and possible cross contamination.

4.5.3 Toilet Facilities

Toilet facilities shall be available for employees as follows:

<table>
<thead>
<tr>
<th>Number of Employees</th>
<th>Minimum Number of Facilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 or fewer</td>
<td>One</td>
</tr>
<tr>
<td>More than 20, fewer than 200</td>
<td>One toilet seat and one urinal</td>
</tr>
<tr>
<td>More than 200</td>
<td>One toilet seat and one urinal per 40 employees</td>
</tr>
</tbody>
</table>

If permanent toilet facilities are not available (at sites more than 500 feet from a building with an accessible toilet), then a portable chemical toilet(s) will be provided.
5.0 Personal Protective Equipment

Based upon the job hazard analysis, it is expected that project personnel will not need extensive protective clothing, and that the on-site work can be completed in Level D protective clothing. Level C protective clothing will be available on site in the event that an upgrade in the level of protection is needed. If conditions warrant higher levels of protection, site work will be suspended until those conditions can be rectified. If Level B PPE is required, the project must be reviewed and a plan addendum prepared by a H&S professional. The addendum will require the review and signature of the project H&S professional, the Project Manager, the Regional or Divisional H&S Manager, and a Certified Industrial Hygienist (CIH) if the Regional or Divisional H&S Manager is not a CIH.

5.1 Respiratory Protection Program

The site respiratory protection program will consist of the following:

- All site personnel will have an assigned respirator.
- All site personnel must be fit tested and qualified in the use of an air purifying respirator within the past 12 months. Fit test and respirator qualification cards must be provided to the Site Supervisor prior to commencing site work.
- All site personnel must within the past year have been medically certified as being capable of wearing a respirator. Documentation of the medical certification must be provided to the Site Supervisor, prior to commencement of site work.
- Only properly cleaned, maintained, NIOSH-approved respirators are to be used on this site.
- If respirators are used, the respirator cartridge is to be disposed of at the end of each work shift, or when load-up or breakthrough occurs.
- Contact lenses are not to be worn when a respirator is worn.
- All site personnel will be clean shaven. Mustaches and side burns are permitted, but they must not touch the sealing surface of the respirator.
- Respirators will be inspected, and a positive, negative pressure test performed prior to each use.
• After each use, the respirator will be wiped with a disinfectant, cleansing wipe. When used, the respirator will be thoroughly cleaned at the end of the work shift. The respirator will be stored in a clean plastic bag.

5.2 Levels of Protection
Personal protective equipment shall be a modified Level D. The minimum level of PPE to be worn onsite during this project depends upon the activity undertaken. The following list defines the level of protection anticipated.

• hard hat, American National Standards Institute (ANSI) approved, when overhead hazards exist
• safety glasses, ANSI approved, during drilling and sampling
• steel-toed boots or shoes, at all times
• long pants and shirt, at all times
• nitrile gloves over latex gloves during sampling
• coated Tyvek coveralls during sampling.

It is not anticipated that level C protection will need to be implemented during the field investigation. However, if this becomes necessary, the following PPE must be worn on site.

• hard hat, ANSI approved, when overhead hazards exist
• safety glasses, ANSI approved, during drilling and sampling
• NIOSH-approved full-face air purifying respirators with NIOSH-approved cartridges for dust, mist, fume, and organic vapors
• steel-toed boots or shoes, at all times
• long pants and shirt, at all times
• nitrile gloves over latex gloves during sampling
• double polyethylene coated Tyvek hooded coveralls
• full tape on ankles, wrists, and hood.

Level A and B PPE will not be used.
5.3 Respiratory Protection Program

Although there is no anticipated use of respirators. The IT respiratory protection program will apply to all activities that arise requiring the use of respirators at the site. Basic requirements are as follows:

- All site personnel will have an assigned respirator face piece.
- All site personnel will have been medically qualified, fit tested, and qualified in the use of the appropriate respirator within the past 12 months. Fit test and respirator qualification cards must provided to the Site Supervisor prior to commencing site work.
- Only properly cleaned, maintained, NIOSH-approved respirators are to be used on this site.
- If air-purifying respirators are used, the respirator cartridge is to be disposed of at the end of each work shift, or when load up or breakthrough occurs.
- Contact lenses are not to be worn when a respirator is required.
- All site personnel will be clean shaven in facial areas which touch the sealing surface of the respirator.
- Respirators will be inspected; a positive and negative pressure test will be performed prior to each use.
- After each use, the respirator will be wiped with a disinfectant, cleansing wipe. When used, the respirator will be thoroughly cleaned at the end of the work shift. The respirator will be stored in a clean plastic bag.

5.4 Selection Matrix

The level of personal protection selected will be based upon real-time air monitoring of the work environment and an assessment by the Field Coordinator of the potential for skin contact with contaminated materials. The PPE selection matrix is given in Table 5-1.
Table 5-1 PPE Selection Matrix

<table>
<thead>
<tr>
<th>FID or PID Reading</th>
<th>Contaminant Contact Potential</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level D</td>
<td>No surface soil or water contamination. Less than 1,000 ppm groundwater or deep soil contamination expected.</td>
</tr>
<tr>
<td>Level C</td>
<td>Less than 100 ppm surface soil contamination. No contaminated surface water. Less than 2,000 ppm groundwater or deep soil contamination.</td>
</tr>
<tr>
<td>Stop Work*</td>
<td>Greater than 100 ppm surface soil contamination. Contaminated surface water. Greater than 2,000 ppm groundwater or deep soil contamination.</td>
</tr>
</tbody>
</table>

*Stop work until cause of elevated reading determined and corrected. Work should not resume without written permission from the project manager or health and safety coordinator. If condition cannot be corrected, the Health and Safety Plan Addendum should be revised to deal with the new conditions.

PID: photoionization detector
FID: flame ionization detector
6.0 Site Control

6.1 Authorization to Enter
Only authorized client and IT personnel will be allowed on the site during site operations. A written record of all personnel entering and exiting the site will be maintained by the IT site supervisor. The site supervisor will ensure that all personnel entering the site have the necessary training, medical, and PPE. He will also ensure that all personnel have been given a thorough briefing on the site hazards and safe work procedures prior to entering the work area.

6.2 Hazard Briefing
No person will be allowed on any IT field sites during site operations without first being given a site hazard briefing. In general, the briefing will consist of a review of the tailgate safety meeting. All persons on the site, including visitors, must sign the site-specific tailgate safety meeting form.

6.3 Documentation of Certification
A training and medical file will be established for the project and kept on site during all site operations. The 40-hour training, update, and specialty training (first-aid/cardiovascular resuscitation [CPR]) certificates, as well as the current annual medical clearance for all project field personnel, will be maintained within that file. All IT and subcontractor personnel must provide their training and medical documentation to the Site Supervisor prior to the start of field work.

6.4 Entry Requirements
In addition to the entry requirements listed above, no personnel will be allowed on any IT field site unless they are wearing the minimum PPE as described in Chapter 5.0. Personnel entering the EZ or contamination reduction zone (CRZ) must wear the required PPE for those locations.
7.0 Decontamination

The project area will be divided into two work zones: EZ and a support zone. The Site Supervisor will be responsible for designation of the work zones. It is not anticipated that a CRZ will be necessary during the field investigation. However, if appropriate the CRZ will be implemented. The contaminated zone will exist only during drilling operations and include the rig, the support truck, and a 20-foot radius around the well hole. The contaminated zone will be marked with barrier tape and will be labeled on each side with the following warning sign: DRILL RIG OPERATING/POSSIBLE CHEMICAL HAZARD, NO UNAUTHORIZED ACCESS.

Only IT personnel and authorized visitors who have completed 40-hour hazardous waste training and who are wearing the required PPE will be allowed within this zone.

Immediately adjacent to the contaminated zone, a decontamination area for equipment and personnel will be established. This area will also be delineated with traffic cones and/or barrier tape. Each side of the decontamination zone will be posted with the following sign: WORK AREA, NO UNAUTHORIZED ACCESS.

The remainder of the IT project area will be designated as the support zone. No special markings or warning labels are required for this area.

7.1 Personnel Decontamination

All personnel working in the contaminated zone must undergo personnel decontamination prior to entering the support zone. The personnel decontamination area shall consist of the following stations.

- **Station 1.** Personnel leaving the contaminated zone will remove the gross contamination from their outer clothing and boots.

- **Station 2.** Plastic-lined waste receptacle. Clean damp clothes or paper towels. Plastic bags. At Station 2, personnel will remove their Tyvek coveralls and gloves and deposit them in the lined waste receptacles. Personnel will wipe their respirators (if used), hard hats, and boots with clean, damp cloths and then remove those items. Those items are then hand carried to the next station.
• **Station 3.** Wash basin with soap and water; respirator sanitation station. At this station, personnel will thoroughly wash their hands and face before leaving the decontamination zone. Respirators will be sanitized and then placed in a clean plastic ziplock bag.

### 7.2 Equipment Decontamination

Any vehicles which have entered the contaminated zone, including the drill rig, will be decontaminated at a centralized decontamination facility. If the level of contamination anticipated is low, decontamination for vehicles will be limited to rinsing of tires with water. For sites with significant levels of contamination, steam cleaning or pressure washing of vehicles and equipment will be required. The drill bits and casing will be decontaminated in accordance with procedures in the Field Sampling Plan Addendum and the quality assurance project plan Addendum.

### 7.3 Personal Protective Equipment Decontamination

Where and whenever possible, single use, external protective clothing shall be used for work within the EZ or CRZ. This protective clothing shall be disposed of in marked containers. Depending upon subsequent analysis, that protective clothing may require disposal as hazardous waste.

Reusable protective clothing will be rinsed at the site with detergent and water. The rinsate will be collected for possible disposal as hazardous waste.

Respiratory protective equipment will be wiped with a damp cloth while in the CRZ and bagged. Once the respirator has been removed from the CRZ, it will be thoroughly cleaned with soap and water. The respirator face piece will be cleaned at the end of each work shift.
8.0 Site Monitoring

8.1 Air Monitoring
Air monitoring will be conducted at each investigation site to determine employee exposure to airborne contaminants. The monitoring results will dictate the selection and appropriateness of PPE. The monitoring devices to be used, at a minimum, are a combustible gas/oxygen meter and a photoionization detector (PID) or flame ionization (FID) detector.

During initial ground penetration, continuous monitoring with the combustible gas/oxygen meter and either the PID or FID will be conducted and readings recorded on the Field Activity Daily Log (FADL). Thereafter, air monitoring will be carried out every half hour. Operations will be discontinued if combustible gas levels exceed 10 percent of the lower explosive limit or if oxygen levels drop below 20 percent. The PID or FID will be used to assess the total airborne concentration of VOC.

8.2 Safety Review
At least once during the project, both the Project Manager and an H&S professional (or their designee) will carry out a comprehensive safety review of the project. The Site Supervisor will conduct frequent site safety inspections (no less than once per week). Management safety reviews will be recorded on Safety Inspection Report Forms and will be forwarded to the responsible business unit management for review. The Site Supervisor will record the inspection results on the Safety Inspection Report.
9.0 Employee Training

9.1 General
All onsite project personnel shall have completed at least 40 hours of hazardous waste operations-related training, as required by OSHA Regulation 29 CFR 1910.120. All field employees receive a minimum of three days of actual field experience under the direct supervision of a trained, experienced supervisor. Those personnel who completed the 40-hour training more than 12 months prior to the start of the project shall have completed an 8-hour refresher course within the past 12 months. The Site Supervisor shall have completed an additional 8 hours of relevant H&S training and shall have a current first-aid/CPR certificate.

IT provides each employee who completes the required 40 hours of classroom training and 3 days of field experience with a certificate signed by the instructor. A copy of the certificate is maintained in the employee's home business unit training files. Subcontractors must provide certificates of training for the project file for all employees assigned to the project.

9.1.1 Tailgate Safety Meetings
Prior to the start of the project, all personnel will participate in a tailgate safety meeting. During the tailgate safety meeting, the HSP Addendum will be discussed. The Site Supervisor will ensure that the anticipated site hazards are summarized and explained to all personnel, and that those personnel are aware of the precautions they must take to minimize their exposure to those hazards. Tailgate safety meetings will be held at the start of each work shift and when new employees arrive on the job site. Attendance records and meeting notes are maintained with the project files.

9.1.2 Material Safety Data Sheets
The site-specific HSP Addendum includes MSDS and occupational health guidelines for chemical substances known to be on site (Appendix A). The HSP Addendum is maintained on site and is accessible to all site employees. Each employee is required to review and sign the HSP Addendum before starting work on the site.

9.1.3 Site-Specific Health and Safety Plan
The IT safety department prepares a site-specific HSP Addendum for each project falling within the scope and application of 29 CFR 1910.120 and IT Procedure HS052. Injury and illness prevention programs are written for all other projects. The Site Supervisor presents
the HSP Addendum and discusses it with all personnel assigned to the project. All workers and visitors must read and sign the HSP Addendum acknowledging acceptance of site rules and understanding of site hazards before the start of the site work. All site visitors will be briefed on activities, and sign the daily Tailgate Safety Meeting form before gaining access to the work areas.

9.2 Site Workers' Basic Course
The following is a list of the topics covered in IT's 40-hour training course:

- general site safety;
- physical hazards (fall protection, noise, heat stress, cold stress);
- names and titles of key personnel responsible for site H&S;
- safety, health, and other hazards typically present at hazardous waste sites;
- use of PPE;
- work practices by which employees can minimize risks from hazards;
- safe use of engineering controls and equipment on site;
- medical surveillance requirements including recognition of symptoms and signs which might indicate overexposure to hazards;
- worker right-to-know (Hazard Communication OSHA 1910.1200);
- routes of exposure to contaminants;
- engineering controls and safe work practices;
- components of the site H&S program;
- decontamination practices for personnel and equipment;
- confined-space entry procedures; and
- emergency response plan.

9.3 Supervisors' Course Content
Management and supervisors must receive an additional eight hours of training presented by
the IT Training Department that includes:

- general site safety and health programs;
- PPE programs; and
- air monitoring techniques.

9.4 Site-Specific Training
Site-specific training will be accomplished through a review of this HSP Addendum and the daily tailgate safety meetings.

9.5 First Aid and Cardiopulmonary Resuscitation
At least one employee current in first aid/CPR will be assigned to the work crew and will be on the site whenever operations are ongoing. First-aid and CPR training courses are offered to all IT employees. Annual refresher training in first aid and CPR is required to maintain the currency of the certificate. The first aid/CPR provider is subject to the provisions of the exposure control plan for voluntary first aid providers (Appendix B).

9.6 Instructors
The IT Training Department, headquartered in Irvine, California, teaches the 40-hour hazardous waste operations classes using Certified Environmental Trainers. When training needs exceed the capacity of the training division, IT uses outside institutions. IT is recognized by the EPA and listed in the Federal Register (FR) (53 FR 3982). Only similarly recognized outside training institutions may be used with prior approval of the IT Training Department.
10.0 Medical Surveillance

10.1 Medical Examination
All onsite project personnel shall have completed a comprehensive medical examination within the past 12 months that meets the requirements of OSHA Regulation 29 CFR 1910.120 and IT Procedure HS100 and HS101. The annual medical includes the following elements:

- medical and occupational history questionnaire;
- physical examination;
- complete blood count, with differential;
- liver enzyme profile;
- chest x-ray, once every three years, for non-asbestos workers;
- pulmonary function test;
- audiogram;
- electrocardiogram for persons older than 35 years of age, or if indicated during the physical examination;
- drug screening;
- visual acuity; and
- follow-up examinations, at the discretion of the examining physician or the corporate medical director.

All employee medical records are maintained by the H&S group, within the worker’s home profit center, or for subcontractors at the subcontractor’s office. The examining physician provides the employee with a letter summarizing his findings and recommendations. Each employee also has the right to inspect and copy his medical records.

The examining physician provides the employer with a letter confirming the worker’s fitness for work and ability to wear a respirator. A copy of this letter for all project workers will be kept on site during all project site work.
Subcontractors will certify that all their employees have successfully completed a physical examination by a qualified physician on the Certification Form. The physical examinations shall meet the requirements of 29 CFR 1910.120, 29 CFR 1910.134, and IT Procedures. Subcontractors will supply copies of the medical examination certificate for each onsite employee.

10.1.1 Placement Examination
All employees will receive a placement medical examination prior to assignment to field operations.

10.1.2 Annual Examination
Each year, subsequent to the placement examination, all employees and subcontractors must undergo an annual examination, similar in scope to the placement examination. Chest x-rays are taken every third year. The medical and occupational history is updated with each examination.

10.1.3 Exit Examination
IT employees receive an exit examination upon leaving the company if they have not been examined within the previous six months. The exit examination consists of the annual examination without drug screen. The employee's immediate supervisor is to notify the home office H&S Assistant within a reasonable time before the termination to allow for the necessary arrangements.

10.2 First-Aid and Medical Treatment
All persons on site must report any near-miss incident, accident, injury, or illness to their immediate supervisor or the Site Supervisor. First aid will be provided by the designated site first aider. Injuries and illnesses requiring medical treatment will be accompanied by an "Authorization for Treatment Form." The employee's supervisor or the Site Supervisor will complete the "Supervisor's Employee Injury Report" and conduct an accident investigation as soon as emergency conditions no longer exist and first-aid and/or medical treatment has been ensured. The investigation should follow the Accident/Injury Investigation Report. These two reports must be completed and submitted to the H&S Manager within 24 hours after the incident.

If first-aid treatment is required, first aid kits are kept at the CRZ and in all IT vehicles. If treatment beyond first aid is required, the injured should be transported to the medical
facility as shown in Appendix C. If the injured is not ambulatory, or shows any sign of not being in a comfortable and stable condition for transport, then an ambulance/paramedics should be summoned. If there is any doubt as to the injured worker’s condition, it is best to let the local paramedic or ambulance service examine and transport the worker.

10.3 Medical Restriction
When a medical care provider identifies a need to restrict work activity, the employee's home office H&S Assistant will communicate the restriction to the employee, their supervisor, and the office H&S professional. The terms of the restriction will be discussed with the employee and this supervisor. Every attempt will be made to keep the employee working, while not violating the terms of the medical restriction.

10.4 Medical Records
Medical and personal exposure monitoring records will be maintained according to the requirements of 29 CFR 1910.20 and HS103, and shall be kept for 30 years post employment. Employee confidentiality shall be maintained. Employees and their authorized representatives have access to these records through the H&S staff.
11.0 Emergency Procedures

This HSP Addendum has been developed to allow drilling and sampling operations to be conducted without adverse impact to the H&S of project personnel, other personnel, and the environment. Supplementary procedures are included in this section to address extraordinary conditions that might occur at the site.

11.1 General

The site supervisor will establish evacuation routes and assembly areas for each site. All personnel entering the site will be informed of these routes and assembly areas. If the site is large and the evacuation routes not clear, a site plan will be made marking the evacuation routes and will be posted at conspicuous locations.

Each site will be evaluated for the potential for fire, explosion, chemical release, or other catastrophic events. Unusual events, activities, chemicals, and conditions will be reported to the Site Supervisor.

11.2 Emergency Procedures

If an incident occurs, the following procedures will be used:

- the Site Supervisor will evaluate the incident and assess the need for assistance;
- the Site Supervisor will call for outside assistance as needed;
- the Site Supervisor will act as liaison between outside agencies and on-site personnel;
- the Site Supervisor will ensure the Project Manager and an H&S representative at the nearest IT office are notified promptly of the incident; and
- the Site Supervisor will take appropriate measures to stabilize the incident scene.

11.3 Safety Signals

Vehicle or portable air horns will be used for safety signals as follows:

- one long blast: emergency evacuation of the site; and
- two short blasts: clear working area around powered or moving equipment.
11.4 Medical Emergency

All employee injuries must be promptly reported to the Site Supervisor. The Site Supervisor will:

- ensure that the injured employee receives prompt first aid and medical attention;
- ensure that the Project Manager are promptly notified of the incident; and
- initiate an investigation of the incident.

11.4.1 Chemical Inhalation

Any employee complaining of symptoms of chemical overexposure as described in Chapter 3.0 will be removed from the work area and transported to the designated medical facility for examination and treatment. It is highly unlikely that the chemicals anticipated as being on site, in the concentrations anticipated, would cause situations immediately dangerous to life and health.

11.4.2 Eye Contact

Project personnel who have had contaminants splashed in their eyes or who have experienced eye irritation while in the contaminated zone, shall immediately proceed to the eyewash station, set up in the decontamination zone. Do not decontaminate prior to using the eyewash. Remove whatever protective clothing is necessary to use the eyewash. Flush the eye with clean running water for at least 15 minutes. Arrange prompt transport to the designated medical facility.

11.4.3 Skin Contact

Project personnel who have had skin contact with contaminants will, unless the contact is severe, proceed through the decontamination zone, to the wash-up area. Personnel will remove any contaminated clothing, and then wash the affected area with water for at least 15 minutes. The worker should be transported to the medical facility listed below, if they show any sign of skin reddening, irritation, or if they request a medical examination.

11.4.4 Personal Injury Accident

In the event of a personal injury accident, the Site Supervisor will assess the nature and seriousness of the injury. In the case of serious or life-threatening injuries, normal decontamination procedures may be ignored. Less serious injuries such as strains, sprains, minor cuts, and contusions may only be treated after the employee has been decontaminated.
Following decontamination, an IT project team member qualified in first aid and CPR will administer suitable first aid. The Site Supervisor will then, if necessary, arrange transport to the appropriate medical facility.

11.5 Fire
In the case of a fire on the site, the Site Supervisor will assess the situation and direct fire-fighting activities. The Site Supervisor will ensure that the client site representative (if there is one) is immediately notified of any fires. IT personnel will attempt to extinguish the fire with available extinguishers, if safe to do so. IT will call the local fire department (911) in the event of a fire that IT is unable to safely and immediately extinguish.

11.6 Emergency Information
The local emergency response numbers list below must be available onsite.

11.6.1 Public Agencies

<table>
<thead>
<tr>
<th>Service</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fire</td>
<td>911 or 377-4266</td>
</tr>
<tr>
<td>Ambulance</td>
<td>911 or 377-2296</td>
</tr>
<tr>
<td>Base Security</td>
<td>911 or 377-5130</td>
</tr>
<tr>
<td>Base Clinic</td>
<td>911 or 377-2296</td>
</tr>
<tr>
<td>Poison Control Center</td>
<td>456-7182</td>
</tr>
</tbody>
</table>

11.6.2 Hospital

Eielson Medical and Dental Clinic
3349 Center Avenue
377-2296

The Eielson Medical and Dental Clinic is located at 3349 Central Avenue. Directions to the base clinic for each OU-2 source area are as follows:

- **From ST18**: go left (west) on Division Street, then right (north) on Central Avenue to the clinic driveway.

- **From ST10/SS14**: go right (west) on Quarry Street, then right (north) on Industrial Drive, then left (west) on Division Street, then right (north) on Central Avenue to clinic driveway.

- **From ST13/DP26**: go left (north) on Flightline Avenue, then right (east) on Division Street, then left (north) on Central Avenue to the clinic driveway.
From ST19: go left (north) on Cargain Road, then left (west) on Quarry Road, then right (north) on Industrial Drive, then left (west) on Division Street, then right (north) on Central Avenue to the clinic driveway.

11.6.3 IT Corporation Emergency Contacts

Occupational Physician:

Greaney Medical Group
1103 S. Anaheim Boulevard
Anaheim, CA 92805
(714) 535-8221

Environmental Medicine Resources, Inc.
4360 Chamblee Dunwoody Road
Suite 202
Atlanta, GA 30341
(800) 229-3676

IT Project Manager

Tom Ashley
(509) 943-6728
12.0 **Summary**

Field work at OU-2, Eielson AFB will consist of conducting: groundwater monitoring well installation and sampling, soil boring installation and sampling, monitoring well abandonment, subsurface geophysical logging, surface geophysical logging (site clearance), floating-product recovery testing, and floating-product measurements.

The following safety related equipment must be available for use during installation or equipment or sampling events:

- hard hat, ANSI approved, when working inside the yard, or when overhead hazard exists;
- safety glasses, ANSI approved, during drilling and sampling;
- steel-toed boots or shoes, ANSI approved, at all times;
- long pants and shirt, at all times;
- Coated Tyvek during sampling;
- Nitrile over latex gloves during sampling;
- HNU Model PI-101 (PID), or equivalent; and
- mine safety appliance combustible gas and oxygen indicator, or equivalent.
13.0 References


APPENDIX A

CHEMICAL INFORMATION
BEACON OIL COMPANY
529 W. 3RD • HANFORD, CA 93230 • (209) 582-0241
FOR MORE INFORMATION CONTACT MSDS COORDINATOR

MATERIAL SAFETY DATA SHEET
DIESEL FUEL

SECTION I - PRODUCT IDENTIFICATION

PRODUCT NAME: DIESEL FUEL
OTHER NAMES: DIESEL FUEL OIL, NO. 2-D
NO. 2 DIESEL OR DIESEL FUEL

CHEMICAL FAMILY: PETROLEUM HYDROCARBONS

DOT HAZ MAT SHIPPIING NAME: FUEL OIL
DOT HAZARD CLASS: COMBUSTIBLE LIQUID

CAS NUMBER: 64741-44-2

SECTION II - HAZARDOUS INGREDIENTS

<table>
<thead>
<tr>
<th>INGREDIENT</th>
<th>CAS NL.</th>
<th>CARCINOGEN</th>
<th>% (BY WT)</th>
<th>TLV (NIOSH)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DIESEL (HYDROCARBONS WITH BP 150 TO 700 F)</td>
<td>64741-44-2</td>
<td>N/AP</td>
<td>99%</td>
<td>NOT EST.</td>
</tr>
</tbody>
</table>

SECTION III - SUMMARY OF HAZARDS

WARNING STATEMENT

CAUTION! COMBUSTIBLE LIQUID
KEEP AWAY FROM HEAT, SPARKS, AND OPEN FLAME.

IRRITANT. OVER-EXPOSURE TO VAPORS OR MISTS MAY CAUSE PULMONARY
IRRITATION, DIZZINESS, AND NAUSEA. EYE AND SKIN EXPOSURE MAY
RESULT IN MILD IRRITATION. MAY CAUSE IRRITATION TO STOMACH AND
INTESTINAL TRACT IF SWALLOWED. DO NOT INDUCE VOMITING.

POSSIBLE CANCER HAZARD BASED ON TEST WITH LABORATORY ANIMALS.
OVER-EXPOSURE MAY CREATE CANCER RISK.

MSDS NO. 0014

PAGE 1 OF 4
DIESEL FUEL

SECTION IV - FIRE AND EXPLOSION DATA

FLASH POINT: 140 TO 170 F
EXPLOSIVE LIMIT: LOWER: 0.1 % UPPER: 10 %

EXTINGUISHING MEDIA: FORM, DRY CHEMICAL, CBB, AND HALON. WATER FOAM OR SPRAY ARE OF SOME VALUE IN COOLING TANKS AND CONTAINERS BUT MAY NOT ACHIEVE EXTINGUISHMENT.

HAZARDOUS DECOMPOSITION PRODUCTS: MAY FORM TOXIC MATERIALS; CARBON DIOXIDE AND CARBON MONOXIDE, VARIOUS HYDROCARBON AND SULFUR COMPOUNDS.

SPECIAL FIREFIGHTING PROCEDURES: DO NOT ENTER ANY ENCLOSURE OR CONFINED FIRE SPACE WITHOUT PROPER PROTECTIVE EQUIPMENT. USE SELF-CONTAINED BREATHING APPARATUS DOWN WIND OF FIRE. COOL TANKS AND CONTAINERS EXPOSED TO FIRE WITH WATER.

UNUSUAL FIRE & EXPLOSION HAZARDS: COMBUSTIBLE LIQUID! MATERIAL MAY BE IGNITED BY HEAT, SPARKS OR FLAME.

NFPA CODE: HEALTH - 0  FLAMMABILITY - 2  REACTIVITY - 0

SECTION V - HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE (TLV): NONE ESTABLISHED

EFFECTS OF OVEREXPOSURE:

INHALATION: INVITATION TO THE NOSE, THROAT, LUNGS AND SIGNS OF CENTRAL NERVOUS SYSTEM (CNS) DEPRESSION (DIZZINESS, DROWSINESS, LOSS OF COORDINATION, COMA AND DEATH) DEPENDING ON THE LEVEL OF EXPOSURE.

EYES: MILD EYE IRRITATION FROM CONTACT WITH LIQUID, MIST, AND/OR VAPOR.

SKIN: SKIN IRRITANT. PROLONGED OR REPEATED CONTACT MAY CAUSE IRRITATION, BURNING AND Tearing.

INGESTION: IRRITATION OF THE MOUTH, THROAT & GASTROINTESTINAL TRACK LEADING TO NAUSEA, VOMITING, DIARRHEA, AND RESTLESSNESS. CNS DEPRESSION SIMILAR TO THAT CAUSED BY INHALATION.

CHRONIC HAZARDS AND SPECIAL HEALTH EFFECTS

REPEETITIVE DIRECT SKIN APPLICATION OF MIDDLE DISTILLATES SIMILAR TO THIS PRODUCT FOR TWO YEARS RESULTED IN SKIN CANCER AND KIDNEY DAMAGE IN LABORATORY ANIMALS.

18910
SECTION VI - EMERGENCY AND FIRST AID

FIRST AID:

INHALATION: IMMEDIATELY MOVE PERSONNEL TO FRESH AIR AREA. AS NECESSARY, GIVE AIR, OXYGEN, OR ADMINISTER CPR. OBTAIN MEDICAL ATTENTION IF BREATHING DIFFICULTIES PERSIST.

EYE CONTACT: FLUSH WITH CLEAN WATER FOR 15 MINUTES. IF IRRITATION PERSISTS, OBTAIN MEDICAL ATTENTION.

SKIN CONTACT: WIPE SKIN FREE OF EXCESS LIQUIDS WITH CLOTH. WASH AFFECTED SKIN THOROUGHLY WITH SOAP AND WATER. IF IRRITATION PERSISTS, SEEK MEDICAL ATTENTION. WASH CLOTHES BUT DISCARD LEATHER SHOES/GLOVES.

INGESTION: DO NOT INDUCE VOMITING, SINCE ASPIRATION INTO THE LUNGS WILL CAUSE CHEMICAL PNEUMONIA. IF ASPIRATION OCCURS OBTAIN MEDICAL ATTENTION.

SECTION VII - PHYSICAL AND CHEMICAL DATA

BOILING POINT: 350 TO 700 F  VISCOSITY UNITS, TEMP (METHOD): N/A DRY POINT:

FREEZING POINT: N/A  VAPOR PRESSURE (REID-PSIA AT 100°F): 0.4 VOLATILE: N/A

SPECIFIC GRAVITY: .81 - .85  SOLUBILITY IN WATER: NEGLIGIBLE pH: N/A

COLOR AND ODOR: CLEAR TO LIGHT YELLOW WITH KEROSENE ODOR.

HAZARDOUS POLYMERIZATION: DOES NOT OCCUR  STABILITY: STABLE

INCOMPATIBILITY: AVOID CONTACT WITH STRONG OXIDIZING AGENTS. REACTS WITH STRONG ACIDS.

CONDITIONS TO AVOID: HEAT, SPARKS, AND OPEN FLAME. SEE SECTION IV.

SECTION VIII - PROTECTIVE EQUIPMENT TO BE USED

RESPIRATORY PROTECTION: USE NIOSH/MSHA APPROVED RESPIRATOR WHEN VAPOR LEVELS EXCEED EXPOSURE LIMITS (PAGE 2).

VENTILATION: KEEP VAPOR CONCENTRATIONS BELOW OCCUPATIONAL EXPOSURE LIMITS (SECTION VI).

SKIN PROTECTION: AVOID PROLONGED AND/OR REPEATED SKIN CONTACT. IF SUBJECT TO FREQUENT CONTACT USE CLEAN AND IMPERVIOUS PROTECTIVE CLOTHING; GLOVES, APRON, BOOTS, AND FACIAL PROTECTION.

EYE PROTECTION: USE EYE PROTECTION WHEN THERE IS A LIKELIHOOD OF SPLASHING OR SPRAYING LIQUID.

OTHER PROTECTIVE EQUIPMENT OR MEASURES: USE GOOD PERSONAL HYGIENE PRACTICES. IN CASE OF SKIN CONTACT, WASH WITH MILD SOAP AND WATER. IMMEDIATELY REMOVE SOAKED CLOTHING AND WASH THOROUGHLY BEFORE REUSE.
DIESEL FUEL

SECTION II - SPILL AND DISPOSAL PROCEDURES

IN THE EVENT OF A SPILL: CONTAIN THE SPILL, REMOVE ALL IGNITION SOURCES AND SAFELY STOP FLOW OF MATERIAL; AND,

SMALL SPILLS: REMOVE FREE LIQUIDS WITH ABSORBENT MATERIAL, TRANSFER TO SAFE CONTAINER, AND STORE IN WELL VENTILATED FIRE SAFE STORAGE AREA UNTIL DISPOSAL.

LARGE SPILLS: EVACUATE ALL NON-ESSENTIAL PERSONNEL. USE PROPER PROTECTIVE EQUIPMENT. NOTIFY PROPER AUTHORITIES, AS REQUIRED, THAT A SPILL HAS OCCURRED. BLANKET WITH FOAM OR USE WATER FOG TO DISPERSE VAPORS. DIESEL FLOATS ON WATER AND MAY CREATE AN EXPLOSION OR FIRE OR ENVIRONMENTAL HAZARD. DINE AREA OF SPILL TO PREVENT SPREADING. PUMP CONTAMINATED WATER AND HYDROCARBON LIQUID TO SALVAGE TANK. REMAINING MATERIAL CAN BE TAKEN UP WITH ABSORBENT AND PLACED IN CONTAINERS.

WASTE DISPOSAL: WHERE FEASIBLE, MAXIMIZE PRODUCT RECOVERY FOR REUSE. OTHERWISE, DISPOSE OF PRODUCT AND CONTAMINATED MATERIALS AS EPA "IGNITABLE HAZARDOUS WASTE" (DOE). USE ONLY APPROVED TREATMENT, TRANSPORTERS AND DISPOSAL SITES IN COMPLIANCE WITH ALL APPLICABLE LAWS.

SECTION I - SPECIAL PRECAUTIONS OR OTHER COMMENTS

STORE AND TRANSPORT IN ACCORDANCE WITH APPLICABLE LAWS. GROUND ALL DRUMS AND TRANSFER VESSELS WHEN HANDLING. SPECIAL PROCEDURES AND PROTECTIVE EQUIPMENT IS REQUIRED FOR ENTRY INTO CONFINED SPACES (REFER TO API PUBL. RP 2015 AND 2015A). ALL ELECTRICAL EQUIPMENT SHOULD MEET APPLICABLE REQUIREMENTS OF THE NATIONAL ELECTRICAL CODE AND NFPA.

CONTAINERS OF THIS MATERIAL MAY BE HAZARDOUS WHEN EMPTIED, SINCE RESIDUE LIQUID OR VAPORS ARE LIKELY PRESENT. UNLESS PROPERLY CLEANED, ALL HAZARD PRECAUTIONS GIVEN ABOVE ARE APPLICABLE.

DISCLAIMER OF LIABILITY

THE INFORMATION INCLUDED IN THE MSDS IS BELIEVED TO BE RELIABLE BUT IS NOT WARRANTED TO BE WHETHER ORIGINATING WITH BEAON OR NOT.

THE METHODS AND CONDITIONS FOR HANDLING THE PRODUCT ARE BEYOND OUR CONTROL. FOR THESE AND OTHER REASONS, WE DO NOT ASSUME RESPONSIBILITY AND EXPRESSLY DISCLAIM LIABILITY FOR LOSS, DAMAGE OR EXPENSES ARISING OUT OF OR IN ANY WAY CONNECTED WITH THE HANDLING, STORAGE, USE, DISPOSAL OF THIS PRODUCT.
# Material Information Bulletin

## Environmental Health & Toxicology

### A-Typical Composition

A blend of paraffins, naphthenes, aromatics & olefins.

### B-Physiological Effects and Health Information

<table>
<thead>
<tr>
<th>Exposure Standard</th>
<th>No OSHA exposure standard or Threshold Limit Value has been established for this material.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eye Irritation</td>
<td>This material is not expected to be a primary eye irritant. However, minor irritation may be noted following contact. (See note below.)</td>
</tr>
<tr>
<td>Skin Irritation</td>
<td>This material is not expected to be a primary skin irritant. However, minor irritation may be noted following prolonged or frequently repeated contact. Prolonged or frequently repeated skin contact may cause the skin to become dry or cracked from the defatting action of this material. (See note below.)</td>
</tr>
<tr>
<td>Systemic Effects</td>
<td>This material is not expected to be toxic by ingestion or by skin contact. However, if this material is swallowed and aspirated into the lungs, chemical pneumonitis. Prolonged exposure to high vapor concentrations of this material may cause signs and symptoms of central nervous system depression such as headache, dizziness, loss of appetite, weakness, and loss of coordination. Affected persons usually experience complete recovery when removed from the exposure area.</td>
</tr>
</tbody>
</table>

**Note:** We have no laboratory data on this material. These conclusions are derived from the results of laboratory tests on similar materials.

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**Warning Statement:**

**HARMFUL OR FATAL IF SWALLOWED**

**DANGER:**

**COMBUSTIBLE**

**Name:** CHEVRON Diesel Fuel No. 2

**Material:** CMS 272102

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*Disclaimer of Warranty, Page 4*

Chevron Environmental Health Center/P.O. Box 1272, Richmond, CA 94802
Reference Phone Number (415) 777-1814 Ext. 4957

(Accepted by U.S. Department of Labor, "Essentially No. 20, Material Safety Data Sheet REV. No. 525, 6")
### C - Emergency and First Aid Procedures

**Eye Contact**

This material is not expected to be irritating to the eyes. However, if irritation is noticed, eyes should be flushed with fresh water. If irritation persists get medical attention.

**Skin Contact**

Remove grossly contaminated clothing and wash skin thoroughly with soap and water. Wash contaminated clothing before reuse.

**Inhalation**

If there are signs or symptoms of overexposure to vapor or mist of this material (as described in Section B - Systemic Effects), move the individual to an uncontaminated area. If breathing has stopped, apply artificial respiration. Get medical attention immediately.

**Ingestion**

If this material is swallowed and aspirated, chemical pneumonitis may result. If swallowed, DO NOT induce vomiting; get medical attention immediately.

### D - Special Protection Information

**Eye Protection**

Avoid eye contact with this material. If the conditions or frequency of use increase the danger of exposure, eye contact can best be avoided by wearing chemical-safety goggles.

**Respiratory Protection**

No respiratory protection is recommended while working with this material. However, if operating conditions create high vapor or mist concentrations, use of an approved respirator for organic vapors and mist is recommended.

**Skin Protection**

Avoid prolonged or frequently repeated skin contact with this material. If the conditions or frequency of use increase the danger of exposure, skin contact can best be avoided by wearing impervious neoprene or rubber gloves.

**Ventilation**

No special ventilation is recommended while working with this material. However, if operating conditions create high concentrations of vapor or mist, special ventilation may be needed.

### E - Fire Protection Information

<table>
<thead>
<tr>
<th>Flash Point (test method)</th>
<th>(P-M) 135-190°F</th>
<th>Flammable Limits (by volume in air)</th>
<th>lower limit</th>
<th>upper limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Autoignition Temperature</td>
<td></td>
<td>Extinguishing Media</td>
<td>CO₂, Dry Chemical, Foam, Water Spray</td>
<td></td>
</tr>
</tbody>
</table>

**Fire Fighting Procedures**

For fires involving this material, do not enter any enclosed or confined fire space without proper protective equipment. This may include self-contained breathing apparatus to protect against the hazardous effects of normal products of combustion or oxygen deficiency. Read the entire bulletin.
### F-Reactivity Data

<table>
<thead>
<tr>
<th>Stability (thermal, light, etc.)</th>
<th>Stable</th>
<th>Unstable</th>
<th>Conditions to Avoid</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Incompatibility</strong> (materials to avoid)</td>
<td>May react with strong oxidizing material.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Hazardous Decomposition Products
- Normal combustion forms carbon dioxide and water vapor; incomplete combustion can produce carbon monoxide.

### Hazardous Polymerization
- May Occur | Conditions to Avoid | Will not Occur | X |

### G-Environmental Protection

#### Environmental Impact

### Precautions if Material is Released or Spilled
- Eliminate all sources of ignition in vicinity of spill or released vapor. Clean up spills as soon as possible, observing precautions in Section D. Absorb large spills with absorbent clay, diatomaceous earth, or other suitable material. A fire or vapor hazard may exist since these materials will only absorb liquids; they will not absorb the vapors.

### Waste Disposal Methods
- Place all contaminated materials in disposable containers and bury in an approved dumping area.

### H-Special Precautions

#### Handling and Storing
- READ AND OBSERVE ALL PRECAUTIONS ON PRODUCT LABEL
- Keep away from heat or open flame.
### 1-Physical Properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boiling Point</td>
<td>315–675°F</td>
</tr>
<tr>
<td>Melting Point</td>
<td></td>
</tr>
<tr>
<td>Solubility</td>
<td>Miscible with hydrocarbons; Insoluble in water.</td>
</tr>
<tr>
<td>Vapor Pressure (mm Hg &amp; temp)</td>
<td>8.2 mm Hg @ 100°F</td>
</tr>
<tr>
<td>Specific Gravity (H₂O = 1)</td>
<td>0.86–0.83</td>
</tr>
<tr>
<td>Viscosity</td>
<td>32.8 to 38.1 SUS @ 100°F</td>
</tr>
<tr>
<td>Molecular Weight</td>
<td></td>
</tr>
<tr>
<td>Percent Volatile by Volume (%)</td>
<td></td>
</tr>
<tr>
<td>Vapor Density (air = 1)</td>
<td>Evaporation (  = 1)</td>
</tr>
<tr>
<td>Pour Point</td>
<td>Other</td>
</tr>
<tr>
<td>Appearance, Color, Odor, etc.</td>
<td>Pale yellow liquid.</td>
</tr>
</tbody>
</table>

The above information is based on data available to us and is believed to be correct. However, NO WARRANTY of MERCHANTABILITY, FITNESS for any use or any other warranty is expressed or to be implied regarding the accuracy of these data, the results to be obtained from the use thereof, hazards connected with the use of the material, or that any such use will not infringe any patent. Since the information contained herein may be applied under conditions beyond our control and with which we may be unfamiliar, we do not assume any responsibility for the results of its use. This information is furnished upon the condition that the person receiving it shall make his own determination of the suitability of the material for his particular purpose.
SECTION I - GENERAL INFORMATION

PRODUCT NAME BENZENE
DATA SHEET NO R495070

CHEMICAL NAME BENZENE
FORMULA C6H6
CAS 71-43-2

SYNONYM BENZOLE
MANUFACTURER SUPELCO INC.

SECTION II - HAZARDOUS INGREDIENTS OF MIXTURES

<table>
<thead>
<tr>
<th>CHEMICAL NAME</th>
<th>COMMON NAME - PERCENTAGE - CAS #</th>
<th>(FORMULA) - PEL(UNITS) - TLV(UNITS)</th>
<th>LD50 VALUE - CONDITIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

SECTION III - PHYSICAL DATA

BOILING POINT 80.1
VAPOR PRESSURE 75
VAPOR DENSITY N/A

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT 12 F
CLOSED CUP FLAMMABLE LIMITS LEL 1.3 UEL 8.9

EXTINGUISHING MEDIA

CO2
FOAM
DRY CHEMICAL
WATER MAY BE INEFFECTIVE.

SPECIAL FIRE FIGHTING PROCEDURES

WEAR SELF CONTAINED BREATHING APPARATUS WHEN FIGHTING A CHEMICAL FIRE.

UNUSUAL FIRE AND EXPLOSION HAZARDS

VAPORS FORM EXPLOSIVE MIXTURES WITH AIR.
MAY REACT WITH OXIDIZING MATERIALS.
CONTAINERS MAY EXPLODE UNDER FIRE CONDITIONS.
EMERGENCY AND FIRST AID PROCEDURES

EYES
FLUSH EYES WITH WATER FOR 15 MINUTES.

SKIN
PROMPTLY WASH SKIN WITH MILD SOAP AND LARGE VOLUMES OF WATER.
REMOVE CONTAMINATED CLOTHING.

INHALATION
IMMEDIATELY MOVE TO FRESH AIR.
GIVE OXYGEN IF BREATHING IS LABORED
IF BREATHING STOPS, GIVE ARTIFICIAL RESPIRATION
CONTACT A PHYSICIAN

INGESTION
NEVER GIVE ANYTHING BY MOUTH TO AN UNCONSCIOUS PERSON
NEVER TRY TO MAKE AN UNCONSCIOUS PERSON VOMIT
DO NOT INDUCE VOMITING.
GIVE LARGE AMOUNTS OF WATER
GIVE LARGE AMOUNTS OF MILK

EFFECTS OF OVEREXPOSURE

MAY IRRITATE EYES AND/OR SKIN
IRRITATES RESPIRATORY TRACT
MAY BE FATAL IF INHALED
HARMFUL IF INHALED
HARMFUL IF SWALLOWED
CONTAINS MATERIAL(S) KNOWN TO THE STATE OF CALIFORNIA TO
CAUSE CANCER.
DERMATITIS
BREATHING DIFFICULTY
PULMONARY EDEMA
HEADACHE
BLURRED VISION
DIZZINESS
GASTROINTESTINAL DISTURBANCES
DEPRESSES CENTRAL NERVOUS SYSTEM
REPORTED HUMAN CARCINOGEN.
CARCINOGENICITY - INDEFINITE IN ANIMALS.
LEUKEMIA
MATERIAL SAFETY DATA SHEET

PRODUCT NAME: BENZENE
DATA SHEET NO: R495070

SECTION V - HEALTH HAZARD DATA

* CONTINUED *
REVERSIBLE CORNEAL EFFECTS MAY OCCUR.

SECTION VI - REACTIVITY DATA

STABILITY: STABLE.

CONDITIONS TO AVOID
N/A

INCOMPATIBILITY
STRONG ACIDS
OXIDIZING AGENTS
FLUORINE, CHLORINE AND BROMINE.

HAZARDOUS DECOMPOSITION PRODUCTS
N/A

Hazardous polymerization will not occur.

CONDITIONS TO AVOID
N/A

SECTION VII - SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED

TAKE UP WITH ABSORBENT MATERIAL.
VENTILATE AREA.
ELIMINATE ALL IGNITION SOURCES.

WASTE DISPOSAL METHOD
COMPLY WITH ALL APPLICABLE FEDERAL, STATE, OR LOCAL REGULATIONS

SECTION VIII - SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (SPECIFIC TYPE)

WEAR FACE MASK WITH ORGANIC VAPOR CANISTER.
PROTECTIVE GLOVES
WEAR PLASTIC GLOVES.

EYE PROTECTION
WEAR PROTECTIVE GLASSES.

VENTILATION
USE ONLY IN EXHAUST HOOD.

SPECIAL
N/A

OTHER PROTECTIVE EQUIPMENT
N/A

SECTION IX - SPECIAL PRECAUTIONS

STORAGE AND HANDLING
STORE IN SEALED CONTAINER IN COOL, DRY LOCATION.
KEEP AWAY FROM HEAT.
KEEP AWAY FROM OXIDIZERS.
KEEP AWAY FROM IGNITION SOURCES.

OTHER PRECAUTIONS
REPORTED CANCER HAZARD.
AVOID EYE OR SKIN CONTACT.
AVOID BREATHING VAPORS.

WHILE THE INFORMATION AND RECOMMENDATIONS SET FORTH HEREIN ARE BELIEVED TO BE ACCURATE AS OF THE DATE HEREOF, SUPELCO, INC. MAKES NO WARRANTY WITH RESPECT THERETO AND DISCLAIMS ALL LIABILITY FROM RELIANCE THEREON.

LAST REVISED 2/13/92
**MATERIAL SAFETY DATA SHEET**

**PRODUCT NAME:** ABC DRY CHEMICAL  
**SYNONYMS:** MULTI-PURPOSE DRY CHEMICAL, MAP, (MONO) AMMONIUM PHOSPHATE, ALL-PURPOSE DRY CHEMICAL

### HAZARDOUS INGREDIENTS

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>CAS NO.</th>
<th>OSHA PEL TWA - mg/m³</th>
<th>ACGIH TLV TWA - mg/m³</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mica</td>
<td>12001-26-2</td>
<td>3 Respirable Dust</td>
<td>3 Respirable Fraction</td>
</tr>
<tr>
<td>Kaolin</td>
<td>1332-58-7</td>
<td>10 Total Dust</td>
<td>10 (c)</td>
</tr>
</tbody>
</table>

(a) Particulate matter not otherwise classified.  
(b) Particulate matter not otherwise classified. Total dust containing no asbestos & less than 1% crystalline silica.  
(c) Total dust containing no asbestos & less than 1% crystalline silica.

### OTHER INGREDIENTS

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>CAS NO.</th>
<th>OSHA PEL TWA - mg/m³</th>
<th>ACGIH TLV TWA - mg/m³</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monoammonium Phosphate</td>
<td>7722-78-1</td>
<td>15 Total Dust (a)</td>
<td>10 (b)</td>
</tr>
<tr>
<td>Ammonium Sulfate</td>
<td>7783-20-2</td>
<td>15 Total Dust (a)</td>
<td>10 (b)</td>
</tr>
<tr>
<td>Ammonium Sulfate</td>
<td>7783-20-2</td>
<td>5 Respirable Fraction</td>
<td></td>
</tr>
</tbody>
</table>

### PHYSICAL AND CHEMICAL CHARACTERISTICS

- **BOILING POINT (°F): NA**  
- **SPECIFIC GRAVITY (H 2 O = 1): 0.65**  
- **VAPOR PRESSURE (MM HG): NA**  
- **PERCENT VOLATILE (%): NA**  
- **VAPOR DENSITY (AIR = 1): NA**  
- **EVAPORATION RATE: NA**  
- **SOLUBILITY IN WATER:** Water repellent coated  
- **REACTIVITY IN WATER:** None  
- **pH:** 4.4  
- **APPEARANCE & ODOR:** Yellow powder. No characteristic odor.  
- **FLASH POINT (°F): None**  
- **AUTO IGNITION TEMPERATURE (°F): NA**  
- **FLAMMABLE LIMITS IN AIR BY VOL:** NA  
- **EXTINQUISHER MEDIA:** None. This material is an extinguishing agent.  
- **SPECIAL FIRE FIGHTING PROCEDURES:** None  
- **UNUSUAL FIRE AND EXPLOSION HAZARDS:** None

### PHYSICAL HAZARDS

- **STABILITY:** Stable  
- **CONDITIONS TO AVOID:** NA

**INCOMPATIBILITY (MATERIALS TO AVOID):** Strong Alkalis, Mg, Sodium Nitrite, Swimming Pool Sanitizers (inorganic perchlorates, Sodium Dichloroisocyanurate Dihydrate, Trichloroisocyanuric Acid, Calcium Hypochlorite, Etc.)

**HAZARDOUS DECOMPOSITION PRODUCTS:** Ammonia, Carbon Monoxide and Oxides of Nitrogen
### HEALTH EFFECTS AND FIRST AID

**EFFECTS OF ACUTE OVEREXPOSURE FOR PRODUCT:**
- **EYES:** Slight irritable.
- **SKIN:** Slight irritable.
- **BREATHING:** Irritant to respiratory tract. Treat as a mineral dust.
- **SWALLOWING:** Harmful if swallowed. May cause sore throat, abdominal pain, nausea, vomiting.

**FIRST AID:**
- **IF IN EYES:** Flush with water for 15 minutes. If irritation persists, seek medical attention.
- **IF ON SKIN:** Wash with soap and water. If irritation persists, seek medical attention.
- **IF IN MOUTH:** Remove victim to fresh air. Seek medical attention if discomfort continues.
- **IF SWALLOWED:** Rinse mouth and drink large amounts of water. Do not induce vomiting. Seek medical attention.

**PRIMARY ROUTES OF ENTRY:** Eyes, Skin Contact, Breathing, Swallowing

**MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE:** Pre-existing respiratory disease.

**EFFECTS OF CHRONIC OVEREXPOSURE FOR PRODUCT:** No adverse chronic effects could be found for this substance.

**PRODUCT LISTED AS CARCINOGEN OR POTENTIAL CARCINOGEN:**
- NATIONAL TOXICOLOGY PROGRAM: [X] YES
- IARC MONOGRAPHS: [ ] NO
- OSHA: [ ] YES

### CONTROL MEASURES AND PROTECTIVE EQUIPMENT

**RESPIRATORY PROTECTION (TYPE):** Dust respirator required when exposure limits are exceeded. Dust respirator recommended whenever airborne dust is present.

**VENTILATION:**
- **GENERAL AREA:** Recommended
- **LOCAL EXHAUST:** Recommended

**SKIN PROTECTION:** Protective Gloves

**EYE PROTECTION:** Safety Glasses

**OTHER PROTECTIVE CLOTHING OR EQUIPMENT:** None required

**WORK/HYGIENE PRACTICES:** Use good personal hygiene and good housekeeping practices.

### SPECIAL PRECAUTIONS AND SPILL/LEAK PROCEDURES

**PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE:** Store in closed, moisture-free containers in a cool, dry location. Avoid unnecessary dustiness.

**OTHER PRECAUTIONS:** Do not cross contaminate with other extinguisher agents.

**STEPS TO BE TAKEN IN CASE PRODUCT IS RELEASED OR SPILLED:** Contain and sweep up. Dispose of in accordance with local, state and federal regulations.

**HMIS RATINGS:**
- **HEALTH:** 1
- **FLAMMABILITY:** 0
- **REACTION:** 0

**HMIS HAZARD INDEX:**
- **MINIMAL:** 0
- **SLIGHT:** 1
- **MODERATE:** 2
- **SERIOUS:** 3
- **SEVERE:** 4

The information provided herein is offered in good faith and is to the best of our knowledge current. Although certain hazards are described herein we cannot state that these are the only hazards which exist. Final determination of suitability and safe usage of this material is the sole responsibility of the user who is obligated to review this data in the specific context of the intended use and determine appropriateness. No guarantee is implied or expressed regarding the accuracy of this information or the use of this material since the conditions of use are beyond our control.
MATERIAL SAFETY DATA SHEET

MANUFACTURER
Pend All Company
5 E. College Drive
Arlington Heights, Illinois 60004
(708) 577-7400

I. Trade Name

EYESALINE SOLUTION

Synonyms
NONE

II. Hazardous Ingredients

Alkyl Dimethyl Benzyl Ammonium Chloride (Less than 0.5% w/v)

III. Physical Data

Boiling Point: 212° F
Vapor Pressure: 760 mm Hg
Vapor Density: ND
Solubility in Water: 100%

Appearance and Odor: Colorless liquid with no discernable odor.

Specific Gravity: ND
Percent Volatile by Volume: ND
Evaporation Rate: ND

IV. Fire and Explosion Hazard Data

Nonflammable Aqueous Solution.

V. Health Hazard Information

Routes of Exposure:

Inhalation: Not Applicable
Skin Contact: Non-Irritating
Skin Absorption: Not Applicable
Eye Contact: Non-Irritating
Ingestion: Ingestion of volumes in excess of 20 liters may cause gastric irritation.

Emergency and First Aid Procedures:

Eye: Not Applicable
Skin: Not Applicable
Inhalation: Not Applicable
Ingestion: See Notes to Physician
VI. Reactivity Data

The solution is considered non-reactive and stable under normal conditions of storage and usage.

VII. Spill or Leak Procedures

Flush area with water.

The solution is not an RCRA hazardous waste.

VIII. Special Protection Information

Wear protective gloves and goggles when handling Eyesaline Concentrate.

IX. Special Precautions

Do not freeze or expose to temperatures in excess of 110°F for extended periods.

Prepared by John W. Bornhoeft, Ph.D.
J.W.B. Associates

Prepared for the exclusive use of the Fend All Company

ND = Not Determined

This information is furnished to you as of June 10, 1990, without warranty, expressed or implied, except it is accurate to the best knowledge of J.W.B. Associates and the Fend All Company. The data on this sheet relates only to the specific product designated herein as Eyesaline Concentrate. J.W.B. Associates and the Fend All Company assume no legal responsibility for use or reliance upon this data. The Fend All Company does not accept any obligations to update you with respect to the subject matter hereof.
SECTION I - GENERAL INFORMATION

PRODUCT NAME
ETHYL BENZENE
DATA SHEET NO. R430380

CHEMICAL NAME
BENZENE, ETHYL-

FORMULA
C2H5C6H5

FORMULA WEIGHT
106

CAS
100-41-4

NRTECS
DA0700000

SUBJECT TO THE REPORTING REQUIREMENTS OF SARA TITLE III, SECTION 313.

SYNONYM
PHENYLETHANANE

MANUFACTURER
SUPELCO INC.

PHONE
814-359-3441

ADDRESS
SUPELCO PARK, BELLEFONTE, PA 16823-0048

SECTION II - HAZARDOUS INGREDIENTS OR MIXTURES

CHEMICAL NAME

COMMON NAME - PERCENTAGE - CAS #

(FORMULA) - PEL(UNITS) - TLV(UNITS)

LD50 VALUE - CONDITIONS

N/A

SECTION III - PHYSICAL DATA

BOILING POINT
136 C

VAPOR PRESSURE
10 MM

SPECIFIC GRAVITY
0.870 G/ML

WATER SOLUBILITY
0.015 L/VOL

APPEARANCE
CLEAR COLORLESS LIQUID

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT
59 F

CLOSERED CUP
FLAMMABLE LIMITS
LEL 1.0 %
UEL 6.7 %

EXTINGUISHING MEDIA

CO2

FOAM

DRY CHEMICAL

SPECIAL FIRE FIGHTING PROCEDURES

WEAR SELF CONTAINED BREATHING APPARATUS WHEN FIGHTING A CHEMICAL FIRE.

UNUSUAL FIRE AND EXPLOSION HAZARDS

MAY REACT VIGOROUSLY WITH OXIDIZING MATERIALS.

SECTION V - HEALTH HAZARD DATA

LD50
3500 MG/KG

ORAL RAT

PEL
100 PPM

TLV
100 PPM

EMERGENCY AND FIRST AID PROCEDURES

EYES
SECTION V - HEALTH HAZARD DATA

* CONTINUED *

FLUSH EYES WITH WATER FOR 15 MINUTES.
CONTACT A PHYSICIAN.

SKIN
FLUSH SKIN WITH LARGE VOLUMES OF WATER.
CONTACT A PHYSICIAN.

INHALATION
IMMEDIATELY MOVE TO FRESH AIR.
IF BREATHING STOPS, GIVE ARTIFICIAL RESPIRATION

INGESTION
NEVER GIVE ANYTHING BY MOUTH TO AN UNCONSCIOUS PERSON
NEVER TRY TO MAKE AN UNCONSCIOUS PERSON VOMIT
DO NOT INDUCE VOMITING.

EFFECTS OF OVEREXPOSURE

MAY IRRITATE EYES AND/OR SKIN
HEADACHE
NARCOSIS
COMA

SECTION VI - REACTIVITY DATA

STABILITY
STABLE.

CONDITIONS TO AVOID
N/A

INCOMPATIBILITY

OXIDIZING AGENTS

HAZARDOUS DECOMPOSITION PRODUCTS
N/A

HAZARDOUS POLYMERIZATION WILL NOT OCCUR.

CONDITIONS TO AVOID
N/A
SECTION VII - SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED

- Take up with absorbent material.
- Ventilate area.
- Eliminate all ignition sources.

WASTE DISPOSAL METHOD

- Comply with all applicable federal, state, or local regulations.

SECTION VIII - SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (SPECIFIC TYPE)

- Wear face mask with organic vapor canister.

PROTECTIVE GLOVES

- Wear rubber gloves.

EYE PROTECTION

- Wear protective glasses.

VENTILATION

- Use only in well-ventilated area.

SPECIAL

- N/A

OTHER PROTECTIVE EQUIPMENT

- N/A

SECTION IX - SPECIAL PRECAUTIONS

STORAGE AND HANDLING

- N/A

OTHER PRECAUTIONS

- Avoid eye or skin contact.
ETHYLBENZENE

AVOID BREATHING VAPORS.

WHILE THE INFORMATION AND RECOMMENDATIONS SET FORTH HEREIN ARE BELIEVED TO BE ACCURATE AS OF THE DATE HEREOF, SUPELCO, INC. MAKES NO WARRANTY WITH RESPECT THERETO AND DISCLAIMS ALL LIABILITY FROM RELIANCE THEREON.

LAST REVISED 1/04/90
Product: Hexane

I. PRODUCT IDENTIFICATION

PRODUCT: Hexane

MATERIAL NAME: N-Hexane

FORMULA: C6H14

SYNONYMS: N-Hexane

CHEMICAL FAMILY: Alkane

MOLECULAR WEIGHT: 86.18

TRADE NAME: Hexane

II. HAZARDOUS INGREDIENTS

For mixtures of this product, request the respective component Material Safety Data Sheets. See Section IX.

MATERIAL (CAS NO): Hexane (110-63-4)

Vol (%): 100

1990-1991 ACGIH TLV-TWA (OSHA-PEL): TWA 50 ppm. Simple asphyxiant (50 ppm)

III. PHYSICAL DATA

BOILING POINT, 760 mm. Hg: 68 °C (156 °F)

SPECIFIC GRAVITY (H2O = 1): 0.7

VAPOR DENSITY (air = 1): 3.0

PERCENT VOLATILES BY VOLUME: 100

FREEZING POINT: -95 °C (-139 °F)

VAPOR PRESSURE AT 20 °C: 124 mm. Hg

IBILITY IN WATER, % by wt.: Insoluble in water

EVAPORATION RATE [Butyl Acetate = 1]: No information found

APPEARANCE AND ODOR: Clear, colorless solution, odorless

IV. HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE: See Section II.

EMERGENCY/FIRST AID

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

A. EXPOSURE/HEALTH EFFECTS

Inhalation: Mild irritant to the respiratory tract. Overexposure may cause tightness, nausea, and blurred vision. Greater exposure may cause unconsciousness and death.

Ingestion: May cause abdominal pain, nausea, and gastrointestinal irritation. Absorption into the lungs can produce severe lung damage.

Skin Contact: May cause redness, irritation.

Eye Contact: Vapors may cause irritation. Splashes may cause redness and pain.

Chronic Exposure: Chronic inhalation may cause peripheral nerve disorders.

Aggravation of Pre-existing Conditions: Persons with pre-existing skin disorders or eye problems or impaired respiratory function may be more susceptible to the effects of the substance.

B. FIRST AID

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

Ingestion: If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water or milk. If available, never give anything by mouth to an unconscious person.

Skin Exposure: Remove any contaminated clothing. Wash off exposure from skin. Wash skin with soap and water for at least 15 minutes. Get medical attention if irritation develops or persists.

Eye Exposure: Wash eyes with plenty of water for at least 15 minutes. If irritation develops, get medical attention.

C. TOXICITY DATA (IITC, 1988)

Oral LD50: 300 mg/kg, Median Soluble: eye: human 5 ppm. Reproductive effects

V. FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (test method): -22 °C to -26 °C

AUTOIGNITION TEMPERATURE: 240 °C to 280 °C

FLAMMABLE LIMITS IN AIR, % by volume:

LOWER 1.1 %

UPPER 7.5 %

EXTINGUISHING MEDIA:

Dry chemical, foam or carbon dioxide. Water spray may be used to cool fire-exposed containers.

SPECIAL FIRE FIGHTING PROCEDURES:

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with two facepieces operated in the pressure demand or other positive pressure mode. Water spray may be used to cool fire-exposed containers. Use chemical safety glasses. Do not work in the proximate presence of this material. Vapor can form along surfaces to distant ignition source and flash back.

UNUSUAL FIRE AND EXPLOSION HAZARDS:

Above flash point, vapor and mixtures are explosive within flammable limits noted above. Contact with oxidizing materials may cause extremely violent combustion.

VI. REACTIVITY DATA

STABILITY: Stable

CONDITIONS TO AVOID: Heat will contribute to instability

INCOMPATIBILITY (materials to avoid): Strong oxidizers

HAZARDOUS DECOMPOSITION PRODUCTS: Toxic gases and vapors may be released if involved in a fire.

HAZARDOUS POLYMERIZATION: Will not occur

CONDITIONS TO AVOID:

VII. SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED:

Ventilate area of leak or spill. Remove all sources of ignition. Clean-up personnel must wear protective clothing and respiratory protection from vapors. Contain and recover liquid, when possible. Use non-sparking tools and equipment. Collect as hazardous waste and atomize in a suitable RCPA approved combustion chamber, or aerosol with venturi, dry sand, earth or similar material for disposal as hazardous waste in a RCPA approved facility. Do not flush to sewer.

WASTE DISPOSAL METHOD:

Slowly release into atmosphere. Discard any product, rinses, disposable container or label in an environmentally acceptable manner, in compliance with Federal, state and local regulations.

VIII. SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (space type): Select in accordance with OSHA 29 CFR 1910.124. Respirators shall be acceptable to MSHA and NIOSH.

Ventilation:

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

MECHANICAL (general): Inadequate. See "Special".

SPECIAL: N/A

OTHER: N/A

PROTECTIVE GLOVES: Preferred

YEYE PROTECTION: Select in accordance with OSHA 29 CFR 1910.132 and 1910.133.

IX. SPECIAL PRECAUTIONS

MIXTURES: When two or more gases or liquid fractions are mixed, their hazardous properties may combine to create additional, unexpected hazards. Obtain and evaluate the safety information for each component before you produce the mixture. Consider an industrial hygienist, or other trained person when you make your safety evaluation of the end product. Remember, gases and liquids have properties which can cause serious injury or death.

DANGER EXTREMELY FLAMMABLE. HARMFUL IF SWALLOWED OR INHALED. AFFECTS CENTRAL NERVOUS SYSTEM. MAY CAUSE IRRITATION. Keep away from heat, sparks and flame. Keep container closed. Use with adequate ventilation. Avoid breathing vapors. Avoid contact with eyes, skin and clothing. Wash thoroughly

December, 1991
EMERGENCY PHONE NUMBER

EMERGENCY RESPONSE INFORMATION: IN CASE OF EMERGENCY INVOLVING THIS MATERIAL, CALL DAY OR NIGHT 1-208-336-1643 OR CALL CHEMTREC AT (800) 424-9300.

Norco requests the users of this product to study this Material Safety Data Sheet (MSDS) and become aware of product hazards and safety information. To promote safe use of this product, a user should (1) notify its employees, agents and contractors of the information on this MSDS and any product hazards and safety information, (2) furnish this same information to each of its customers for the product, and (3) request such customers to notify their employees and customers for the product of the same product hazards and safety information.

Nor-LAB Calibration Gases & Equipment
1121 W. Amity, Boise, ID 83705
Phone (208) 336-1643 • Fax (208) 384-1720 • Wats 1-800-657-6672
**Material Safety Data Sheet**

24-HOUR EMERGENCY TELEPHONE — (201) 555-2151
CHEMTREC # (900) 424-4500 — NATIONAL RESPONSE CENTER 2 (800) 424-0802

**H2331 -02**

**EFFICIENT: 05/11/89**

**PRODUCT NAME:** HEXANE

**COMMON SYNONYMS:** NORMAL HEXANE;
HEXYL HYDROCARBON

**CHEMICAL FAMILY:** ALIPHATIC HYDROCARBONS

**FORMULA:** C6H14

**FORMULA WT.:** 86.18

**CAS #:** 110-54-3

**MSDS/TECS NO.:** M-927500

**PRODUCT USE:** LABORATORY REAGENT

**PRODUCT CODES:** 9310, 9305, 9307, 9308, 9262, 9316, 9318

---

**Precautionary Labeling**

**BAKER SAF-T-DATA® SYSTEM**

**HEALTH** — **2** MILD

**FLAMMABILITY** — **3** SEVERE (FLAMMABLE)

**REACTIVITY** — **0** NONE

**CONTACT** — **2** MODERATE

---

**Laboratory Protective Equipment**

**GOGGLES:** LAD CCAT; VENT HOOD; PROPER GLOVES; CLASS 3 EXTINGUISHER

**U.S. Precautionary Labeling**

**DANGER**

CAUSES IRRITATION. EXTREMELY FLAMMABLE. HARMFUL IF SWALLOWED, INHALED, OR ABSORBED THROUGH SKIN.

KEEP AWAY FROM HEAT, SPARKS, FLAMES. DO NOT BREATHE VAPOR. KEEP IN TIGHTLY CLOSED CONTAINER. USE WITH ADEQUATE VENTILATION. WASH THOROUGHLY AFTER HANDLING. IN CASE OF FIRE, USE ALCHEMICAL FOAM; CRY CHEMICAL, CARBON DIOXIDE. WATER MAY BE INEFFECTIVE. FLUSH SPILL AREA WITH WATER SPRAY.

**International Labeling**

AVOID CONTACT WITH EYES. AFTER CONTACT WITH SKIN: WASH IMMEDIATELY WITH PLENTY OF WATER. KEEP CONTAINER TIGHTLY CLOSED.

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

CONTINUE ON PAGE 2
J. T. Baker Inc. 224 Red School Lane, Phillipsburg, NJ 08865

MATERIAL SAFETY DATA SHEET

24-HOUR EMERGENCY TELEPHONE: (201) 455-2151

CHEMTREC: (800) 424-9300 — NATIONALLY RESPONSIVE CENTER # (800) 424-8802

SECTION I - IDENTIFICATION

-IDENTIFICATION:
HEXANE

EFFECTIVE: 05/01/39

ISSUED: 05/16/89

SECTION II - COMPONENTS

COMPONENT
N-Hexane
Methylcyclopentane

CAS NO.
110-54-3
98-37-7

WEIGHT %
80
2

OSHA/PEL
500 PPM
N/E

ACGIH/TLV
50 PPM
N/E

SECTION III - PHYSICAL DATA

Boiling Point: 69 C (156 F)
(BP 760 MM HG)

Melting Point: -95 C (-139 F)
(MP 760 MM HG)

Specific Gravity: 0.66
(H2O = 1)

Solubility (H2O): Negligible (< 0.1%)%

PH: N/A

Odor Threshold (P.P.M.): N/A

Coefficient Water/air Distribution: N/A

Appearance & Odor: Colorless Liquid. Faint Odor.

SECTION IV - FIRE AND EXPLOSION HAZARDOUS DATA

Flash Point (closed cup): -23 C (-10 F)

NFPA 704M Rating: 1-3-0

Autocignition Temperature: 224 C (437 F)

Flammable Limits: Upper: 7.7 %. Lower: 1.2 %

Fire Extinguishing Media:
Use alcohol foam, dry chemical or carbon dioxide. (Water may be ineffective.)

CONTINUED ON PAGE: 3
SECTION IV - FIRE AND EXPLOSION HAZARD DATA (CONTINUED)

SPECIAL FIRE-FIGHTING PROCEDURES

FIREIGHTERS SHOULD WEAR PROPER PROTECTIVE EQUIPMENT AND SELF-CONTAINED BREATHING APPARATUS WITH FULL FACCIPECE OPERATED IN POSITIVE PRESSURE MODE. MOVE EXPOSED 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/THA): 190 MG/H (50 PPM)

SHORT-TERM EXPOSURE LIMIT (STEL): NOT ESTABLISHED

PERMISSIBLE EXPOSURE LIMIT (PEL): 1800 MG/H (500 PPM)

TOXICITY OF COMPONENTS

ORAL RAT LD50 FOR N-HEXANE
CARCINOGENICITY: NO IARC: NO 2 LIST: NO CSNA REG: NO 28 7 G/KG

CARCINOGENICITY

NONE IDENTIFIED.

REPRODUCTIVE EFFECTS

BLOOD CHANGES HAVE BEEN REPORTED IN LABORATORY ANIMALS. IN TESTS WITH LABORATORY ANIMALS, FETAL DEATH HAS BEEN REPORTED IN ONE OUT OF THREE

STUDIES.

CONTINUED ON PAGE: 4
EFFECTS OF OVEREXPOSURE

INHALATION: HEADACHE, NAUSEA, VOMITING, DIZZINESS, CROWDINESS, IRRITATION OF UPPER RESPIRATORY TRACT, UNCONSCIOUSNESS, MAY CAUSE NARCOSIS

SKIN CONTACT: IRRITATION, DERMATITIS

EYE CONTACT: IRRITATION

SKIN ABSORPTION: NOT IDENTIFIED

INGESTION: HEADACHE, NAUSEA, VOMITING, DIZZINESS, GASTROINTESTINAL IRRITATION

CHRONIC EFFECTS: CENTRAL NERVOUS SYSTEM DEPRESSION

TARGET ORGANS
SKIN, EYES, RESPIRATORY SYSTEM, LUNGS

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE
NONE IDENTIFIED

PRIMARY ROUTES OF ENTRY
INHALATION, INGESTION, EYE CONTACT, SKIN CONTACT

EMERGENCY AND FIRST AID PROCEDURES

INGESTION: CALL A PHYSICIAN. IF SWALLOWED, DO NOT 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.

EYE CONTACT: IN CASE OF EYE CONTACT, IMMEDIATELY FLUSH WITH PLENTY OF WATER FOR AT LEAST 15 MINUTES.

SARA/TITLE III HAZARD CATEGORIES AND LISTS

G/C: YES CHRONIC: YES FLAMMABILITY: YES PRESSURE: NO REACTIVITY: NO

CONTINUED ON PAGE: 5
HEXANE

SECTION V - HEALTH HAZARD DATA (CONTINUED)

EXTREMELY HAZARDOUS SUBSTANCE: NO
CERCLA HAZARDOUS SUBSTANCE: NO
TOXIC CHEMICALS: NO
TSCA INVENTORY: YES

SECTION VI - REACTIVITY DATA

STABILITY: STABLE
HAZARDOUS POLYMERIZATION: WILL NOT OCCUR

CONDITIONS TO AVOID: HEAT, FLAME, OTHER SOURCES OF IGNITION

INCOMPATIBILITIES: STRONG OXIDIZING AGENTS, CHLORINE, FLUORINE, MAGNESIUM PERCHLORATE

CECCOMPOSITION 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 FLAMES, SMOKING, OR FLAMES IN AREA. STOP LEAK IF YOU CAN DO SO WITHOUT RISK. USE WATER SPRAY TO REDUCE VAPORS. TAKE LEAK WITH SAND OR OTHER NON-COMBUSTIBLE ABSORBENT MATERIAL AND PLACE INTO CONTAINER FOR LATER DISPOSAL. FLUSH AREA WITH WATER.

J. T. BAKER SULFURDUR(R) SOLVENT ABSORBENT 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)
J.T. Baker Inc. 222 Rec School Lane, Phillipsburg, NJ 08865

MAT E R I A L S A F E T Y D A T A S H E E T

24-HOUR EMERGENCY TELEPHONE -- (201) 359-2151
CHEMREC & (800) 424-9360 -- NATIONAL RESCUE CENTER & (800) 424-0802

09-16-1994

EFFECTIVE: 05/01/89

ISSUED: 05/16/89

---

**SECTION VII - 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.

---

**SECTION IX - STORAGE AND HANDLING PRECAUTIONS**

SAFE-T-DATA: STORAGE CLASS CODE: RED (FLAMMABLE)

AGE REQUIREMENTS
KEEP CONTAINER TIGHTLY CLOSED. STORE IN A COOL, DRY, WELL-VENTILATED, FLAMMABLE LIQUID STORAGE AREA.

SPECIAL PRECAUTIONS
BOND AND GROUND CONTAINERS WHEN TRANSFERRING LIQUID.

---

**SECTION X - TRANSPORTATION DATA AND ADDITIONAL INFORMATION**

COMMON (I.C.T.)

PROPER SHIPPING NAME: HEXANE
HAZARD CLASS: FLAMMABLE LIQUID
UN/NA: UN1209
LABELS: FLAMMABLE LIQUID
REGULATORY REFERENCES: 49 CFR 172.101; 173.115

INTERNATIONAL (I.M.A.)

PROPER SHIPPING NAME: HEXANES
HAZARD CLASS: 3.1
UN: UN1209 MARINE POLLUTANTS: NO
LABELS: FLAMMABLE LIQUID

CONTINUED ON PAGE: 7
**J.T. Baker INC.** 222 RED SCHOOL LANE, PHLILPSBURG, NJ 08865

**MATERIAL SAFETY DATA SHEET**

24-HOUR EMERGENCY TELEPHONE -- (908) 755-2151
CHEMTAC & (900) 424-1300 -- NATIONAL RESPONSE CENTER -- (BGC) 425-1802

*2/11/92*

**EFFECTIVE:** 05/01/89

**SECTION X - TRANSPORTATION DATA AND ADDITIONAL INFORMATION (CONTINUED)**

**REGULATORY REFERENCES:** 49CFR 172.102; PART 178; INC

**AIR (I.C.A.O.)**

**PROPER SHIPPING NAME:** HEXANE

**HAZARD CLASS:** 3.1

**UN:** UN1200

**LABELS:** FLAMMABLE LIQUID

**PACKAGING GROUP:** II

**REGULATORY REFERENCES:** 49CFR 172.101; 173.4; PART 175; ICAC/IATA

**U.S. CUSTOMS HARMONIZATION NUMBER:** 29011066001

**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 PROCLAMATED THEREUNDER (29 CFR 1910.1200 ET. SECT.) 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. EXPANDING 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 INFORMATION GENERAL SAFETY INFORMATION BECOMES AVAILABLE, BAKER WILL PERIODICALLY REVISE THIS MATERIAL SAFETY DATA SHEET. IF YOU HAVE ANY QUESTIONS, PLEASE CALL CUSTOMER SERVICE (1-908-JTBAKER) FOR ASSISTANCE.

---

RIGHT 1989 J.T. BAKER INC.
J.T. Baker Inc., 222 Red School Lane, Phillipsburg, NJ 08865

MATERIAL SAFETY DATA SHEET

24-HOUR EMERGENCY TELEPHONE -- (209) 355-2151
CHEMTREC # (800) 424-9300 -- NATIONAL RESPONSE CENTER: (800) 424-8802

PAGE: B
ISSUED: 05/16/89

EFFECTIVE: 05/01/89

* TRACEMARKS OF J.T. BAKER INC.

APPROVED BY QUALITY ASSURANCE DEPARTMENT.

-- LAST PAGE --
"ISSUED 02/25/82"
General Information

Item Name: TURBINE FUEL, AVIATION
Manufacturer's Name: CHEVRON ENVIRONMENTAL HEALTH CENTER INC.
Manufacturer's Street: 15501 SAN PABLO AVE.
Manufacturer's City: RICHMOND
Manufacturer's State: CA
Manufacturer's Country: US
Manufacturer's Zip Code: 94804-0054
Manufacturer's Emerg Ph #: 415-833-3737
Manufacturer's Info Ph #: 415-833-3737
Instructor/Vendor #: 1: CHEVRON ENVIRONMENTAL HEALTH CENTER INC.
Instructor/Vendor #: 1 Cage: 81E20
Instructor/Vendor #: 2:
Instructor/Vendor #: 2 Cage:
Instructor/Vendor #: 3:
Instructor/Vendor #: 3 Cage:
Instructor/Vendor #: 4:
Instructor/Vendor #: 4 Cage:
Safety Data Action Code:
Safety Focal Point: D
Record No. For Safety Entry: 062
Safety Entries This Site #: 003 Status: SE
MSDS Prepared: 1994-08-27
Safety Data Review Date: 1994-08-27
This Item Manager: KY
PDES Preparer's Name: R. D. FARBER
Preparer's Company:
Preparer's St Or P. O. Box:
Preparer's City:
Preparer's State:
Preparer's Zip Code:
Other MSDS Number:
PDES Serial Number: BOMGR
Certification Number: 9115-T-3624
Use Type, Grade, Class: GRADE JP-4
Order Characteristic Code: F2
Net Of Issue: GL
Net Of Issue Container Qty: BULK
Type Of Container: BULK
Unit Weight: 6.6 LBS/GL
State License Number: N/R
Explosive Weight: N/R
Propellant Weight-Ammon: N/R
Explosive Ammunition Code: N/R
**Extinguishing Media:** CARBON DIOXIDE, DRY CHEMICAL, FOAM AND WATER FOG.

**Special Fire Fighting Precautions:** USE FULL FIRE FIGHTING GEAR WITH SCBA. THIS MATERIAL EVAPORATES QUICKLY EVEN AT VERY LOW TEMPERATURES AND IS AN EXTREME FIRE HAZARD. COOL NEARBY CONTAINERS.

**Unusual Fire And Explosion Hazards:** FORMS EXPLOSIVE MIXTURES WITH AIR, PAPER, AND OTHER COMBUSTIBLE ORGANIC MATTER. MAY UNDERGO SPONTANEOUS COMBUSTION WHEN MOISTURED WITH WATER.

**Reactivity Data**

**Stability:** YES

**Spontaneous Decomposition Hazards:** CARBON DIOXIDE AND CARBON MONOXIDE

**Health Hazard Data**

**NOS-LOSO Mixture:** UNKNOWN

**Route Of Entry - Inhalation:** YES

**Route Of Entry - Skin:** YES

**Route Of Entry - Ingestion:** YES

**Health Haz Acute:** EYE/SKIN/RESPIRATORY TRACT IRRITATION. MOBILE HAZARDous IS EXPOSURE TO AIRBORNE HIST OR OTHER ASPIRATION INTO THE LUNGS. INTO THE LUNGS, THIS MATERIAL IS VERY DIFFICULT TO REMOVE AND CAN CAUSE DEATH. PROLONGED AND REPEATED EXPOSURES CAN CAUSE DAMAGE TO THE LIVER, KIDNEYS AND CENTRAL NERVOUS SYSTEM.

**Carcinogenicity - IARC:** YES

**Carcinogenicity - OSHA:** YES

**Carcinogenicity - NTP:** YES

**Carcinogenicity - ACGIH:** YES

**Carcinogenicity - HSE:** YES

**Carcinogenicity - THIS MATERIAL CONTAINS BENZENE, A KNOWN CANCER.**

**Signs/Effects Of Overexp.:** EYE: MILD IRRITATION, SKIN: DRYING AND UCHATTING WITH PROLONGED CONTACT. INHALATION: Headache, Nausea, Loss of Appetite, Ears, Loss of Coordination, Confusion, Drowsiness. ASPIRATION OF LIQUID INTO CHEMICAL PNEUMONITIS. INGESTION: G/I IRRITATION, NAUSEA, POSSIBLY MELTING.

**Acute Effects Of Prolonged Exposure:** EYE: IMMEDIATELY FLUSH WITH PLENTY OF WATER FOR 5 MINUTES. GET MEDICAL ATTENTION. SKIN: REMOVE CONTAMINATED CLOTHING AND SHOES WITH SOAP AND WATER. INHALATION: REMOVE TO FRESH AIR. RESUSCITATION. ORIGIN: OXYGEN AS NEEDED. THEN GET MEDICAL HELP. INGESTION: GIVE MILK OR WATER IT DO NOT INDUCE VOMITING. GET MEDICAL ATTENTION AT ONCE.

**Precautions for Safe Handling and Storage:**

**Spills:** WEAR PROTECTIVE EQUIPMENT, ELIMINATE SOURCES OF IGNITION, AND VENTILATE AREA AS REQUIRED. ABSORB SMALL SPILLS WITH INERTIAL OR CAPE TO RETAIN LARGE SPILL. PLACE WASTE IN DOT APPROVED CONTAINER FOR DISPOSAL.

**Neutralizing Agent:** NONE

**Disposal Method:** DISPOSE OF IN ACCORDANCE WITH ALL APPLICABLE DEKAL, STATE AND LOCAL REGULATIONS. UNUSED OR SPILL CLEAN UP MATERIAL.
Ingredient Focal Point: D
NESH (REDCS) Number: CY1400000
CAS Number: 71-43-2
OSHA PEL: 1PPM/ESTRL:1710.1028
OSHA TLV: 10 PPM; A2; 9192
Other Recommended Limit: NONE SPECIFIED

Proprietary: NO
Ingredient: CYCLOHEXANE (SARA III)
Ingredient Sequence Number: 06
Percent: 5

Ingredient Action Code:
Ingredient Focal Point: D
NESH (REDCS) Number: EU8800000
CAS Number: 110-62-7
OSHA PEL: 300 PPM
OSHA TLV: 300 PPM, 9192
Other Recommended Limit: NONE SPECIFIED

Proprietary: NO
Ingredient: METHYL 1-ERT-BUTYL ETHER (SARA III)
Ingredient Sequence Number: 07
Percent: 7

Ingredient Action Code:
Ingredient Focal Point: D
NESH (REDCS) Number: KN5290000
CAS Number: 1534-04-4
OSHA PEL: NOT ESTABLISHED
OSHA TLV: NOT ESTABLISHED
Other Recommended Limit: NONE SPECIFIED

Physical/Chemical Characteristics

Appearance And Odor: COLORLESS TO PALE AMBER LIQUID
Melting Point: 250F, 121C
Boiling Point: N/R
Max Pressure (MM Hg/70 F): 2-3PSI
Mass Density (Air=1): N/K
Specific Gravity: 0.75-0.30
Composition Temperature: N/K
Evaporation Rate And Ref: N/K
Solubility In Water: INSOLUBLE
Percent Volatiles By Volume: N/K
Viscosity: 4 CST 0-34.4C

Bioactivity:
Rm (Radioactive Material):
Ignitom (Milligrams): N/K
Rosition Rate (IPY): N/K
Ignition Temperature: N/K

Fire and Explosion Hazard Data

Flash Point: -10F,-23C
Lower Explosive Limit: CC
Ignite Point Method: CC
Lower Explosive Limit: 1.5
Upper Explosive Limit: 8
Ingredients/Identity Information

Ingredient: JP-4 (A WIDE BOILING ALIPHATIC AND AROMATIC DISTILLATE) SEE THE FOLLOWING IDENTIFIABLE COMPONENTS.

Ingredient Sequence Number: 01

Ingredient Action Code:
Ingredient Focal Point: 1
OSHA (RTECS) Number: NY9330000
AC Number: UNKNOWN
IASH PEL: NOT ESTABLISHED
OSHA TLV: NOT ESTABLISHED
Other Recommended Limit: USAF OHR TWA 200 PPM

Ingredient: TOLUENE (SARA III)
Ingredient Sequence Number: 02

Ingredient Action Code:
Ingredient Focal Point: D
OSHA (RTECS) Number: XS2230000
AC Number: 102-88-3
IASH PEL: 100 PPM/150 STEL
OSHA TLV: 100 PPM/150 STEL
Other Recommended Limit: NONE SPECIFIED

Ingredient: XYLENES (O-, M-, P- ISOMERS) (SARA III)
Ingredient Sequence Number: 03

Ingredient Action Code:
Ingredient Focal Point: D
OSHA (RTECS) Number: ZE2440000
AC Number: 1030-20-7
IASH PEL: 100 PPM/150 STEL
OSHA TLV: 100 PPM/150 STEL
Other Recommended Limit: J枪E SPECIFIED

Ingredient: ETHYL BENZENE (SARA III)
Ingredient Sequence Number: 04

Ingredient Action Code:
Ingredient Focal Point: D
OSHA (RTECS) Number: DA0690000
AC Number: 104-41-4
IASH PEL: 100 PPM/125 STEL
OSHA TLV: 100 PPM/125 STEL
Other Recommended Limit: NONE SPECIFIED

Ingredient: BENZENE (SARA III)
Ingredient Sequence Number: 05

Ingredient Action Code:
ILL LIKELY BE A HAZARDOUS WASTE (CODE D001).

Precautions-Handling/Storing: STORE IN A COOL, DRY, WELL VENTILATED AREA AWAY FROM SOURCES OF IGNITION OR OXIDIZERS. KEEP CONTAINER CLOSED WHEN NOT IN USE. PROTECT FROM DAMAGE.

Other Precautions: "EMPTY" CONTAINERS MAY CONTAIN RESIDUE AND/OR FUMES WHICH ARE EXPLOSIVE. DO NOT CUT, DRILL, WELD ETC. ON CONTAINERS.

Control Measures


Ventilation: MECHANICAL (GENERAL) VENTILATION IS USUALLY ADEQUATE.

Protective Gloves: RUBBER OR HYDROCARBON RESISTANT GLOVES

Eye Protection: SAFETY GLASSES/Chemical splash GOGGLES

Other Protective Equipment: SAFETY SHOWER AND EYE BATH. INDUSTRIAL TYPE "CLOTHING AND APRON ARE REQUIRED TO AVOID PROLONGED OR REPEATED CONTACT.

Personal Hygiene Practices: WASH THOROUGHLY AFTER HANDLING AND BEFORE EATING OR DRINKING. LAUNDER CONTAMINATED CLOTHING BEFORE REUSE.

Other: Safety & Health Data: DO NOT PRESSURIZE "EMPTY" DRUMS. DO NOT USE THIS MATERIAL FOR A PORTABLE HEATER OR APPLIANCE FUEL.
# Material Safety Data Sheet

## II. Hazardous Components

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>%</th>
<th>OSHA Limit</th>
<th>TLV</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## III. Physical and Chemical Properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Value(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flammable</td>
<td>No</td>
</tr>
<tr>
<td>Flash Point</td>
<td>Not Applicable</td>
</tr>
<tr>
<td>Specific Gravity</td>
<td>Grease paste</td>
</tr>
<tr>
<td>Solubility in Water</td>
<td>Insoluble</td>
</tr>
</tbody>
</table>

## IV. Fire Protection Information

- Flammable Liquid and Vapor: Not Available
- Flash Point: Not Available
- Flammable Limits: Not Available
- Compressed Gas: Not Available

**Fire Extinguishing Agents:**
- Carbon dioxide, dry chemical, or foam.

**Combustion and Spread:**
- May produce toxic fumes at temperatures above 930°F.
- Smoke may be generated when exposed to heat.

**Fire and Explosion Hazards:**
- For fire fighting, use self-contained breathing apparatus with positive pressure. May produce toxic fumes at temperatures above 930°F.
Not applicable.

May cause mild irritation with repeated or prolonged contact.

May cause mild irritation with repeated or prolonged contact.

Accidental ingestion can cause gastrointestinal irritation.

REPORTED AS POTENTIAL CARCINOGEN  Not Applicable  National Toxicology Program
OR CARCINOGEN  International Agency for Research on Cancer  GINA

VI. FIRST AID PROCEDURES

Not applicable

Flush with water for a minimum of 15 minutes. Get medical attention if irritation develops.

Wash with soap and water prior to eating or smoking.

Call a physician as soon as possible.
Not required under normal conditions of use.

SPECIAL PROTECTION INCORPORATION
If eye contact is probable, use safety glasses or chemical goggles.

For prolonged contact, use nitrile or neoprene gloves.

Not applicable

VIII. SPECIAL PRECAUTIONS

Do not store with strong oxidizers

Avoid exposure to extreme temperatures.

IX. ENVIRONMENTAL PROTECTION

Pick up and place in container for disposal.

Utilize permitted industrial waste disposal site. Comply with local, state, and regional regulations.

The information contained herein is based upon data available to us and reflects our best professional judgment. Since it is impossible to anticipate the conditions under which our products can be used, we cannot guarantee that the recommendations will be adequate for all individual situations. Each user of this product should determine the suitability of the product for his particular purpose & should comply with all federal, state and local regulations. Our goal is to manufacture products with zero or minimal hazards. Our products are improved daily as up-to-date information and research is received from our suppliers to use products with less or no hazards. Please feel free to contact us for current information. The latest MSDS will be furnished with each shipment.
January 5, 1987

Mr. George Sisbert  
Vice President, Marketing  
King Oil Tools, Inc.  
2401 Wilson  
Humble, TX 77398  

Dear Mr. Sisbert:  

I have evaluated the possibility of using Compound 143 ("Green Stuff") at  
the Vista Chemical Complex in Lake Charles. Because testing has shown that  
"Green Stuff" is chemically compatible with the objectives of the ongoing  
study, I approve of its use as a drill pipe thread compound during mud  
rotary well drilling at the site.  

I base approval on the results of two tests. These tests, which were  
performed by J. C. Come of the Vista VCM Plant Lab, indicate that:  

1. Up to 4 ppm of "Green Stuff" does not interfere with the detection of  
volatile organic chemicals (VOC's) in a 40-ppm VOC standard solution.  

2. A 300-ppm solution of "Green Stuff" does not contain any VOC's above  
the detection limit of 10 ppb.  

Copies of this letter are being forwarded to Layne-Louisiana and our  
groundwater consultant.  

Sincerely,  

Ronald D. Truelove  
Process Engineer  
Environmental  
Process Engineering Division  

cc:  
VOC 150 to GW M/N  
Mike Hayes, Vista, Westlake  
Tom Grumbles, Vista, Houston  

Mr. James H. Crouch, District Manager  
Layne-Louisiana Company  
P. O. Box DD  
Lake Charles, LA 70602  

Mr. Dean Love  
IT Corporation  
4116 Calia Avenue  
Baton Rouge, LA 70809
Chemical analysis of "green stuff" received in our lab on 2/1/88.

**Chemical Analysis**

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silver, mg/kg</td>
<td>&lt;1.00</td>
</tr>
<tr>
<td>Arsenic, mg/kg</td>
<td>&lt;0.025</td>
</tr>
<tr>
<td>Barium, mg/kg</td>
<td>6.87</td>
</tr>
<tr>
<td>Beryllium, mg/kg</td>
<td>&lt;0.50</td>
</tr>
<tr>
<td>Cadmium, mg/kg</td>
<td>&lt;0.40</td>
</tr>
<tr>
<td>Chromium, mg/kg</td>
<td>&lt;1.00</td>
</tr>
<tr>
<td>Copper, mg/kg</td>
<td>&lt;1.00</td>
</tr>
<tr>
<td>Mercury, mg/kg</td>
<td>&lt;0.25</td>
</tr>
<tr>
<td>Nickel, mg/kg</td>
<td>&lt;1.00</td>
</tr>
<tr>
<td>Lead, mg/kg</td>
<td>&lt;2.00</td>
</tr>
<tr>
<td>Antimony, mg/kg</td>
<td>&lt;10.0</td>
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<tr>
<td>Selenium, mg/kg</td>
<td>0.037</td>
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<tr>
<td>Tellurium, mg/kg</td>
<td>&lt;2.00</td>
</tr>
<tr>
<td>Zinc, mg/kg</td>
<td>1.83</td>
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</table>

**Reactivity**

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Results</th>
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</thead>
<tbody>
<tr>
<td>Hydrogen Sulfide, ppm</td>
<td>&lt;20</td>
</tr>
<tr>
<td>Hydrocyanic Acid, ppm</td>
<td>&lt;0.65</td>
</tr>
</tbody>
</table>

Client: King Oil Tools, Inc.
Mr. Eberhardt
2401 Wilson Road
Humble, Texas 77338

Project: Chemical analysis of "green stuff" received in our lab on 2/1/88.

**Southwestern Laboratories**

Mark Tipton
Analytical Lab Supervisor

Copies: 3

Reviewed By:

File No. 2-6941-00
Report No. 89-188
Report Date 2/23/88
"GREEN STUFF"
TOOL JOINT COMPOUND

TECHNICAL DATA

Color........................................Green
Odor............................................Mild
Temperature Range..............................-70 deg. F to 
                                          +600 deg. F
Flash Point..................................375 deg. F
Dropping Point, F (ASTM D217)..............None
Type Oil........................................Synthetic
Thickener......................................Fumed Silicate
Consistency, Cone Penetration
  (ASTM D217)..................................220 to 300
Oil Separation, % Wt. loss
  (ASTM D1742)................................5 max
Oxidation Stability (ASTM D942)
  100 hour, psi drop..................................10 max
Rust Preventative Test (ASTM D1743)....No. 2
Elastomer Compatability test, % max....29
  (Federal Test Standard No. 792A,
   Method 3603 except substitute
   grease for oil specified)
Corrosion Inhibitor..............................Conventional
                                          Imidazoline
                                          Derivate
EP Additive......................................Diester Type,
                                          containing no
                                          phosphorous,
                                          sulfur, or metal
                                          salt

GENERAL COMPOSITION

Ricinus Oil
Flouroinated Polytetrafluoroethylene
Silica
Ethylene Bisstearamide
Color
  (1,4-Di(isopropylamino) Anthraquinone)
**BASE/NEUTRAL EXTRACTABLES**

<table>
<thead>
<tr>
<th>Compound</th>
<th>Concentration Units:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Azobenzene</td>
<td>ND &lt; 100</td>
</tr>
<tr>
<td>Acanaphtylene</td>
<td>ND &lt; 100</td>
</tr>
<tr>
<td>Acanaphthene</td>
<td>ND &lt; 100</td>
</tr>
<tr>
<td>Fluorene</td>
<td>ND &lt; 100</td>
</tr>
<tr>
<td>N-Nitrosodiaphylineamines</td>
<td>ND &lt; 100</td>
</tr>
<tr>
<td>4-Bromophenylyphenyl Ether</td>
<td>ND &lt; 100</td>
</tr>
<tr>
<td>Di-n-butyl Phthalate</td>
<td>ND &lt; 100</td>
</tr>
<tr>
<td>Hexachlorobenzene</td>
<td>ND &lt; 100</td>
</tr>
<tr>
<td>Phenanthrene</td>
<td>ND &lt; 100</td>
</tr>
<tr>
<td>Anthracene</td>
<td>ND &lt; 100</td>
</tr>
<tr>
<td>Fluoranthene</td>
<td>ND &lt; 100</td>
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<td>Butylbenzyl Phthalate</td>
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<td>Chrysene</td>
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<td>Indeno(1,2,3-CO)Pyrene</td>
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<td>Dibenzo(A,H)Anthracene</td>
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<tr>
<td>Benzo(GHI)Perylene</td>
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</table>
**SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET**

**Matrix:** Grease  
**% Solids:**  

**Scan** | **Compound** | **Concentration Units:**
--- | --- | ---

### ACID EXTRACTABLES

- 2-Chlorophenol: ND <100
- 2-Nitrophenol: ND <100
- Phenol: ND <100
- 2,4-Dimethylphenol: ND <100
- 2,4-Dichlorophenol: ND <100
- 2,4,6-Trichlorophenol: ND <100
- 4-Chloro-3-Methylphenol: ND <100
- 2,4-Dinitrophenol: ND <100
- 2-Methyl-4,6-Dinitrophenol: ND <100
- Pantachlorophenol: ND <100
- 4-Nitrophenol: ND <100

### BASE/NEUTRAL EXTRACTABLES

- N-Nitrosodimethylamine: ND <100
- Bis(2-Chloroethyl)ether: ND <100
- Bis(2-Chloroisopropyl)Ether: ND <100
- N-Nitrosodi-n-propylamine: ND <100
- 1,3-Dichlorobenzene: ND <100
- 1,4-Dichlorobenzene: ND <100
- 1,2-Dichlorobenzene: ND <100
- Hexachloroethane: ND <100
- Bis(2-Chloroethoxy)methane: ND <100
- Nitrobenzene: ND <100
- Isophorone: ND <100
- 1,2,4 Trichlorobenzene: ND <100
- Hexachlorobutadiene: ND <100
- Naphthalene: ND <100
- Dimethylphthalate: ND <100
- Diethyl Phthalate: ND <100
- 4-Chlorophenylphenyl Ether: ND <100
- Hexachlorocyclopentadiene: ND <100
- 2-Chloronaphthalene: ND <100
- 2,6-Dinitrotoluene: ND <100
- 2,4-Dinitrotoluene: ND <100
VOLATILE ORGANICS ANALYSIS DATA SHEET

**Matrix:** Grease  
**Method:** Soil/Waste - EPA SW846; 5030/a240  
**Water - EPA 624**  
**Technique:** Purge-and-Trap GC/MS  

<table>
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<th>Scan</th>
<th>Compound</th>
<th>Concentration Units</th>
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<tr>
<td></td>
<td>Methylene Chloride</td>
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<td>Dibromochloromethane</td>
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<td>1,1,2,2-Tetrachloroethane</td>
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<td></td>
<td>Acrylonitrile</td>
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<tr>
<td>903</td>
<td>Ethyl Benzene</td>
<td>1.7</td>
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</table>
MATERIAL SAFETY DATA SHEET

EFFECTIVE DATE: 3/1/89

KING OIL TOOLS, INC.
2401 WILSON ROAD
HUMBLE, TEXAS 77340

PRODUCT NAME

DESCRIPTION

MIXTURE OF CASTOR OIL-POLYMERIZED CASTOR OIL-GROUND TFELOM-ADDITIVE AND THICKENERS

THE FOLLOWING COMPOUNDS HAVE BEEN DEEMED HAZARDOUS IN ACCORDANCE WITH 29 CFR 1910.1200 HAZARDOUS

Physical Data

Boiling Point: NA
Vapor Pressure: NEGLIGIBLE
Vapor Density (Air=1): NA
Solubility in Water: INSOLUBLE
Specific Gravity: 1.1
Per-Cent Volatile by Volume: 0
Appearance and Odor: BLUE GREEN GARDNIY Paste-Held Odor

Section 1

Fire and Explosion Hazard Data

Flash Point: 340 F
Method Used: CLOSED CUP
Upper Explosive Limit %: NA
Lower Explosive Limit %: NA
Extinguishing Media: FOAM-DRY CHEMICAL

Section 2

Special Fire Fighting Equipment and Hazards:

Respiratory Masks Should be Worn During Fire Fighting to Protect Against Acid Fumes-Organic Vapors and Dust

Section 3

Reactivity Data

Stability: STABLE
Incompatibility: OXYGEN OR OXIDIZING MATERIALS

Hazardous Decomposition Products:

Carbon Dioxide-Carbon Monoxide-Tetrafluoromethylene-Hexafluoropropane-Octafluorisobutylene-Hydrogen Fluoride-And Other Fluorinated Compounds

Hazardous Polymerization: WILL NOT OCCUR

Section 4

Spill, Leak, and Disposal Methods

Sign to Take for Spills:

Disposal Method:

SHOVEL INTO CONTAINERS

CONTROLLED INCINERATION OR SANITARY LANDFILL UNLESS DIRECTED BY FEDERAL-STATE OR LOCAL REGULATIONS
SECTION 5

HEALTH HAZARD DATA

CAUSES SEVERE DIARRHEA

EYE CONTACT

NA

SKIN CONTACT

NA

INHALATION

NA

EFFECTS OF OVEREXPOSURE

FIRST AID

EYES

WASH WITH WATER FOR 15 MINUTE-CONSULT PHYSICIAN

SKIN

WASH WITH SOAP AND WATER

INHALATION

CONSULT PHYSICIAN

INGESTION

CONSULT PHYSICIAN

SECTION 7

SPECIAL HANDLING INFORMATION

VENTILATION

NONE

RESPIRATORY PROTECTION

NONE

PROTECTIVE CLOTHING

RUBBER GLOVES

EYE PROTECTION

SAFETY GLASSES

SECTION 8

SPECIAL PRECAUTIONS

NONE

OTHER INFORMATION

KEEP AWAY FROM HEAT OR OPEN FLAME-KEEP CONTAINER TIGHTLY CLOSED
ADDITIONAL EMERGENCY TELEPHONE NO. MED A. NCLEARE 409/273-3400

This used to be called
"Green Stuff"
(you should probably keep the old
MSDS, too, in case there's some
"Green Stuff" still out there).
"KING STUFF"

TOOL JOINT COMPOUND

TECHNICAL DATA

Color ........................................ Green
Odor ........................................ Nil
Temperature Range ......................... -40 deg. F to +500 deg. F
Flash Point ................................. 440 Deg. F
Dropping Point, F (ASTM D217) ........ None
Type Oil ....................................... Synthetic
Thickener ..................................... Fumed Silicata
Consistency, Cone Penetration
   (ASTM D217) ........................................ 220 to 300
Oil Separation, % Wt. loss
   (ASTM D1742) ...................................... 5 max
Oxidation Stability (ASTM D942)
   100 hours, psi drop .......................... 10 max
Rust Preventative Test (ASTM D1743). No. 2
Rustometer Compatibility test, Z max ... 29
   (Federal Test Standard No. 792s,
   Method 3603 except substitute
   grease for oil specified)
Corrosion Inhibitor ...................... Conventional
   Imedosolona Derivate
   Ester Type, containing no
   phosphorous, sulfur, or metal salt

EP Additive .........................................

GENERAL COMPOSITION

Ricinus Oil
Fluoronated Polytetrafluorethylene
Silica
E.P. Additive, Corrosion Inhibitor
Color
   (1,4-Di(Isopropylamino) Anthragininone)
Project: Chemical analysis of pipe dope sample taken by the client and received in our lab on September 15, 1988. Sample I.D.: King Stuff

EP TOXICITY

<table>
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<th>Contaminant</th>
<th>Measured Concentration, mg/l</th>
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<td>Arsenic</td>
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<tr>
<td>Barium</td>
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</tr>
<tr>
<td>Beryllium</td>
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<tr>
<td>Cadmium</td>
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<tr>
<td>Chromium</td>
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<tr>
<td>Copper</td>
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<td>Nickel</td>
<td>&lt;0.05</td>
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<tr>
<td>Lead</td>
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<tr>
<td>Thallium</td>
<td>&lt;0.50</td>
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</tbody>
</table>

SOUTHWESTERN LABORATORIES

Reviewed By

Mark Tipton
Analytical Lab Supervisor

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**VOLATILE ORGANICS ANALYSIS DATA SHEET**

<table>
<thead>
<tr>
<th>Scan</th>
<th>Compound</th>
<th>Concentration Units: mg/kg</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Methylene Chloride</td>
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<td>Trichlorofluoromethane</td>
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<td>Chloroform</td>
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<tr>
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<tr>
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<td>Dibromochloromethane</td>
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<td>Trans-1,3-Dichloropropene</td>
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<td>Bromoform</td>
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<td></td>
<td>Acrolein</td>
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<td></td>
<td>Acrylonitrile</td>
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<td>Chloroform</td>
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<td>Bromomethane</td>
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<td>Vinyl Chloride</td>
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<tr>
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<td>Ethyl Benzene</td>
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**SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET**

**Client:** King Oil Tools, Inc.  
**Sample I.D.:** King Stuff  
**Data File:** EMA092603  
**Matrix:** Grease

**Method:** Soil/Waste - EPA SW846; 3550/8270  
**Extraction:** (Sep/Sonic) Sonication

**Concentration Units:** mg/kg (ppm)

<table>
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<tr>
<th>Scan Compound</th>
<th>Acid Extractables</th>
<th>Base/Neutral Extractables</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-Chlorophenol</td>
<td>ND &lt;100</td>
<td>ND &lt;100</td>
</tr>
<tr>
<td>2-Nitrophenol</td>
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<td>ND &lt;100</td>
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<tr>
<td>Phenol</td>
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<td>2,4-Dimethylphenol</td>
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<tr>
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<td>2,4,6-Trichlorophenol</td>
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<td>4-Chloro-3-Methylphenol</td>
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<td>N-Nitrosodimethylamine</td>
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<td>Bis(2-Chloroethyl)ether</td>
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<tr>
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**SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET**

**Client:** King Oil Tools, Inc.

**Sample I.D.:** King Stuff

**Data File:** EWA092603

**File No.:** 2-4941-00

**Report No.:** 88-2182

**Report Date:** 10/17/88

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<td>BASE/NEUTRAL EXTRACTABLES</td>
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<td>Acenaphthene</td>
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<td>Fluoranthene</td>
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<td>N-Nitrosodiphenylamine</td>
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<tr>
<td></td>
<td>4-Bromophenylphenyl Ether</td>
</tr>
<tr>
<td></td>
<td>Di-n-butyl Phthalate</td>
</tr>
<tr>
<td></td>
<td>Hexachlorobenzene</td>
</tr>
<tr>
<td></td>
<td>Phenanthrene</td>
</tr>
<tr>
<td></td>
<td>Anthracene</td>
</tr>
<tr>
<td></td>
<td>Fluoranthenes</td>
</tr>
<tr>
<td></td>
<td>Butylbenzyl Phthalate</td>
</tr>
<tr>
<td></td>
<td>Bis(2-Ethylhexyl) Phthalate</td>
</tr>
<tr>
<td></td>
<td>Pyrene</td>
</tr>
<tr>
<td></td>
<td>Chrysene</td>
</tr>
<tr>
<td></td>
<td>Benzo(A)Anthracene</td>
</tr>
<tr>
<td></td>
<td>Benzidine</td>
</tr>
<tr>
<td></td>
<td>3,3'-Dichlorobenzidine</td>
</tr>
<tr>
<td></td>
<td>Di-n-octyl Phthalate</td>
</tr>
<tr>
<td></td>
<td>Benzo(K) Fluoranthene</td>
</tr>
<tr>
<td></td>
<td>Benzo(B) Fluoranthene</td>
</tr>
<tr>
<td></td>
<td>Benzo(A) Pyrene</td>
</tr>
<tr>
<td></td>
<td>Indeno(1,2,3-CD) Pyrene</td>
</tr>
<tr>
<td></td>
<td>Dibenz(A,H) Anthracene</td>
</tr>
<tr>
<td></td>
<td>Benzo(GH) Perylene</td>
</tr>
</tbody>
</table>

**Concentration Units:** mg/kg
PESTICIDE/PCB ANALYSIS DATA SHEET

Matrix: Grease
% Solids: ---

Method: Soil/Waste - EPA SW846; 3550/8080
Water - EPA 608
Extraction: (SepF/Sonic) Sonication

<table>
<thead>
<tr>
<th>Compound</th>
<th>Concentration Units:</th>
<th>mg/kg</th>
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</thead>
<tbody>
<tr>
<td>A-BHC</td>
<td>ND</td>
<td>&lt;0.5</td>
</tr>
<tr>
<td>B-BHC</td>
<td>ND</td>
<td>&lt;1.0</td>
</tr>
<tr>
<td>D-BHC</td>
<td>ND</td>
<td>&lt;1.0</td>
</tr>
<tr>
<td>G-BHC</td>
<td>ND</td>
<td>&lt;1.0</td>
</tr>
<tr>
<td>Aldrin</td>
<td>ND</td>
<td>&lt;1.0</td>
</tr>
<tr>
<td>Chlordane</td>
<td>ND</td>
<td>&lt;5.0</td>
</tr>
<tr>
<td>4,4'-DDD</td>
<td>ND</td>
<td>&lt;2.5</td>
</tr>
<tr>
<td>4,4'-DDE</td>
<td>ND</td>
<td>&lt;2.5</td>
</tr>
<tr>
<td>4,4'-DDT</td>
<td>ND</td>
<td>&lt;2.5</td>
</tr>
<tr>
<td>Dieldrin</td>
<td>ND</td>
<td>&lt;1.0</td>
</tr>
<tr>
<td>Endosulfan I</td>
<td>ND</td>
<td>&lt;1.0</td>
</tr>
<tr>
<td>Endosulfan II</td>
<td>ND</td>
<td>&lt;2.5</td>
</tr>
<tr>
<td>Endosulfan Sulfate</td>
<td>ND</td>
<td>&lt;2.5</td>
</tr>
<tr>
<td>Endrin</td>
<td>ND</td>
<td>&lt;1.0</td>
</tr>
<tr>
<td>Endrin Aldehyde</td>
<td>ND</td>
<td>&lt;2.5</td>
</tr>
<tr>
<td>Heptachlor</td>
<td>ND</td>
<td>&lt;1.0</td>
</tr>
<tr>
<td>Heptachlor Epoxide</td>
<td>ND</td>
<td>&lt;1.0</td>
</tr>
<tr>
<td>Methoxychlor</td>
<td>ND</td>
<td>&lt;1.5</td>
</tr>
<tr>
<td>Toxaphene</td>
<td>ND</td>
<td>&lt;20.0</td>
</tr>
<tr>
<td>PCB-1016</td>
<td>ND</td>
<td>&lt;20.0</td>
</tr>
<tr>
<td>PCB-1221</td>
<td>ND</td>
<td>&lt;20.0</td>
</tr>
<tr>
<td>PCB-1232</td>
<td>ND</td>
<td>&lt;20.0</td>
</tr>
<tr>
<td>PCB-1242</td>
<td>ND</td>
<td>&lt;20.0</td>
</tr>
<tr>
<td>PCB-1248</td>
<td>ND</td>
<td>&lt;20.0</td>
</tr>
<tr>
<td>PCB-1254</td>
<td>ND</td>
<td>&lt;20.0</td>
</tr>
<tr>
<td>PCB-1260</td>
<td>ND</td>
<td>&lt;20.0</td>
</tr>
</tbody>
</table>
### U.S. DEPARTMENT OF LABOR
Occupational Safety and Health Administration

**MATERIAL SAFETY DATA SHEET**

Required under USDL Safety and Health Regulations for Ship Repairing, Shipbuilding, and Shipbreaking (29 CFR 1911.101.1918.1917)

#### SECTION I

**MANUFACTURER'S NAME**

NEVADA CEMENT COMPANY

**ADDRESS (Name, Street, City, State, and ZIP Code)**

P. O. BOX 940, Fernley, NV 89408-0840

**CHEMICAL NAME AND SYNONYMS**

Portland Cement

**TRADE NAME AND SYNONYMS**

Nevada Cement Type II

**CHEMICAL FAMILY**

Hydraulic Calcium Silicate

**FORMULA**

Iron/Clay/Limestone

#### SECTION II - HAZARDOUS INGREDIENTS

<table>
<thead>
<tr>
<th>PAINTS, PRESERVATIVES, &amp; SOLVENTS</th>
<th>% TLV (Units)</th>
<th>ALLOYS AND METALLIC COATINGS</th>
<th>% TLV (Units)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PIGMENTS</td>
<td>n/a</td>
<td>BASE METAL</td>
<td>n/a</td>
</tr>
<tr>
<td>CATALYST</td>
<td>n/a</td>
<td>ALLOYS</td>
<td>n/a</td>
</tr>
<tr>
<td>VEHICLE</td>
<td>n/a</td>
<td>METALLIC COATINGS</td>
<td>n/a</td>
</tr>
<tr>
<td>SOLVENTS</td>
<td>n/a</td>
<td>Filler Metal, Flux Coating, or Core Flux</td>
<td>n/a</td>
</tr>
<tr>
<td>ADDITIVES</td>
<td>n/a</td>
<td>OTHERS</td>
<td>n/a</td>
</tr>
<tr>
<td>OTHERS</td>
<td>n/a</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES**

#### SECTION III - PHYSICAL DATA

<table>
<thead>
<tr>
<th>BOILING POINT (°F)</th>
<th>n/a</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPECIFIC GRAVITY (g/cm³)</td>
<td>3.15</td>
</tr>
<tr>
<td>VAPOR PRESSURE (mm Hg)</td>
<td>n/a</td>
</tr>
<tr>
<td>PERCENT VOLATILE BY VOLUME (%)</td>
<td>n/a</td>
</tr>
<tr>
<td>VAPOR DENSITY (AIR=1)</td>
<td>n/a</td>
</tr>
<tr>
<td>EVAPORATION RATE (%)</td>
<td>1-1%</td>
</tr>
<tr>
<td>SOLUBILITY IN WATER (slight)</td>
<td></td>
</tr>
<tr>
<td>APPEARANCE AND ODOR</td>
<td></td>
</tr>
</tbody>
</table>

#### SECTION IV - FIRE AND EXPLOSION HAZARD DATA

<table>
<thead>
<tr>
<th>FLASH POINT (Method used)</th>
<th>n/a</th>
</tr>
</thead>
<tbody>
<tr>
<td>FLAMMABLE LIMITS</td>
<td>LFL</td>
</tr>
<tr>
<td>EXTINGUISHING MEDIA</td>
<td>n/a</td>
</tr>
<tr>
<td>SPECIAL FIRE FIGHTING PROCEDURES</td>
<td>n/a</td>
</tr>
<tr>
<td>UNUSUAL FIRE AND EXPLOSION HAZARDS</td>
<td>n/a</td>
</tr>
</tbody>
</table>
SECTION V - HEALTH HAZARD DATA

**Threshold Limit Value**
- 5 mg m\(^{-3}\) (respirable dust)
- 10 mg m\(^{-3}\) (total dust)

**Effects of Overexposure**
- Irritation of the respiratory tract from breathing cement dust. Irritation of the skin and irritation of the eyes.

**Emergency and First Aid Procedures**
- Control of dust. In case of contact with skin or eyes, flush for 15 minutes with water. If irritation persists, contact medical help.

SECTION VI - REACTIVITY DATA

<table>
<thead>
<tr>
<th>Stability</th>
<th>Unstable</th>
<th>Conditions to Avoid</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Stable</td>
<td>X</td>
</tr>
</tbody>
</table>

**Incompatibility (Materials to Avoid)**
- None

**Hazardous Decomposition Products**
- None

**Hazardous Polymerisation**
- Will not occur

SECTION VII - SPILL OR LEAK PROCEDURES

**Steps to be Taken If Material is Released or Spilled**
- Do not breathe dust. Avoid contact with the eyes or prolonged contact with the skin.

**Waste Disposal Method**
- Wearing a dust mask, safety glasses and gloves, sweep spill into retaire sack.

SECTION VIII - SPECIAL PROTECTION INFORMATION

**Respiratory Protection (Mask, etc.)**
- Use of NIOSH approved respirator in dusty environments.

**Ventilation**
- Local exhaust
- Mechanical (ventilator)
- Natural ventilation
- Other

**Protective Gloves**
- Any type will protect
- Eye Protection
  - Yes (safety glasses)

**Other Protection Equipment**
- Respirator to prevent breathing of dust

SECTION IX - SPECIAL PRECAUTIONS

**Precautions to be Taken in Handling and Storage**
- Maintain cement in a ventilated area and take appropriate precautions to avoid eye and skin exposure.

**Other Precautions**
- None
DATE 7/08/92

MATERIAL SAFETY DATA SHEET

SECTION I - GENERAL INFORMATION

(PROREORDER PRODUCT BY THIS NO.)

PRODUCT NAME P-XYLENE 5G
DATA SHEET NO. R437014

P-XYLENE

CHEMICAL NAME BENZENE, 1,4-DIMETHYL-
FORMULA CH3C6H4CH3
FORMULA WEIGHT 106
CAS 106-42-3 NRTMCS ZE2625000

SUBJECT TO THE REPORTING REQUIREMENTS OF SARA TITLE III, SECTION 313.
SYNONYM DIMETHYLBENZENE
MANUFACTURER SUPELCO INC. PHONE 814-359-3441
ADDRESS SUPELCO PARK, BELLEFONTE, PA 16823-0048

SECTION II - HAZARDOUS INGREDIENTS OF MIXTURES

CHEMICAL NAME
COMMON NAME - PERCENTAGE - CAS #
(FORMULA) - PEL(UNITS) - TLV(UNITS)
LD50 VALUE - CONDITIONS

N/A

SECTION III - PHYSICAL DATA

BOILING POINT 138 C
VAPOR PRESSURE 9 MM Hg
SPECIFIC GRAVITY .860 G/ML
WATER SOLUBILITY N/A
APPEARANCE CLEAR COLORLESS LIQUID
OR SHARP ODOR

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT 81 F
FLAMMABLE LIMITS LEL 1.1 UEL 7

EXTINGUISHING MEDIA

CO2
FOAM
DRY CHEMICAL

SPECIAL FIRE FIGHTING PROCEDURES

WEAR SELF CONTAINED BREATHING APPARATUS WHEN FIGHTING A CHEMICAL FIRE.

UNUSUAL FIRE AND EXPLOSION HAZARDS

FLASHBACK ALONG VAPOR TRAIL MAY OCCUR.

SECTION V - HEALTH HAZARD DATA

LD50 5000 MG/KG ORAL RAT
PEL 100 PPM
TLV 100 PPM

EMERGENCY AND FIRST AID PROCEDURES

EYES
* CONTINUED *

**SECTION V - HEALTH HAZARD DATA**

**FLUSH EYES WITH WATER FOR 15 MINUTES.**
**CONTACT A PHYSICIAN.**

**SKIN**
**PROMPTLY WASH SKIN WITH MILD SOAP AND LARGE VOLUMES OF WATER.**
**REMOVE CONTAMINATED CLOTHING.**

**INHALATION**
**IMMEDIATELY MOVE TO FRESH AIR.**
**GIVE OXYGEN IF BREATHING IS LABORED**
**IF BREATHING STOPS, GIVE ARTIFICIAL RESPIRATION**
**CONTACT A PHYSICIAN.**

**INGESTION**
**NEVER GIVE ANYTHING BY MOUTH TO AN UNCONSCIOUS PERSON**
**NEVER TRY TO MAKE AN UNCONSCIOUS PERSON VOMIT**
**DO NOT INDUCE VOMITING.**
**IMMEDIATELY CONTACT A PHYSICIAN.**

**EFFECTS OF OVEREXPOSURE**

**IRRITATES RESPIRATORY TRACT**
**VAPOR IS NARCOTIC IN HIGH CONCENTRATIONS**
**ANIMAL TERATOGEN, POSSIBLE REPRODUCTIVE HAZARD.**
**IRRITATES EYES**
**IRRITATES SKIN**
**DERMATITIS**
**IRRITATES NOSE AND THROAT**
**HEADACHE**
**DIZZINESS**
**GASTROINTESTINAL DISTURBANCES**
**TACHYCARDIA**
**DEPRESSES CENTRAL NERVOUS SYSTEM**
**LIVER DAMAGE**
**KIDNEY DAMAGE**
**POSSIBLE TERATOGEN**
**CORNEAL VACUOLIZATION.**

**SECTION VI - REACTIVITY DATA**

**STABILITY**: STABLE.

**CONDITIONS TO AVOID**

N/A
SECTION VI - REACTIVITY DATA

INCOMPATIBILITY

OXIDIZING AGENTS

HAZARDOUS DECOMPOSITION PRODUCTS
N/A

HAZARDOUS POLYMERIZATION WILL NOT OCCUR.

CONDITIONS TO AVOID
N/A

SECTION VII - SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED

TAKE UP WITH ABSORBENT MATERIAL.
VENTILATE AREA.
ELIMINATE ALL IGNITION SOURCES.

WASTE DISPOSAL METHOD

COMPLY WITH ALL APPLICABLE FEDERAL, STATE, OR LOCAL REGULATIONS

SECTION VIII - SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (SPECIFIC TYPE)

WEAR FACE MASK WITH ORGANIC VAPOR CANISTER.
WEAR SELF-CONTAINED BREATHING APPARATUS.

PROTECTIVE GLOVES

WEAR GLOVES.
WEAR IMPERVIOUS GLOVES.

EYE PROTECTION

WEAR PROTECTIVE GLASSES.

VENTILATION

USE ONLY IN EXHAUST HOOD.
SECTON VIII - SPECIAL PROTECTION INFORMATION

SPECIAL
N/A

OTHER PROTECTIVE EQUIPMENT
N/A

SECTION IX - SPECIAL PRECAUTIONS

STORAGE AND HANDLING

STORE IN SEALED CONTAINER IN COOL, DRY LOCATION.
KEEP AWAY FROM HEAT.
KEEP AWAY FROM OXIDIZERS.
STORE IN DRY, WELL VENTILATED AREA.
KEEP AWAY FROM IGNITION SOURCES.

OTHER PRECAUTIONS

AVOID EYE OR SKIN CONTACT.
AVOID BREATHING VAPORS.

WHILE THE INFORMATION AND RECOMMENDATIONS SET FORTH HEREIN ARE BELIEVED TO BE ACCURATE AS OF THE DATE HEREOF, SUPELCO, INC. MAKES NO WARRANTY WITH RESPECT THERETO AND DISCLAIMS ALL LIABILITY FROM RELIANCE THEREON.

LAST REVISED 6/11/92
MATERIAL SAFETY DATA SHEET

SECTION I - GENERAL INFORMATION

PRODUCT NAME 0-XYLENE 5G
DATA SHEET NO R437010

CHEMICAL NAME 0-XYLENE
FORMULA CH3C6H14Cu3
FORMULA WEIGHT 106
CAS 95-47-6 NRTECS ZE2450000

SUBJECT TO THE REPORTING REQUIREMENTS OF SARA TITLE III, SECTION 313.
SYNONYM DIMETHYLBENZENE
MANUFACTURER SUPELCO INC.
ADDRESS SUPELCO PARK, BELLEFONTE, PA 16823-0048

SECTION II - HAZARDOUS INGREDIENTS OF MIXTURES

<table>
<thead>
<tr>
<th>CHEMICAL NAME</th>
<th>COMMON NAME</th>
<th>PERCENTAGE</th>
<th>CAS #</th>
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<tbody>
<tr>
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SECTION III - PHYSICAL DATA

<table>
<thead>
<tr>
<th>PROPERTY</th>
<th>VALUE</th>
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<tbody>
<tr>
<td>BOILING POINT</td>
<td>144°C</td>
</tr>
<tr>
<td>MELTING POINT</td>
<td>-25°C</td>
</tr>
<tr>
<td>SPECIFIC GRAVITY</td>
<td>0.88 g/ml</td>
</tr>
<tr>
<td>WATER SOLUBILITY</td>
<td>N/A</td>
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<tr>
<td>VAPOR PRESSURE</td>
<td>7 mmHg</td>
</tr>
<tr>
<td>VAPOR DENSITY</td>
<td>3.70 (AIR=1)</td>
</tr>
<tr>
<td>DENSITY</td>
<td>0.7 (BUTYL ACETATE=1)</td>
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SECTION IV - FIRE AND EXPLOSION HAZARD DATA

<table>
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<tr>
<th>PROPERTY</th>
<th>VALUE</th>
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<tbody>
<tr>
<td>FLAMMABLE LIMITS</td>
<td>LEL 1.0</td>
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<td></td>
<td>UEL 6</td>
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SECTION V - HEALTH HAZARD DATA

<table>
<thead>
<tr>
<th>PROPERTY</th>
<th>VALUE</th>
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</thead>
<tbody>
<tr>
<td>LD50</td>
<td>5000 mg/kg</td>
</tr>
<tr>
<td>PEL</td>
<td>100 ppm</td>
</tr>
<tr>
<td>ORAL RAT</td>
<td></td>
</tr>
<tr>
<td>TLV</td>
<td>100 ppm</td>
</tr>
</tbody>
</table>

EMERGENCY AND FIRST AID PROCEDURES

YES

EXTINGUISHING MEDIA

CO2
FOAM
DRY CHEMICAL

SPECIAL FIRE FIGHTING PROCEDURES

WEAR SELF CONTAINED BREATHING APPARATUS WHEN FIGHTING A CHEMICAL FIRE.

UNUSUAL FIRE AND EXPLOSION HAZARDS

N/A
**MATERIAL SAFETY DATA SHEET**

**DATE 7/08/92**

**CATALOG NO 48581**

"PRODUCT NAME O-XYLENE 5G"

**DATA SHEET NO R437010**

O-XYLENE

**SECTION V - HEALTH HAZARD DATA**

* CONTINUED *

**FLUSH EYES WITH WATER FOR 15 MINUTES.**

CONTACT A PHYSICIAN.

**SKIN**

PROMPTLY WASH SKIN WITH MILD SOAP AND LARGE VOLUMES OF WATER.

REMOVE CONTAMINATED CLOTHING.

**INHALATION**

IMMEDIATELY MOVE TO FRESH AIR.

IF BREATHING STOPS, GIVE ARTIFICIAL RESPIRATION

CONTACT A PHYSICIAN

**INGESTION**

NEVER GIVE ANYTHING BY MOUTH TO AN UNCONSCIOUS PERSON

NEVER TRY TO MAKE AN UNCONSCIOUS PERSON VOMIT

DO NOT INDUCE VOMITING.

IMMEDIATELY CONTACT A PHYSICIAN.

**EFFECTS OF OVEREXPOSURE**

IRRITATES EYES

IRRITATES SKIN

DERMATITIS

IRRITATES NOSE AND THROAT

DIZZINESS

GASTROINTESTINAL DISTURBANCES

CORNEAL VACUOLIZATION.

**SECTION VI - REACTIVITY DATA**

**STABILITY**

STABLE.

**CONDITIONS TO AVOID**

N/A

**INCOMPATIBILITY**

OXIDIZING AGENTS

HAZARDOUS DECOMPOSITION PRODUCTS

N/A

HAZARDOUS POLYMERIZATION WILL NOT OCCUR.
DATE 7/08/92

MATERIAL SAFETY DATA SHEET

CATALOG NO 48581
PRODUCT NAME O-XYLENE 5G
DATA SHEET NO R437010
O-XYLENE

* CONTINUED *

CONDITIONS TO AVOID

N/A

SECTION VI - REACTIVITY DATA

SECTION VII - SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED

TAKE UP WITH ABSORBENT MATERIAL.
VENTILATE AREA.
ELIMINATE ALL IGNITION SOURCES.

WASTE DISPOSAL METHOD

COMPLY WITH ALL APPLICABLE FEDERAL, STATE, OR LOCAL REGULATIONS
TREAT AS DE MINIMUS WASTE.

SECTION VIII - SPECIAL PROTECTION INFORMATION

FIRST AID PROTECTION (SPECIFIC TYPE)

WEAR FACE MASK WITH ORGANIC VAPOR CANISTER.

PROTECTIVE GLOVES

WEAR GLOVES.
WEAR IMPERVIOUS GLOVES.

EYE PROTECTION

WEAR PROTECTIVE GLASSES.

VENTILATION

USE ONLY IN WELL VENTILATED AREA.

SPECIAL

N/A

OTHER PROTECTIVE EQUIPMENT

N/A
SECTION IX - SPECIAL PRECAUTIONS

STORAGE AND HANDLING

STORE IN SEALED CONTAINER IN COOL, DRY LOCATION.
KEEP AWAY FROM HEAT.
KEEP AWAY FROM OXIDIZERS.
STORE IN DRY, WELL VENTILATED AREA.
KEEP AWAY FROM IGNITION SOURCES.

OTHER PRECAUTIONS

AVOID EYE OR SKIN CONTACT.
AVOID BREATHING VAPORS.

WHILE THE INFORMATION AND RECOMMENDATIONS SET FORTH HEREIN ARE BELIEVED TO BE ACCURATE AS OF THE DATE HEREOF, SUPELCO, INC. MAKES NO WARRANTY WITH RESPECT THERETO AND DISCLAIMS ALL LIABILITY FROM RELIANCE THEREON.

LAST REVISED 1/09/90
SECTION I - PRODUCT IDENTIFICATION

Product Name: Nitric Acid
Formula: HNO₃
Formula Ut: 63.01
CAS No.: 7697-37-2
NIOSH/RTECS No.: QU5775000
Common Synonyms: Hydrogen Nitrate; Azotic Acid
Product Codes: 48011, BSOS, 9602, 9598, 9606, 9601, 9597, 9600, 5113, 9616, 5371

PRECAUTIONARY LABELING

Baker SAF-T-DATA™ System

Laboratory Protective Equipment

Precautionary Label Statements

POISON! DANGER!
STRONG OXIDIZER - CONTACT WITH OTHER MATERIAL MAY CAUSE FIRE LIQUID AND VAPOR CAUSE SEVERE BURNS - MAY BE FATAL IF SWALLOWED HARMFUL IF INHALED AND MAY CAUSE DELAYED LONG INJURY SPILLAGE MAY CAUSE FIRE OR LIBERATE DANGEROUS GAS

Keep from contact with clothing and other combustible materials. Do not store near combustible materials. Do not get in eyes, on skin, or on clothing. Do not breathe vapor. Keep in tightly closed container. Use with adequate ventilation. In case of fire, use water spray, alcohol foam, dry chemical, or carbon dioxide. Flush spill area with waterspray.

SECTION II - HAZARDOUS COMPONENTS

Component
Nitric Acid

% 65-75
CAS No. 7697-37-2
SECTION III - PHYSICAL DATA

Boiling Point: 121°C (250°F)
Melting Point: -42°C (-44°F)
Specific Gravity: 1.41
(Specific Gravity (H₂O=1))
Solubility (H₂O): Complete (in all proportions) % Volatiles by Volume: 100
Appearance & Odor: Colorless liquid, with choking odor

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

Flash Point: N/A
NFLPA 704M Rating: 3-0-0 OXY
Flammable Limits: Upper - N/A % Lower - N/A %

Fire Extinguishing Media
Use water spray.

Special Fire-Fighting Procedures
Firefighters should wear proper protective equipment and self-contained breathing apparatus with full facepiece operated in positive pressure mode. Move exposed containers from fire area if it can be done without risk. Use water to keep fire-exposed containers cool; do not get water inside containers.

Unusual Fire & Explosion Hazards
Strong oxidizer. Contact with other material may cause fire.

Toxic Gases Produced
nitrogen oxides, hydrogen gas

SECTION V - HEALTH HAZARD DATA

Threshold Limit Value (TLV/TWA): 5 mg/m³ (2 ppm)
Short-Term Exposure Limit (STEL): 10 mg/m³ (4 ppm)
Permissible Exposure Limit (PEL): 5 mg/m³ (2 ppm)
Carcinogenicity: NTP: No IARC: No Z List: No OSHA reg: No

Effects of Overexposure
Inhalation of vapor may cause nausea, vomiting, lightheadedness or
(headache.

Inhalation of vapors may cause severe irritation of the respiratory system.

Inhalation of vapors may cause coughing, chest pains, difficulty breathing, or unconsciousness.

Contact with liquid or vapor may cause severe irritation or burns of the skin, eyes, and mucous membranes.

Ingestion may cause severe burns to mouth, throat, and stomach. May have adverse effect on kidney function and may be fatal.

Ingestion is harmful and may be fatal.

Medical Conditions Generally Aggravated By Exposure

None Identified

Routes Of Entry

Inhalation, ingestion, eye contact, skin contact

Emergency and First Aid Procedures

CALL A PHYSICIAN.

If swallowed, do NOT induce vomiting; if conscious, give water, milk, or milk of magnesia.

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes.

Wash clothing before re-use.

SECTION UII - REACTIVITY DATA

Stability: Stable

Hazardous Polymerization: Will not occur

Conditions to Avoid:

heat, light, moisture

Incompatibles:

strong bases, combustible materials,
strong reducing agents, alkalies, most common metals, organic materials, alcohols, carbide

Decomposition Products:
oxides of nitrogen, hydrogen

SECTION UIII - SPILL AND DISPOSAL PROCEDURES

Steps to be taken in the event of a spill or discharge

Wear self-contained breathing apparatus and full protective clothing. Stop leak if you can do so without risk. Ventilate area. Neutralize spill with soda ash or lime. With clean shovel, carefully place material into clean, dry container and cover; remove from area. Flush spill area with water. Keep combustibles (wood, paper, oil, etc.) away from spilled material.

J. T. Baker Neutrasorb® or Neutrasol® "Low Na" acid neutralizers
Nitric Acid

SECTION I - PRODUCT IDENTIFICATION

Product Name: Nitric Acid
Formula: HNO₃
Formula Unit: 63.01
CAS No.: 7697-37-2
NOSH/ATCS No.: 05775000
Common Synonym: Hydrogen Nitrate
Product Code: 4801, 9605, 9602, 9598, 9608, 9601, 5371, 9597, 9600, 5113, 9616

PRECAUTIONARY LABELLING

BAKER SAF-T-DATA™ System

Health 3 0 3
Flammability
Reactivity
Contact

Laboratory Protective Equipment

Precautionary Label Statements

POISON! DANGER!
STRONG OXIDIZER - CONTACT WITH OTHER MATERIAL MAY CAUSE FIRE.
LIQUID AND VAPOR CAUSE SEVERE BURNS - MAY BE FATAL IF SWALLOWED.
HARMFUL IF INHALED AND MAY CAUSE DELAYED LUNG INJURY.
SPILLAGE MAY CAUSE FIRE OR LIBERATE DANGEROUS GAS.
Keep from contact with clothing and other combustible materials. Do not
store near combustible materials. Do not get in eyes, on skin, or clothing.
Avoid breathing vapor. Keep in tightly closed container. Use with
adequate ventilation. Wash thoroughly after handling. In case of fire,
flush with water. Flush spill area with water spray.

SECTION II - HAZARDOUS COMPONENTS

Component: Nitric Acid

CAS No. 65-75-0 7697-37-2

Continued on Page: 2
Nitric Acid

Effective: 10/01/85

SECTION V - HEALTH HAZARD DATA (Continued)

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes.

SECTION VI - REACTIVITY DATA

Stability: Stable

Hazardous Polymerization: Will not occur

Conditions to Avoid: Heat, light

Incompatibles: Strong bases, combustible materials, strong reducing agents

Decomposition Products: Oxides of nitrogen

SECTION VII - SPILL AND DISPOSAL PROCEDURES

Steps to be taken in the event of a spill or discharge:
Wear self-contained breathing apparatus and full protective clothing. Stop leak if you can do so without risk. Ventilate area. Neutralize spill with soda ash or lime. With clean shovel, carefully place material into clean, dry container and cover; remove from area. Flush spill area with water. Keep combustibles (wood, paper, oil, etc.) away from spilled material.

J. T. Baker Neutrasorb™ or Neutrasol™ "Low Na" acid neutralizers are recommended for spills of this product.

Disposal Procedure:
Dispose in accordance with all applicable federal, state, and local environmental regulations.

EPA Hazardous Waste Number: D002, D003 (Corrosive, Reactive 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 100 ppm, a chemical cartridge respirator with acid cartridge is recommended. Above this level, a self-contained breathing apparatus is advised.

Eye/Skin Protection:
Safety goggles and face shield, uniform, protective suit, acid-resistant gloves are recommended.

Continued on Page: 4
SECTION III - PHYSICAL DATA

Boiling Point: 120°C (248°F)
Melting Point: -42°C (-44°F)
Specific Gravity: 1.50

Evaporation Rate:

Nitric Acid

Solubility (H2O): Complete (in all proportions) Volatiles by Volume: 100

Appearance & Odor: Colorless liquid, with choking odor.

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

Flash Point: N/A
NFPA 704H Rating: 3-0-0 OXY

Fire Extinguishing Media
Use water spray.

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.

NFPA 704H Rating: 3-0-0 OXY

Strong oxidizer. Contact with other material may cause fire.

Toxic Gases Produced
nitrogen oxides

SECTION V - HEALTH HAZARD DATA

Threshold Limit Value (TLV/TWA): 5 mg/m³ (2 ppm)
Short-Term Exposure Limit (STEL): 10 mg/m³ (4 ppm)

Effects of Overexposure
Liquid may cause severe burns to skin and eyes.
Inhalation of vapors may cause severe irritation of the respiratory system.
Inhalation of vapors may cause coughing, chest pains, difficulty breathing, or unconsciousness.
Ingestion may be fatal.

Emergency and First Aid Procedures
If swallowed, do NOT induce vomiting. Give water, milk, or milk of magnesia.

Continued on Page: 3
SECTION IX - STORAGE AND HANDLING PRECAUTIONS

SAF-T-DATA™ Storage Color Code: Yellow

Special Precautions
Keep container tightly closed. Store separately and away from flammable and combustible materials.

SECTION X - TRANSPORTATION DATA AND ADDITIONAL INFORMATION

DOMESTIC (D.O.T.)

Proper Shipping Name Nitric acid (over 40%)
Hazard Class Oxidizer
UN/NA UN2031
Labels OXIDIZER, CORROSIVE
Reportable Quantity 1000 LBS.

INTERNATIONAL (I.M.O.)

Proper Shipping Name Nitric acid
Hazard Class B
UN/NA UN2031
Labels CORROSIVE

A = Not Applicable or Not Available

The information published in this Material Safety Data Sheet has been compiled from our experience and data presented in various technical publications. It is the user's responsibility to determine the suitability of this information for the adoption of necessary safety precautions. We reserve the right to revise Material Safety Data Sheets periodically as new information becomes available.
SECTION VII - SPILL AND DISPOSAL PROCEDURES (Continued)

Disposal Procedure

Dispose in accordance with all applicable federal, state, and local environmental regulations.

EPA Hazardous Waste Number: D002 (Corrosive 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 100 ppm, a chemical cartridge respirator with acid cartridge is recommended. Above this level, a self-contained breathing apparatus is advised.

Eye/Skin Protection: Safety goggles and face shield, uniform, protective suit, acid-resistant gloves are recommended.

SECTION IX - STORAGE AND HANDLING PRECAUTIONS

SAF-T-DATA™ Storage Color Code: Yellow

Special Precautions

Keep container tightly closed. Store separately and away from flammable and combustible materials.

SECTION X - TRANSPORTATION DATA AND ADDITIONAL INFORMATION

DOMESTIC (D.O.T.)

Proper Shipping Name: Nitric acid (over 40%) Poison - Inhalation Hazard
Hazard Class: Oxidizer
UN/NA: UN2831
Labels: OXIDIZER, CORROSIVE
Reportable Quantity: 1000 LBS.

INTERNATIONAL (I.M.O.)

Proper Shipping Name: Nitric acid
Hazard Class: 8
UN/NA: UN7031
Labels: CORROSIVE
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<th>N3660 - 02</th>
<th>Nitric Acid</th>
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<tr>
<td>Effective: 09/10/86</td>
<td>Issued: 09/12/86</td>
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The information published in this Material Safety Data Sheet has been compiled from our experience and data presented in various technical publications. It is the user's responsibility to determine the suitability of this information for the adoption of necessary safety precautions. We reserve the right to revise Material Safety Data Sheets periodically as new information becomes available.
MATERIAL SAFETY DATA SHEET

SECTION I - GENERAL INFORMATION

PRODUCT NAME: M-XYLENE 5G

DATA SHEET NO: R437012

CHEMICAL NAME: BENZENE, 1,3-DIMETHYL-

FORMULA: C₆H₄CH₃

CAS: 108-38-3

NRTECS: ZE2275000

SUBJECT TO THE REPORTING REQUIREMENTS OF SARA TITLE III, SECTION 313.

SYNONYMS: DIMETHYLBENZENE

MANUFACTURER: SUPELCO INC.

PHONE: 814-359-3441

ADDRESS: SUPELCO PARK, BELLEFONTE, PA 16823-0048

SECTION II - HAZARDOUS INGREDIENTS OF MIXTURES

<table>
<thead>
<tr>
<th>CHEMICAL NAME</th>
<th>COMMON NAME</th>
<th>PERCENTAGE</th>
<th>CAS</th>
<th>(FORMULA)</th>
<th>PEL(UNITS)</th>
<th>TLV(UNITS)</th>
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KEY TO SYMBOLS:

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<th>B</th>
<th>C</th>
<th>D</th>
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<tbody>
<tr>
<td>PEL</td>
<td>TLV</td>
<td>LD50</td>
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SECTION III - PHYSICAL DATA

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<tr>
<td>MELTING POINT</td>
<td>-48°C</td>
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<tr>
<td>SPECIFIC GRAVITY</td>
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<td>WATER SOLUBILITY</td>
<td>N/A</td>
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<td>APPEARANCE</td>
<td>CLEAR COLORLESS LIQUID</td>
</tr>
<tr>
<td>FLASH POINT</td>
<td>84°F</td>
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<tr>
<td>FLAMMABLE LIMITS</td>
<td>LEL 1.1 UEL 7</td>
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SECTION IV - FIRE AND EXPLOSION HAZARD DATA

EXTINGUISHING MEDIA

CO2, FOAM, DRY CHEMICAL

SPECIAL FIRE FIGHTING PROCEDURES

WEAR SELF CONTAINED BREATHING APPARATUS WHEN FIGHTING A CHEMICAL FIRE.

UNUSUAL FIRE AND EXPLOSION HAZARDS

FLASHBACK ALONG VAPOR TRAIL MAY OCCUR.
WHEN HEATED TO DECOMPOSITION, FORMS TOXIC

LD50 5000 MG/KG ORAL RAT
PEL 100 PPM

SECTION V - HEALTH HAZARD DATA

EMERGENCY AND FIRST AID PROCEDURES

EYES

TLV 100 PPM
**MATERIAL SAFETY DATA SHEET**

**DATE** 7/08/92

**CATALOG NO** 48582

**PRODUCT NAME** M-XYLENE 5G

**DATA SHEET NO** R437012

**M-XYLENE**

*CONTINUED*

**SECTION V - HEALTH HAZARD DATA**

**FLUSH EYES WITH WATER FOR 15 MINUTES.**

**CONTACT A PHYSICIAN.**

**SKIN**

**PROMPTLY WASH SKIN WITH MILD SOAP AND LARGE VOLUMES OF WATER.**

**REMOVE CONTAMINATED CLOTHING.**

**INHALATION**

**IMMEDIATELY MOVE TO FRESH AIR.**

**IF BREATHING STOPS, GIVE ARTIFICIAL RESPIRATION**

**CONTACT A PHYSICIAN**

**INGESTION**

**NEVER GIVE ANYTHING BY MOUTH TO AN UNCONSCIOUS PERSON**

**NEVER TRY TO MAKE AN UNCONSCIOUS PERSON VOMIT**

**DO NOT INDUCE VOMITING.**

**IMMEDIATELY CONTACT A PHYSICIAN.**

**EFFECTS OF OVEREXPOSURE**

**INHALATION MAY BE FATAL AS A RESULT OF SPASM, INFLAMMATION AND EDEMA OF THE LARYNX AND BRONCHI, CHEMICAL PNEUMONITIS AND PULMONARY EDEMA.**

**ANIMAL TERATOGEN, POSSIBLE REPRODUCTIVE HAZARD.**

**IRRITATES EYES**

**IRRITATES SKIN**

**DERMATITIS**

**IRRITATES NOSE AND THROAT**

**CHEST PAINS**

**PULMONARY EDEMA**

**HEADACHE**

**NAUSEA**

**DIZZINESS**

**GASTROINTESTINAL DISTURBANCES**

**DEPRESSES CENTRAL NERVOUS SYSTEM**

**LIVER DAMAGE**

**KIDNEY DAMAGE**

**REPORTED TERATOGEN**

**CORNEAL VACUOLIZATION.**

**SECTION VI - REACTIVITY DATA**

**STABILITY** STABLE.

**CONDITIONS TO AVOID**

N/A
SECTION VI - REACTIVITY DATA

INCOMPATIBILITY

OXIDIZING AGENTS

HAZARDOUS DECOMPOSITION PRODUCTS

N/A

HAZARDOUS POLYMERIZATION WILL NOT OCCUR.

CONDITIONS TO AVOID

N/A

SECTION VII - SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED

TAKE UP WITH ABSORBENT MATERIAL.

VENTILATE AREA.

ELIMINATE ALL IGNITION SOURCES.

WASTE DISPOSAL METHOD

COMPLY WITH ALL APPLICABLE FEDERAL, STATE, OR LOCAL REGULATIONS

SECTION VIII - SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (SPECIFIC TYPE)

WEAR FACE MASK WITH ORGANIC VAPOR CANISTER.

PROTECTIVE GLOVES

WEAR IMPERVIOUS GLOVES.

EYE PROTECTION

WEAR PROTECTIVE GLASSES.

VENTILATION

USE ONLY IN WELL VENTILATED AREA.
MATERIAL SAFETY DATA SHEET

W. R. Grace & Co.
62 Whittmore Ave.
Cambridge, MA 02140

MSDS Number: Z-8315
Cancel: New
Date Prepared: March 12, 1987

SECTION I - PRODUCT IDENTIFICATION

Trade Name and Synonyms:
Chemical Name and Family:

Formula: 

CAS#: 1318-00-9

DOT Hazard Class/ID# /Label:
Reportable Quantity (RQ):
Surface Freight Classification:

NPCHA-HMIS Hazard Index:

SECTION II - HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Percent by Weight</th>
<th>Exposure Limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Dust</td>
<td>Not Applicable</td>
<td>OSHA: 15mg/m³</td>
</tr>
<tr>
<td>Respirable Dust</td>
<td>Not Applicable</td>
<td>ACGIH: 10mg/m³</td>
</tr>
</tbody>
</table>

SECTION III - PHYSICAL/ CHEMICAL CHARACTERISTICS

Boiling Point: Not Applicable

Vapor Pressure (mm Hg.) Same as water

Vapor Density (AIR = 1) Same as water

Solubility in Water: Negligible

Specific Gravity (H₂O=1) 5-10pcf (Bulk Density

% Volatiles 10-40% water-based emulsion

Evaporation Rate: Same as water (Butyl Acetate = 1)

pH: Not Applicable
SECTION VII - PRECAUTIONS FOR SAFE HANDLING AND USE

Warning Statements:

CAUTION!

Product contains Vermiculite CAS #1318-00-9 premoistened with a water-based emulsion to control dust.
Contact with water reactive chemicals may result in explosion or release of hazardous vapors.
Inhalation of dust may cause coughing or sneezing.
Eye contact may cause minor physical irritation.

Precautionary Measures:

Do not use in moisture sensitive applications or with water reactive chemicals.
Keep packages sealed to prevent drying.
Avoid creating dust.
Avoid contact with eyes.

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

Clean spilled product quickly to minimize drying. Use methods to clean spill which avoid creating airborne dust. Remove for disposal.

Waste Disposal Method:

Discard empty packaging promptly. Avoid excessive handling of empty packaging, which may result in unnecessary release of airborne particulates.

According to EPA (40 CFR § 261.3) waste of this product is not defined as hazardous. Dispose of all waste in accordance with federal, state and local regulations.

SECTION VIII - CONTROL MEASURES

Respiratory Protection (Specify Type): Not generally required. A NIOSH Type TC-21C-XXX dust respirator may be desirable if dust is created in handling. However, dust levels are expected to be minimal as long as product remains moist.

Ventilation

Local Exhaust: Not generally required, but should be used where available.
Mechanical: Special: None
Other: None

Protective Gloves: Not generally required.

Eye Protection: Goggles recommended.

Other Protective Clothing or Equipment: Normal work clothes.

Work/Hygienic Practices: Observe precautions noted above.
MATERIAL SAFETY DATA SHEET

SECTION I - GENERAL INFORMATION
(Reorder Product by this No.)

PALOG NO 48572
PRODUCT NAME TOLUENE
DATA SHEET NO R495080

TOLUENE
CHEMICAL NAME BENZENE, METHYL-
FORMULA C6H5CH3
CAS 108-88-3 NTECS XS5250000
SYNONYM TOLUOL; METHYL BENZENE
MANUFACTURER SUPELCO INC.
ADDRESS SUPELCO PARK, BELLEFONTE, PA 16823-0048

SECTION II - HAZARDOUS INGREDIENTS OF MIXTURES
CHEMICAL NAME
COMMON NAME - PERCENTAGE - CAS #
(FORMULA) - PEL(UNITS) - TLV(UNITS)
LD50 VALUE - CONDITIONS

BOILING POINT 111 C
VAPOR PRESSURE 22 MM
SPECIFIC GRAVITY 0.870 G/ML
WATER SOLUBILITY 0.05
PEARLANCE CLEAR COLORLESS LIQUID
SWEET ODOR

SECTION III - PHYSICAL DATA

FLASH POINT 40 F
EXTINGUISHING MEDIA
WATER
CO2
FOAM
DRY CHEMICAL

SPECIAL FIRE FIGHTING PROCEDURES
WEAR SELF CONTAINED BREATHING APPARATUS WHEN FIGHTING A CHEMICAL FIRE.

UNUSUAL FIRE AND EXPLOSION HAZARDS
FLASHBACK ALONG VAPOR TRAIL MAY OCCUR.

SECTION V - HEALTH HAZARD DATA

LD50 636 MG/KG ORAL RAT
PEL 100 PPM

EMERGENCY AND FIRST AID PROCEDURES
YES
* CONTINUED *

FLUSH EYES WITH WATER FOR 15 MINUTES.
CONTACT A PHYSICIAN.

SKIN
PROMPTLY WASH SKIN WITH MILD SOAP AND LARGE VOLUMES OF WATER.
REMOVE CONTAMINATED CLOTHING.
CONTACT A PHYSICIAN.
WASH CLOTHING AND SHOES BEFORE REUSING.

INHALATION
IMMEDIATELY MOVE TO FRESH AIR.
GIVE OXYGEN IF BREATHING IS LABORED
IF BREATHING STOPS, GIVE ARTIFICIAL RESPIRATION
CONTACT A PHYSICIAN.

INGESTION
NEVER GIVE ANYTHING BY MOUTH TO AN UNCONSCIOUS PERSON
NEVER TRY TO MAKE AN UNCONSCIOUS PERSON VOMIT
DO NOT INDUCE VOMITING.
CONTACT A PHYSICIAN.

EFFECTS OF OVEREXPOSURE
CONTAINS MATERIAL(S) KNOWN TO THE STATE OF CALIFORNIA TO
CAUSE REPRODUCTIVE TOXICITY.
IRRITATES EYES
IRRITATES SKIN
DERMATITIS
IRRITATES NOSE AND THROAT
HEADACHE
NAUSEA
DIZZINESS
GASTROINTESTINAL DISTURBANCES
DEPRESSES CENTRAL NERVOUS SYSTEM
COMA
LIVER DAMAGE
KIDNEY DAMAGE
REPORTED MUTAGEN
RESPIRATORY FAILURE
LIQUID INGESTION MAY RESULT IN VOMITING; ASPIRATION OF VOMITUS INTO
THE LUNGS MAY RESULT IN CHEMICAL PNEUMONITIS AND PULMONARY EDEMA/HEMOR

SECTION VI - REACTIVITY DATA

STABILITY STABLE.
SECTION VI - REACTIVITY DATA

CONDITIONS TO AVOID
N/A

INCOMPATIBILITY
STRONG ACIDS
OXIDIZING AGENTS

HAZARDOUS DECOMPOSITION PRODUCTS
N/A

HAZARDOUS POLYMERIZATION WILL NOT OCCUR.

CONDITIONS TO AVOID

DO NOT WELD, HEAT OR DRILL ON OR NEAR CONTAINER; EVEN EMPTIED CONTAINERS CAN CONTAIN EXPLOSIVE VAPORS.

SECTION VII - SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED

TAKE UP WITH ABSORBENT MATERIAL.
VENTILATE AREA.
ELIMINATE ALL IGNITION SOURCES.

WASTE DISPOSAL METHOD

COMPLY WITH ALL APPLICABLE FEDERAL, STATE, OR LOCAL REGULATIONS

SECTION VIII - SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (SPECIFIC TYPE)

WEAR FACE MASK WITH ORGANIC VAPOR CANISTER.
WEAR NIOSH/OSHA APPROVED RESPIRATORY PROTECTION.

PROTECTIVE GLOVES

WEAR IMPERVIOUS GLOVES.
SECTION VIII - SPECIAL PROTECTION INFORMATION

EYE PROTECTION
WEAR PROTECTIVE GLASSES.

VENTILATION
USE ONLY IN WELL VENTILATED AREA.

SPECIAL
N/A

OTHER PROTECTIVE EQUIPMENT
N/A

SECTION IX - SPECIAL PRECAUTIONS

STORAGE AND HANDLING

THIS PRODUCT IS DESIGNATED AS A HAZARDOUS SUBSTANCE UNDER SECTION 311
OF THE CLEAN WATER ACT.
REFRIGERATE IN SEALED CONTAINER.
KEEP AWAY FROM HEAT.
KEEP AWAY FROM OXIDIZERS.
KEEP AWAY FROM IGNITION SOURCES.

OTHER PRECAUTIONS

AVOID EYE OR SKIN CONTACT.
AVOID BREATHING VAPORS.

WHILE THE INFORMATION AND RECOMMENDATIONS SET FORTH HEREIN ARE BELIEVED TO BE
ACCURATE AS OF THE DATE HEREOF, SUPELCO, INC. MAKES NO WARRANTY WITH RESPECT
THERETO AND DISCLAIMS ALL LIABILITY FROM RELIANCE THEREON.

LAST REvised 7/08/92
We, Analytical Products, Inc. have determined that the products listed below (or attached), which are sold to American Scientific Products and/or American Physicians Service & Supply are covered by the Federal OSHA Hazard Communications Rule and/or respective state Right-to-Know laws. Therefore, a Material Safety Data Sheet has not been prepared for the product(s).

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<th>American S/P or APSLS Cat. No.</th>
<th>Mfr. Cat. No.</th>
<th>Item Description</th>
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<td>H7590-2A</td>
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<tr>
<td></td>
<td>12155</td>
<td>pH 10.00 Calibrating Buffer</td>
</tr>
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</table>
Dear MSDS Requestor:

Enclosed are the MSDS's you recently requested (along with a copy of your request). The MSDS's have been arranged in the order presented on your request.

The following is an explanation of codes used in processing your request.

✓ = An MSDS and/or a non-hazardous determination has been provided for this product.

✗ = Product highlighted in GREEN. The product information you supplied did not cross-reference to a specific MSDS. Recheck the product information and refresh the product description, catalog # and manufacturer's name on the enclosed postage-paid request card.

◪ = Product highlighted in YELLOW. Neither an MSDS nor a non-hazardous determination has been provided to us at this time. We will hold your request in a pending file until MSDS information becomes available. We will then follow-up on your request.

I = This product is considered an ARTICLE. No MSDS is required. Refer to 29 CFR 1910.1200 b6 & c.

= Refer to Baxter Diagnostics, Inc. letter for an MSDS statement regarding Baxter Diagnostics products (Dade, Paramax, Stema, etc.).

↑ = Duplicate catalog # and/or multiple catalog #’s found on the same document provided earlier in this request.

$ = We do not distribute this Sigma Diagnostics product. A copy of your request has been forwarded to Sigma in St. Louis, Missouri. You should receive a direct response from them.

Ø = We do not distribute this product, therefore, MSDS information has not been included. Contact the manufacturer listed on the label of the product.

◱ = This product is the responsibility of ___________________________________ division of Baxter. We have forwarded your request to them. You should receive a response from them directly.

◳ = Chem Service Product. MSDS is obtained through your regional Baxter customer service representative. We have forwarded your request. You should receive a response from him/her directly.

Thank you for purchasing from Scientific Products.

Audrey

(MSDS Clerk)
Burdick Healthcare Corporation
Burdick & Jackson Division
1953 South Harvey Street
Muskegon, MI 49442 USA

information/emergency telephone no. 818.728.3171
chemist/telephone no. 800.424.9300
canadian emergency telephone no. 613.992.8686

MATERIAL SAFETY
DATA SHEET

METHANOL

I. Identification

chemical name Methanol
molecular weight 32.04
chemical family Alcohol
formula CH₃OH
synonyms Carbinol, Methyl Alcohol, Wood Alcohol
DOT proper shipping name Methyl Alcohol or Methanol
DOT hazard class Flammable Liquid
DOT identification no. UN1230, CAS no. 67-56-1

II. Physical and Chemical Data

boiling point, 760mm Hg 64.7°C freezing point -97.7°C evaporation rate (BuAc=1) ca 5
vapor pressure at 23°C 97 mm Hg vapor density (air=1) 1.11 solubility in water stable @ 20°C complete
% volatiles by volume ca 100 specific gravity (H₂O=1) @ 20°C 0.792 stability
hazardous polymerization Not expected to occur.
appearance and odor A clear, colorless liquid with a slight alcoholic odor.
conditions to avoid Heat, sparks, open flame, open containers, and poor ventilation.

materials to avoid Strong oxidizing agents and reactive metals which will displace hydrogen.
hazardous decomposition products Incomplete combustion can generate carbon monoxide and other toxic vapors such as formaldehyde.

III. Fire and Explosion Hazard Data

flash point, (test method) 12°C (Tag closed cup) auto ignition temperature 385°C
flammable limits in air % by volume: lower limit 6.7 upper limit 36.5
unusual fire and explosion hazards May burn with an Invisible flame. Mixtures with water as low as 21% by volume are still flammable (flash point below 37.8°C). Under some circumstances can corrode certain metals, including aluminum and zinc, and generate hydrogen gas.

extinguishing media Carbon dioxide, dry chemical, alcohol foam, water mist or fog.
special fire fighting procedures Wear full protective clothing and self-contained breathing apparatus.

Heat will build pressure and may rupture closed storage containers.
Keep fire-exposed containers cool with water spray.

IV. Hazardous Components

Methanol % ca 100 TLV 200 ppm (skin) CAS no. 67-56-1

Burdick & Jackson's Disclaimer: The information and recommendations presented in this Material Safety Data Sheet are based on sources believed to be reliable at the date hereof. Burdick & Jackson makes no representation on its completeness or accuracy and it is the user's responsibility to determine if product's suitability for its intended use, the product's safe use, and the product's proper disposal. No representations or warranties, either express or implied, of merchantability or fitness for a particular purpose or of any kind are made with respect to the information provided in this Material Safety Data Sheet or the product to which such information refers. Burdick & Jackson neither assumes nor authorizes any other person to assume for it, any other or additional liability or responsibility resulting from the use of, or reliance upon, this information.
V. Health Hazards

Occupational Exposure Limits

<table>
<thead>
<tr>
<th>Agency</th>
<th>TLV-TWA</th>
<th>STEL</th>
<th>Ceiling</th>
</tr>
</thead>
<tbody>
<tr>
<td>OSHA</td>
<td>200 ppm</td>
<td>250 ppm</td>
<td>not listed</td>
</tr>
<tr>
<td>ACGIH</td>
<td>200 ppm</td>
<td>250 ppm</td>
<td></td>
</tr>
<tr>
<td>NIOSH</td>
<td>200 ppm</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Concentration Immediately Dangerous to Health

<table>
<thead>
<tr>
<th>Agency</th>
<th>Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>OSHA/NIOSH</td>
<td>25,000 ppm</td>
</tr>
<tr>
<td>Odor Threshold</td>
<td>10 ppm</td>
</tr>
<tr>
<td></td>
<td>2000 ppm</td>
</tr>
</tbody>
</table>

Carcinogenic Data

Methanol is not listed as a carcinogen by IARC, NTP; OSHA, or ACGIH.

Primary Routes of Entry

Methanol may exert its effects through inhalation, skin absorption, and ingestion.

Industrial Exposure: Route of Exposure/Signs and Symptoms

Inhalation: Exposure can cause drowsiness and intoxication, headache, visual disturbance leading to blindness, coughing and shortness of breath, collapse and death at high concentrations.

Eye Contact: Liquid can cause moderate burning, watering, swelling, and redness; high vapor concentration (greater than 2000 ppm) may cause same symptoms.

Skin Contact: This substance may be absorbed through intact skin and produce toxic effects. Extensive, repeated, and/or prolonged skin contact can cause burning, itching, redness, or blisters.

Ingestion: Causes burning of the gastrointestinal tract and toxic effects. Swallowing more than 2 ounces of methanol can cause death.

Effects of Overexposure

Mild poisoning is characterized by fatigue, nausea, headache, and delayed visual blurring. Moderate intoxication results in severe depression. Temporary or permanent blindness may follow in 2-6 days. In severe poisoning, symptoms progress to rapid, shallow respiration, cyanosis, coma, hypotension, dilated pupils, and visual disturbance. Death may result from respiratory failure.

Medical Condition Aggravated by Exposure

Preclude exposure to those individuals with diseases of eyes, liver, kidneys, and lungs.
Emergency First Aid

Inhalation: Immediately remove to fresh air. If not breathing, administer mouth-to-mouth rescue breathing. If there is no pulse administer cardiopulmonary resuscitation (CPR). Contact physician immediately.

Eye Contact: Rinse with copious amounts of water for at least 15 minutes. Get emergency medical assistance.

Skin Contact: Flush thoroughly for at least 15 minutes. Wash affected skin with soap and water. Remove contaminated clothing and shoes. Wash clothing before re-use, and discard contaminated shoes. Get emergency medical assistance.

Ingestion: Call local Poison Control Center for assistance. Contact physician immediately. Never induce vomiting or give anything by mouth to a victim unconscious or having convulsions.

Note to Physician

In case of ingestion or massive inhalation, observe victim as an inpatient because slow metabolism causes a latent period of 24 hours between exposure and acidosis and blindness.

VI. Safety Measures and Equipment

Ventilation: Adequate ventilation is required to protect personnel from exposure to chemical vapors exceeding the PEL and to minimize fire hazards. The choice of ventilation equipment, either local or general, will depend on the conditions of use, quantity of material, and other operating parameters.

Respiratory: Use approved respirator equipment. Follow NIOSH and equipment manufacturer's recommendations to determine appropriate equipment (air-purifying, air-supplied, or self-contained breathing apparatus).

Eyes: Safety glasses are considered minimum protection. Goggles or face shield may be necessary depending on quantity of material and conditions of use.

Skin: Protective gloves and clothing are recommended. The choice of material must be based on chemical resistance and other user requirements. Generally, neoprene, nitrile rubber, or rubber offer acceptable chemical resistance. Individuals who are acutely and specifically sensitive to methanol may require additional protective equipment.
Storage: Methanol should be protected from temperature extremes and direct sunlight. Proper storage of methanol must be determined based on other materials stored and their hazards and potential chemical incompatibility. In general, methanol should be stored in an acceptably protected and secure flammable liquid storage room.

Other: Emergency eye wash fountains and safety showers should be available in the vicinity of any potential exposure. Ground and bond metal containers to minimize static sparks.

VII. Spill and Disposal Data

Spill Control: Protect from ignition. Wear protective clothing and use approved respirator equipment. Absorb spilled material in an absorbent recommended for solvent spills and remove to a safe location for disposal by approved methods. If released to the environment, comply with all regulatory notification requirements. CERCLA Reportable Quantity -- 5,000 lbs.

Waste Disposal: Dispose of methanol as an EPA hazardous waste. Contact state environmental agency for listing of licensed hazardous waste disposal facilities and applicable regulations. Hazardous waste numbers: U154(ignitable); D001(ignitable).

VIII. SARA/Title III Data

<table>
<thead>
<tr>
<th>Hazard Classification</th>
<th>Chemical Listings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Immediate Health</td>
<td>Extremely Hazardous Substances No</td>
</tr>
<tr>
<td>Delayed Health</td>
<td>CERCLA Hazardous Substances Yes</td>
</tr>
<tr>
<td>Fire</td>
<td>Toxic Chemicals</td>
</tr>
<tr>
<td>Sudden Release</td>
<td>Yes</td>
</tr>
<tr>
<td>Reactive</td>
<td></td>
</tr>
</tbody>
</table>

Methanol is subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA) and 40CFR Part 372. This product does not contain any other toxic chemical above 1% concentration or a carcinogen above 0.1% concentration.

Revision Date: July, 1989

KEY

ca    Approximately
na    Not applicable
C     Ceiling

STEL  Short Term Exposure Level (15 minutes)
TLV   Threshold Limit Value
TWA   Time Weighted Average (8 hours)
BuAc  Butyl Acetate

CERCLA Comprehensive Environmental Response, Compensation and Liability Act
**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.

**PRODUCT NAME:** VOLCLAY GROUT

**MANUFACTURER’S INFORMATION**

Manufacturer's Name & Address:
American Colloid Company  
1500 West Share Drive  
One North Arlington  
Arlington Heights, Illinois 60004

Emergency Telephone Number: 708-392-4600  
Telephone Number for Information: 708-392-4600  
Date Prepared: July 3, 1994

**Hazardous Components**  

<table>
<thead>
<tr>
<th>Chemical Identity</th>
<th>Common Name(s)</th>
<th>OSHA REL</th>
<th>ACGIH TLV</th>
<th>Other Limits (optional)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crystalline Quartz</td>
<td>CAS: 14808-60-7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Respirable Crystalline Quartz</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Present (TWA)</td>
<td>0.1mg/m³</td>
<td>0.1mg/m³ TWA</td>
<td>50ug/m³ TWA</td>
<td>&lt;2%</td>
</tr>
<tr>
<td>Proposed (TWA)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>nuisance Dust</td>
<td>Respirable</td>
<td>5mg/m³</td>
<td>5mg/m³</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total Dust</td>
<td>15mg/m³</td>
<td>10mg/m³</td>
<td></td>
</tr>
</tbody>
</table>

**PRODUCT IDENTIFICATION**

- **Chemical Name:** Bentonite Clay  
- **Chemical Family:** Natural Mineral, Montmorillonite  
- **CAS No.:** 1302-78-9  
- **FORMULA:** Naturally occurring hydrated aluminosilicate of sodium, calcium, magnesium, and iron  
- **NPPA/NMIS:** Health - 1, Fire - 0, Reactivity - 0, Specific Hazard - See Section VI  
- **DOT Class:** Not Regulated  

*WARNING:* This clay product contains a small amount of crystalline silica which may cause delayed respiratory disease if inhaled over a prolonged period of time. Avoid breathing dust. Use NIOSH/OSHA approved respirator where TWA for crystalline silica may be exceeded. IARC Monographs on the evaluation of the carcinogenic risk of chemicals to humans (volume 42, 1987) concludes that there is "limited evidence" of the carcinogenicity of crystalline silica to humans. IARC classification 2A.
PRODUCT NAME: VOLCLAY GROUT

Section III

PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point - Not Applicable
Vapor Pressure (mm Hg.) - Not Applicable
Vapor Density (Air = 1) - Not Applicable
Solubility in Water - Negligible
Appearance and Odor - Pale gray to buff powder or granules, odorless

Section IV

FIRE AND EXPLOSION HAZARD DATA

Flash Point (Method Used) - Not Applicable
Flammable Limits - Not Applicable
Extinguishing Media - Not Applicable
Special Fire Fighting Procedures - Inorganic Mineral/Non-Flammable
Unusual Fire and Explosion Hazards - Not Applicable

Section V

REACTIVITY DATA

Stability - Unstable
Conditions to Avoid - None Known

Section VI

HEALTH HAZARD DATA

Route(s) of Entry:
Inhalation? Yes
Skin? No
Ingestion? No

Health Hazards (Acute and Chronic) - May cause delayed respiratory disease if dust inhaled over a prolonged period of time.

Carcinogenicity:
OSHA Regulated? No
IARC Monographs? Yes

Signs and Symptoms of Exposure - Excessive inhalation of dust may result in shortness of breath and reduced pulmonary function.

Medical Conditions Generally Aggravated by Exposure - Individuals with pulmonary and or respiratory disease including but not limited to asthma and bronchitis should be precluded from exposure to dust.

Emergency and First Aid Procedures:
Eyes - Flush with water.
Skin - Wash with soap and water.
Inhalation - Remove patient to fresh air; give oxygen.
PRODUCT NAME: VOLCLAY GROUT

Section VII

PRECAUTIONS FOR SAFE HANDLING AND USE

Steps to be Taken in Case Material is Released or Spilled - Vacuum if possible to avoid generating airborne dust. Avoid breathing dust. Use an approved respirator. Avoid adding water, the product will become slippery when wet.

Waste Disposal Method - Follow federal, state and local regulations for solid waste.

Precautions to Be Taken in Handling and Storing - Avoid breathing dust, use NIOSH/NIOSH approved respirator where TLV limits for Crystalline Silica may be exceeded.

Other Precautions - Slippery when wet.

Section VIII

CONTROL MEASURES

Respiratory Protection (Specify Type) - OSHA standard 1910.134 or ANSI Z88.2-1980 specification.

Ventilation - Local Exhaust - As appropriate Special - None
Mechanical - General - As appropriate Other - None

Protective Gloves - Not Required Eye Protection - Recommended

Other Protective Clothing or Equipment - None

Work/Hygiene Practices - Use good housekeeping practices.

The information herein has been compiled from sources believed to be reliable and is accurate to the best of our knowledge. However, American Colloid Company cannot give any guarantees regarding information from other sources, and expressly does not make any warranties, nor assumes any liability, for its use.
AMERICAN COLLOID COMPANY
One North Arlington • 1500 West Shure Drive
Arlington Heights, Illinois 60005-4338 • USA
(708) 392-4600 • Fax (708) 392-4609

MATERIAL SAFETY DATA SHEET • May be used to comply with OSHA's Hazard Communication Standard,

PRODUCT NAME: GROTH INITIATOR

Section I MANUFACTURER'S INFORMATION

Manufacturer's Name & Address:
American Colloid Company
1500 West Shure Drive
One North Arlington
Arlington Heights, Illinois 60005

Emergency Telephone Number: 708-392-4600
Telephone Number for Information: 708-392-4600
Date Prepared: August 31, 1988

Section II HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

Hazardous Components
(Specific Chemical Identity: Common Name(s))

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>Other Limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MgO - Magnesium Oxide</td>
<td>100%</td>
</tr>
</tbody>
</table>

Nuisance Dust
Respirable
5mg/m³
5mg/m³

Total Dust
15mg/m³
10mg/m³

PRODUCT IDENTIFICATION

Chemical Name: Magnesium Oxide
Chemical Family: Alkaline Earth Oxide
CAS No.: 1309-46-4
FORMULA: MgO

WFPA/NFPA: Health - 0, Fire - 0, Reactivity - 0, Specific Hazard - None

Section III PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point
Vapor Pressure (mm Hg.)
Vapor Density (AIR = 1)
Solubility in Water
Appearance and Odor

Not Applicable
Not Applicable
Not Applicable
Insoluble
Off-white granular material, no distinguishable odor.

Section IV FIRE AND EXPLOSION HAZARD DATA

Flash Point (Method Used)
Flammable Limits
Extinguishing Media
Special Fire Fighting Procedures
Unusual Fire and Explosion Hazards

Not Applicable
Not Applicable
Not Applicable
Inorganic Non-flammable
Not Applicable
PRODUCT NAME: GROUT INITIATOR

Section V  REACTIVITY DATA

<table>
<thead>
<tr>
<th>Stability</th>
<th>Unstable</th>
<th>Stable</th>
<th>X</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conditions to Avoid</td>
<td>Keep material dry; it hydrates slowly with generation of some heat.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Incompatibility (Materials to Avoid) - None Known

Hazardous Decomposition or By-products - None Known

Hazardous Polymerization - May Occur

Conditions to Avoid - None Known

Section VI  HEALTH HAZARD DATA

<table>
<thead>
<tr>
<th>Route(s) of Entry</th>
<th>Inhalation?</th>
<th>Yes</th>
<th>Skin?</th>
<th>Yes</th>
<th>Ingestion?</th>
<th>No</th>
</tr>
</thead>
</table>

Health Hazards (Acute and Chronic) - Can cause irritation to the eyes on contact and to the skin on prolonged contact. Avoid dusty conditions; dust tends to dehydrate mucous membranes.

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

Signs and Symptoms of Exposure - Irritation of eyes or skin becomes apparent.

Medical Conditions Generally Aggravated by Exposure - None Known

Emergency and First Aid Procedures - Eyes--Flush thoroughly with water; consult physician.
- Skin--Wash off using mild soap and water.

Section VII  PRECAUTIONS FOR SAFE HANDLING AND USE

Steps to be Taken in Case Material is Released or Spilled - Vacuum if possible to avoid generating airborne dust. Avoid breathing dust. Wear an approved respirator if TLV for nuisance dust may be exceeded. Avoid adding water; the product will become slippery when wet.

Waste Disposal Method - Disposal in accordance with federal, state and local regulations for solid wastes.

Precautions to Be Taken In Handling and Storing - Avoid breathing dust. Use NIOSH/MSHA approved respirator where TLV limits for nuisance dust may be exceeded.

Other Precautions - Slippery when wet.
<table>
<thead>
<tr>
<th>Section VIII</th>
<th>CONTROL MEASURES</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Respiratory Protection</strong> (Specify Type) - NIOSH approved, with approval TC-21C-XXX</td>
<td></td>
</tr>
<tr>
<td>Ventilation - Local Exhaust - As appropriate</td>
<td>Special - None</td>
</tr>
<tr>
<td>Protective Gloves - Mechanical (General) - As appropriate</td>
<td>Other - None</td>
</tr>
<tr>
<td>Eye Protection - Recommended</td>
<td></td>
</tr>
<tr>
<td>Other Protective Clothing or Equipment - As appropriate to minimize exposure.</td>
<td></td>
</tr>
<tr>
<td>Work/Hygiene Practices - Use good housekeeping practices.</td>
<td></td>
</tr>
</tbody>
</table>
Product Trade Name: AMMONIA INHALANTS
Chemical Name & Synonyms: AMMONIA, WATER & ALCOHOL
Chemical Family: Formula

National Fire Protection Association 704M Signal (or estimate)
Health: Fire: Reactivity: Specific Hazard:

HAZARDOUS INGREDIENTS

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>%</th>
<th>TLV (Units)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMMONIA</td>
<td>15</td>
<td>50 PPM</td>
</tr>
<tr>
<td>AMMONIA</td>
<td>35</td>
<td>UNK</td>
</tr>
</tbody>
</table>

PHYSICAL DATA

c. Vapor density (Air = 1) LESS THAN 1

d. Solubility in water (%) COMPLETE

e. Specific gravity (H₂O = 1) 0.93

f. Per cent volatile by volume 35%

EXPLOSION HAZARD DATA

a. Flash point, closed cup, °F 87° OPEN CUP

b. Lower flammability limits in air, LEL 0

c. Upper flammability limits in air, UEL 0

d. Extinguishing media: CO₂, WATER

e. Special fire fighting procedures: N/A

HEALTH HAZARD DATA

a. Physiological Properties:

1. Acute oral toxicity (LD₅₀ if available): 22.6 GMS/KG IN RATS (ESTIMATE)

2. Local effects to eyes: IRRITATING TO EYES

3. Local effects to skin: IRRITATING TO MUCOUS MEMBRANES

4. Sensitizing effects: UNKNOWN

5. Dermal absorption (LD₅₀ if available): N/A

6. Inhalation effects (LC₅₀ if available): N/A

7. Threshold Limit Value (or estimate): 100 PPM (ESTIMATE)
MATERIAL SAFETY DATA SHEET

--- PRODUCT IDENTIFICATION ---

MANUFACTURER'S NAME: JAMES ALEXANDER CORP.
TEL. NO.: (908) 362-9266

ADDRESS: 245 ROUTE 94 BLAIRSTOWN, NJ 07825

EMERGENCY ASSISTANCE: CHEMTREC 800-424-9300

TRADE NAME: AMMONIA INHALANT SOLUTION

SYNONYMS: N/A

O.O.T. SHIPPING NAME: FLAMMABLE CORROSIVE LIQUID N.O.S. US 2924

--- HAZARDOUS INGREDIENTS ---

<table>
<thead>
<tr>
<th>MATERIAL OR COMPONENT</th>
<th>CAS NO.</th>
<th>OSHA PEL</th>
<th>ACGIH TLV</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMMONIA</td>
<td>7664-41-7</td>
<td>17.5</td>
<td>50PPM</td>
</tr>
<tr>
<td>ETHYL ALCOHOL</td>
<td>64-17-5</td>
<td>37.5</td>
<td>1000PPM</td>
</tr>
</tbody>
</table>

--- PHYSICAL DATA ---

BOILING POINT: N/A FOR MIXTURES
MELTING POINT: -17 DEGREES C
SPECIFIC GRAVITY: 0.891 25/25
VAPOR DENSITY: UNKNOWN
VAPOR PRESSURE: UNKNOWN
SOLUBILITY IN H2O: VERY SOLUBLE

% VOLATILES BY VOL.: 55%
EVAPORATION RATE (BUTYL ACETATE=1): UNKNOWN

APPEARANCE AND ODOR: CLEAR, PINK TO LIGHT RED LIQUID. PUNGENT ODOR OF AMMONIA.

PH: UNKNOWN
MATERIAL SAFETY DATA SHEET

IV. FIRE & EXPLOSION INFORMATION

SM POINT: LESS THAN 50 DEGREES F
AUTO IGNITION TEMP: AMMONIA 651 DEG.C
TEST METHOD: PENSKY MARIENS CLOSED CUP
ETHYL ALCOHOL 423 DEG.C

FLAMMABLE LIMITS IN AIR % BY VOLUME
LOWER UNKNOWN
UPPER UNKNOWN

EXTINGUISHING MEDIA: WATER, ALCOHOL FOAM, CO2 OR DRY CHEMICAL

SPECIAL FIRE FIGHTING PROCEDURES: REMOVE ALL SOURCES OF IGNITION. SPRAY EXTINGUISHING MEDIA DIRECTLY INTO BASE OF FLAMES.

UNUSUAL FIRE AND EXPLOSION HAZARD: WHEN HEATED, MIXTURE WILL GIVE OFF AMMONIA GAS. A STRONG IRRITANT TO EYES, RESPIRATORY TRACT, & MUCOUS MEMBRANES. CLOSED CONTAINERS EXPOSED TO HEAT MAY DEVELOP PRESSURE. COMBUSTION OF RELEASED AMMONIA MAY FORM NITROGEN OXIDES.

V. HEALTH HAZARD INFORMATION

PRIMARY ROUTES OF EXPOSURE: INHALATION

SIGNS AND SYMPTOMS OF EXPOSURE: SEVERE EXPOSURE:

INHALATION: IRRITATION, HEADACHE, COUGHING, SEVERE LUNG CONGESTION, BREATHING DIFFICULTY.

EYE CONTACT: BURNS, MAY LEAD TO BLINDNESS.

SKIN CONTACT: LOCAL IRRITATION, BURNS.

INGESTION: BURNING PAIN IN MOUTH, THROAT. CONSTRUCTION OF THROAT. COUGHING. FOLLOWED BY VOMITING OR DIARRHEA. ORAL LOSS FOR AMMONIUM HYDROXIDE = 350 MG/KG

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: INDIVIDUALS WITH PRE-EXISTING SKIN DISORDERS. EYE PROBLEMS. OR IMPAIRED RESPIRATORY FUNCTION MAY BE MORE SUSCEPTIBLE TO THE EFFECTS OF OVEREXPOSURE.
VI. FIRST AID MEASURES

INHALATION: FOR EXPOSURE. REMOVE SUBJECT IMMEDIATELY TO FRESH AIR. GIVE ARTIFICIAL RESPIRATION IF VICTIM IS NOT BREATHING. GET IMMEDIATE MEDICAL ATTENTION.

FOR EYE CONTACT: FLUSH WITH COPIOUS AMOUNTS OF WATER FOR 15 MINUTES. EYELIDS SHOULD BE HELD APART AND AWAY FROM EYEBALL FOR THOROUGH RINSING. GET IMMEDIATE MEDICAL ATTENTION.

FOR SKIN CONTACT: FLUSH WITH COPIOUS AMOUNTS OF WATER. DO NOT RUB OR APPLY OINTMENT TO AFFECTED AREA. OBTAIN MEDICAL ATTENTION IF IRRITATION PERSISTS AFTER WASHING.

FOR INGESTION: CONTACT A POISON CONTROL CENTER IMMEDIATELY. DO NOT INDUCE VOMITING. GET IMMEDIATE MEDICAL ATTENTION. DO NOT GIVE ANYTHING BY MOUTH TO AN UNCONSCIOUS OR CONVULSING PERSON. KEEP VICTIM'S HEAD BELOW HIS HIPS, IF VOMITING TO PREVENT BREATHING OF VICTIM'S OWN VOMITUS.

VII. TOXICITY DATA

NONE OF THE COMPONENTS PRESENT IN THE SOLUTION ARE CURRENTLY CLASSIFIED AS CARCINOGENS IN THE NTP ANNUAL REPORT ON CARCINOGENS OR IN THE IARC MONOGRAPHS.

VIII. PERSONAL PROTECTION

INHALATION: NOT REQUIRED FOR PRODUCT (INHALANT) USE. IN CASE OF SPILL OR IF VAPOR CONCENTRATION IS HIGH, USE A NIOSH APPROVED AMMONIA/METHYL AMINE RESPIRATOR. MAINTAIN AMMONIA CONCENTRATION TO 50 PPM OR LESS.

EYE PROTECTION: NOT REQUIRED FOR PRODUCT (INHALANT) USE. WHEN HANDLING BULK MATERIAL, ALWAYS WEAR GAS-TIGHT, SPLASH-PROOF CHEMICAL SAFETY GOGGLES. IT IS GENERALLY RECOGNIZED THAT CONTACT LENSES SHOULD NOT BE USED WHEN WORKING WITH CHEMICALS BECAUSE CONTACT LENSES MAY CONTRIBUTE TO THE SEVERITY OF AN EYE INJURY.

GLOVES: NOT REQUIRED FOR PRODUCT (INHALANT) USE. USE RUBBER GLOVES AND OVERSHOES WHEN HANDLING BULK MATERIAL.

IX. HAZARDOUS REACTIVITY

AMMONIA COMPONENT WILL DECOMPOSE TO HYDROGEN AND NITROGEN GASES ABOVE 450 DEGREES C.

CONDITIONS TO AVOID: AVOID MIXING WITH ACIDS, HYPOCHLORITES (CHLORINE BLEACH), HALOGENS, SODIUM HYDROXIDE. AVOID CONTACT WITH IRON, GALVANIZED SURFACES, COPPER, BRASS, BRONZE, ALUMINUM ALLOYS, MERCURY. GOLD, SILVER, STRONG OXIDIZERS. AVOID HEATING.
SPILL LEAK AND DISPOSAL PROCEDURES

FOR LARGE SPILLS, EXTINGUISH ALL SOURCES OF IGNITION. STOP LEAK IF YOU CAN DO SO WITHOUT RISK. WEAR RESPIRATORY PROTECTION AND PROTECTIVE CLOTHING. CONTAIN BY DIKING WITH NON-COMBUSTIBLE ABSORBENT MATERIALS AND PLACE RESIDUE IN DOT APPROVED WASTE CONTAINER.

COMPLY WITH ALL APPLICABLE LOCAL, STATE AND FEDERAL REGULATIONS ON SPILL REPORTING, HANDLING AND DISPOSAL OF WASTE.

OTHER PRECAUTION: CONTAINERS, EVEN THOSE THAT HAVE BEEN EPTIED, WILL RETAIN PRODUCT RESIDUE AND VAPORS. HANDLE EMPTY CONTAINERS AS IF THEY WERE FULL.

PREPARED BY: DAVID ROBINSON
TITLE: VICE PRESIDENT
PREPARATION DATE: JUNE 1989
LATEST REVISION DATE: MARCH 1993

JAMES ALEXANDER CORPORATION (JAC) EXPRESSLY DISCLAIMS ALL EXPRESS OR IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO THE PRODUCT OR INFORMATION PROVIDED HEREIN.

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I. PRODUCT IDENTIFICATION

PRODUCT: Isobutylene

CHEMICAL NAME: 2-Methylpropene

I. PRODUCT IDENTIFICATION

PRODLIC1' isoburylene

II. HAZARDOUS INGREDIENTS

For mixtures of this product request the respective component Material Safety Data Sheets. See Section IX.

MATERIAL (CAS NO.): 2-Methylpropene (115-11-7)

WT (%): 100

1980-1991 ACIGIN TLV-TWA (OSHA-Pel): None currently established (None currently established)

III. PHYSICAL DATA

BOILING POINT: 750 mm, Hg, -6.9°C (~19.6°F)

SPECIFIC GRAVITY (H₂O = 1): 0.6002 at 20°C

VAPOR DENSITY (air = 1): 1.9677 at 21°C

PERCENT VOLATILES BY VOLUME: 100

FREEZING POINT: -140.34°C (~220.6°F)

VAPOR PRESSURE AT 20°C: 24.3 psig

SOLUBILITY IN WATER, % BY WT.: Negligible

EVAPORATION RATE: (Budry Airea = 1) High

APPEARANCE AND ODOR: Colorless gas at normal temperature and pressure; odor of coal gas, mild sweetish odor.

IV. HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE: See Section II.

EFFECTS OF A SINGLE (ACUTE) OVEREXPOSURE:

Swallowing: An unlikely route of exposure. This product is a gas at normal temperature and pressure, but instills of the nose and mouth may result from contact with the liquid.

Skin Absorption: No evidence of adverse effects from multiple irritations. Inhalation: May be mildly irritating to mucous membranes. At high concentrations, may cause drowsiness. At very high concentrations, may act as an anesthetic and cause unconsciousness. Lack of oxygen can cause death.

Eye Contact: Exposure to liquid may cause burning.

Effects of Repeated (Chronic) Overexposure:

Repeated or prolonged exposure may cause dermatitis.

Other Effects of Overexposure:

None currently known.

MEDICAL CONDITIONS AGGRAVATED BY OVEREXPOSURE:

None currently known.

EMERGENCY AND FIRST AID PROCEDURES:

Swallowing: This product is a gas at normal temperature and pressure.

Skin Contact: For exposure to liquid, immediately wash area with warm water and soap to safe 100°F. In case of massive exposure, remove clothing. Eye Contact: Exposure to liquid may cause burning.

Hazardous: Remove to fresh air. Give artificial respiration if necessary. Call a physician.

VOTES TO PHYSICIAN: This product may be a cardiac anesthetist; avoid the use of stimulants. There is no specific antidote, and treatment of overexposure should be directed at the control of symptoms and the cardiac condition.

V. FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (test method): -78°C (~105°F) T.C.C.

 autoignition temperature: 465°C (869°F)

SPECIAL FIRE FIGHTING PROCEDURES:

Precaution: 1. Do not expose containers to a source of inflaming or autoignition. 2. Do not use water. 3. Do not use fire extinguishers causing violent reactivity. 4. Water may cause violent reactivity. 5. Avoid the use of water.

UNUSUAL FIRE AND EXPLOSION HAZARDS:

Refractory gas forms explosive mixtures with air and dusting agents. Consumer may rupture due to heat of fire. Do not attempt to extinguish with water. Do not attempt to extinguish with water.

VI. REACTIVITY DATA

HAZARDOUS POLYMERIZATION: May occur.

VII. SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED:

DAMAGED: Forms explosive mixtures with air. See Section IX. Immediately evaluate all personnel from danger area. Use self-contained breathing apparatus when working. Remove all sources of ignition without risk. Water may cause violent reactivity. Radiant vapor with top or fine water sprays. Shut off leak at source. Use portable watered hose stream to cool container to lessened area. Use water from safe distance in HAZARDOUS POLYMERIZATION area, especially confined areas. Check the temperature and pressure of the container.

VIII. SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (density type):

STANDARD: In accordance with OSHA 29 CFR 1910.134 Respirators shall be available to MSDA and HMDA.

VENTILATION:

MECHANICAL (enclosed): Inadequate. See SPECIAL.

SPECIAL: Use only in a closed system.

OTHER: Not applicable. See SPECIAL.

PROTECTIVE GLOVES: None.

EYE PROTECTION: Select in accordance with OSHA 29 CFR 1910.133.


IX. SPECIAL PRECAUTIONS

DANGER:

Flammable. Inhibited by air under pressure. Use piping and equipment adequately designed to withstand pressures to be encountered. May form explosive mixtures with air. Graded all equipment. Only start quiet, proof tests and explosion proof equipment. Keep away from heat, sparks, and naked flame. Spark and use with adequate ventilation at all times. Use only in a closed system. Do not use if in use in use and when dry. Keep away from dusty areas.

MIXTURES:

When this or other gases, or liquids are mixed, then hazardous properties may combine to create additional hazards.

OTHER:

Consult an industrial Hygienist. Other initiated person when you make your safety evaluation of the end product. Remember, gases and liquids have properties which can cause serious injury or death. Be sure to read and understand all safety and other instructions supplied with all containers of this product.
EMERGENCY PHONE NUMBER

EMERGENCY RESPONSE INFORMATION: IN CASE OF EMERGENCY INVOLVING THIS MATERIAL, CALL DAY OR NIGHT 1-208-336-1543 OR CALL CHEMTREC AT (800) 424-8300.

Norco requests the users of this product to study this Material Safety Data Sheet (MSDS) and become aware of product hazards and safety information. To promote safe use of this product, a user should (1) notify its employees, agents and contractors of the information on this MSDS and any product hazards and safety information, (2) furnish this same information to each of its customers for the product, and (3) request such customers to notify their employees and customers for the product of the same product hazards and safety information.

NorLAB Calibration Gases & Equipment
1121 W. Amity, Boise, Id 83705
Phone (208) 336-1643 • Fax (208) 384-1720 • Wats 1-800-657-6672
### PHYSICAL DATA

- **Boiling Point:** 86°F (30°C)
- **Critical Temperature:** 270°F (-40°C)
- **Critical Pressure:** 0.299 lbf/in²
- **Flash Point:** N/A
- **Autoignition Temperature:** 68°F (20°C)
- **Barometric Coefficient:** .0183

**Colorless gas with possible slight olefinic odor**

### FIRE AND EXPLOSION HAZARD DATA

- **Flammable Limits:** N/A
- **Flammable Limits in Air:** N/A
- **Explosive Limits:** N/A
- **Explosive Limits in Air:** N/A
- **SPECIAL PRECAUTIONS:**
  - **Safe Handling:** Non-inflammable gas
  - **Health Hazards:** Nonhazardous

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

### REACTIVITY DATA

- **Reactivity:** None
- **Stability:** Stable
- **Stability (Temperature at which instability will occur):** N/A
- **Stable at:** Room Temperature
- **Severe Reaction: None**

### SPILL OR LEAK PROCEDURES

- **Inspected by:** N/A
- **Approved by:** N/A

### SPECIAL PRECAUTIONS

- **DOT Shipping Name:** Compressed Gas, n.o.s.
- **DOT Hazard Class:** Nonflammable Gas
- **DOT Shipping Code:** N.0.
- **UN Number:** 1916

- **SPECIAL PRECAUTIONS:**
  - **Valve Protection Caps must remain in place unless container is secured with valve outlet plugged to one point.**
  - **Do not drag, slide or roll cylinders.** Use a suitable hand truck for cylinder movement. For a pressure reducing regulator when connecting cylinder to lower pressure 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 on the discharge line.** Do not tamper with (valve) safety device. Close valve after each use and when empty.

- **FOR ADDITIONAL HAZARD INFORMATION CONSULT THE LATEST EDITION OF THE NATIONAL FIRE PROTECTION ASSOCIATION (NFPA) GUIDELINES.**

- **SPECIAL PRECAUTIONS:**
  - **For other classifying hazard联合国代码：** Consult the latest edition of the UN Manual of Regulations for Dangerous Goods.

- **GENERAL PRECAUTIONS:**
  - **Avoid contact with eyes, skin, and clothing.**
  - **Wash hands after handling.**

- **SAFETY PRECAUTIONS:**
  - **If this mixture is dry, it is not corrosive and may be used with all materials of construction.**
  - **However, corrosive acids which are formed with air to be hydrated so that they increase in volume and lose their protective role (rust formation).**

- **CONFIDENTIAL OR PRODUCTION DATA:**
  - **Compressed gas cylinders should not be refilled except by qualified producers of compressed gases.**
  - **Transport cylinders in trucks, railcars, railcars, or on commercial vessels.**
  - **Always secure cylinders in an upright position before transporting them.**

**Emergency Response Information:**

- **In case of emergency involving this material, call D.O.T. or N.H.L. 1-800-394-4887.
- **Call ChemAlert at 800-242-4555.**

**Additional Information:**

- **Contact the U.S. Department of Transportation for additional information.**

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**Note:** The information provided is for educational purposes and should not be used as a substitute for professional advice. Always consult the original source or a qualified professional for accurate and up-to-date information.
Material Safety Data Sheet

Health Hazard Data

Name Listed (ACGIH 1989-1996) or by OSHA

Signs of poisoning:
The amount of isobutylene in this mixture should not present any symptoms of toxicity. This mixture is breathed. Air is non-toxic and necessary to support life.

Inhalation of air in a high pressure environment such as underwater diving, scuba 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.

High pressure effects (greater than one atmosphere of oxygen) are on the central nervous system. Improper decompression results in the accumulation of nitrogen in the blood.

Isobutylene or air are listed in the ARA, AITP or by OSHA as a carcinogen or potential carcinogen.

Listing as Carcinogen

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

Product: Methane

1. PRODUCT IDENTIFICATION

PRODUCT: Methane

CHEMICAL NAME: Methane

Molecular: CH4

TYPICAL USES: Non-toxic, inert gas used for a variety of purposes including: clean fuel, refrigerants, and inert gas for various industrial processes.

MOLECULAR WEIGHT: 16.043

MERCURY: Measured

UNUSUAL FIRE AND EXPLOSION HAZARDS:

A gas mixture is not expected to support combustion. Although combustion of pure methane is possible under certain conditions, it is unlikely to occur in the typical use cases.

Methane is flammable, but its flammability limits are wide. The lower flammability limit is 5% by volume in air, while the upper flammability limit is 15% by volume in air. The flash point of methane is -104°F (-70°C) and the fire point is 270°F (132°C). Methane is a colorless, odorless gas that may present a fire and explosion hazard in the presence of an ignition source.

Inhalation of Methane:

Methane is a colorless, odorless gas. Inhalation of large quantities of methane can cause dizziness, fainting, and even unconsciousness. Methane can also cause nausea, vomiting, and abdominal pain.

Ingestion of Methane:

Methane is not normally ingested, but if ingested, it can cause severe nausea, vomiting, and abdominal pain.

Contact with Methane:

Methane is not normally absorbed through the skin, but if absorbed, it can cause dizziness, fainting, and even unconsciousness.

Eye Contact:

Methane is not normally absorbed through the skin, but if absorbed, it can cause irritation.

Health Effects:

Methane is not normally ingested, but if ingested, it can cause severe nausea, vomiting, and abdominal pain.

Ingestion of Methane:

Methane is not normally absorbed through the skin, but if absorbed, it can cause irritation.
I. HAZARDOUS INGREDIENTS

For mixtures of this product refer to the respective component Material Safety Data Sheets. See Section IX.

MATERIAL (CAS NO): Venture 74-62-4

WT (W): 100

1880-168 ACID TRICHALCONE VENTURE 74-62-4 (VESA-PET). Some substances under (W) are currently established.

II. REACTIVITY DATA

STABILITY: Stable

CONDITIONS TO AVOID: Temperatures in excess of 70°C.

INCOMPATIBILITY: Avoid contact with strong oxidizing agents.

N I 

HAZARDOUS DECOMPOSITION PRODUCTS: Thermal decomposition or burning may produce CO2, CO, SO2, and H2O. All materials in excess of 75°C and in the absence of oxygen at 100 KPa. Methane combustion is more hazardous.

HAZARDOUS POLYMERIZATION: Will not occur.

CONDITIONS TO AVOID: Acids or strong oxidizers.

III. PHYSICAL DATA

BOILING POINT, THO mm, Hg -81.5°C (-119°F) 

SPECIFIC GRAVITY (d420) = 1.019

VAPOR DENSITY (air = 1) = 0.65 (OC) (32°F)

PERCENT VOLATILES BY VOLUME = 100

FREEZING POINT = -182°C (-279°F)

VAPOR PRESSURE AT 26°C: 10.7

SOLUBILITY IN WATER: % BY WT: Slightly

EVAPORATION RATE: (Michel Testafe=4) For applicable

APPEARANCE AND ODOR: Colorless gas at normal temperatures and pressure.

IV. HEALTH HAZARD DATA

ALLOWABLE LIMITS: See Section II.

EFFECTS OF A SINGLE (ACUTE) OVEREXPOSURE:

Recovery is usually rapid and complete.

Eye Contact: Immediate wash with water.

Skin Contact: Wash area with water.

Inhalation: No immediate effects, but may result in chemical conjunctivitis.

MEDICAL CONDITIONS AGgravated by OVEREXPOSURE:

None currently known.

SIGNIFICANT LABORATORY DATA WITH POSSIBLE RELEVANCE TO HUMAN HEALTH HAZARD EVALUATION:

None currently known.

EMERGENCY AND FIRST AID PROCEDURES

Inhalation: Fresh air and oxygen if breathing is labored.

Eye Contact: Cool, clean water.

Skin Contact: Wash with water.

NOTE TO PHYSICIAN: There is no specific antidote. Treatment is symptomatic and is based on the course of symptoms and clinical condition.

V. FIRE AND EXPLOSION HAZARD DATA

MINIMUM FLAMMABLE LIMIT: 1.85% (VOL)

MAXIMUM EXPLOSION PRESSURE: 0.26 psig

EXTINGUISHING MEDIA: CO2, dry chemicals, water spray or fog.

SPECIAL FIRE FIGHTING PROCEDURES:

Avoid fire exposure from large area. Water spray can be used to cool equipment which causes nearby distances to steam in the event of fire.

Special Precautions:

Don't breathe vapors.

Wear a self-contained breathing apparatus in the event of fire.

VI. REACTIVITY DATA

STABILITY: Stable

CONDITIONS TO AVOID: Temperatures in excess of 70°C.

INCOMPATIBILITY: Avoid contact with strong oxidizing agents.

N I 

HAZARDOUS DECOMPOSITION PRODUCTS: Thermal decomposition or burning may produce CO2, CO, SO2, and H2O. All materials in excess of 75°C and in the absence of oxygen at 100 KPa. Methane combustion is more hazardous.

HAZARDOUS POLYMERIZATION: Will not occur.

CONDITIONS TO AVOID: Acids or strong oxidizers.

VII. SPILL OR LEAK PROCEEDURES

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED:

DANGER: For the danger information, refer to Section VI. Incompatible with strong oxidizing agents and corrosive materials. Avoid contact with strong oxidizing agents and acidic materials. Methane combustion is more hazardous.

VENTILATION:

LOCAL EXHAUST: Vents should be used.

MECHANICAL (ventilation): As required.

SPECIAL: Not applicable.

OTHER: Not applicable.

PROTECTIVE GLOVES: Standard protective gloves are recommended.

EYE PROTECTION: Select in accordance with OSHA 29 CFR 1910.133.


VIII. SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (Safety Lung) - Select in accordance with OSHA 29 CFR 1910.134 Respirators shall be acceptable to NIOSH and OSHA.

VENTILATION:

LOCAL EXHAUST: Vents should be used.

MECHANICAL (ventilation): As required.

SPECIAL: Not applicable.

OTHER: Not applicable.

IX. SPECIAL PRECAUTIONS

HAZARDOUS GASES: Avoid fire exposure from large area. Water spray can be used to cool equipment which causes nearby distances to steam in the event of fire.

MIXTURES:

When more than one material is involved, then the hazardous properties may combine to create an unexpected hazard. Obtain one or more references for each component before you proceed with the fire. Consult a reliable Inorganic Chemistry or Chemical Engineering reference source to make your own evaluation of the fire or explosion hazards present. Chemicals may combine to create dangerous mixtures which can cause serious injury or death. Be sure to read and understand these recommendations with guidance from the appropriate authority.

NOTE:

Combustion with propane can be extremely hot. For safety information on general handling of combustible gases, obtain a copy of the local fire department's "Fire Safety Guide for Combustible Gases in Containers" from the Compressed Gas Association, Inc. 1321 Jefferson Davis Highway, Arlington, VA 22202.
Material Data Safety Sheet

Product: YSI 3161 Conductivity Calibrator 1000 micromho/cm

Components                        CAS #     %
Potassium Chloride                 7447407  <1.0
Iodine, resublimed                7553562  <1.0
Balance - Water

The hazards associated with this product are those related to the constituent chemicals. Material Safety Data Sheets for these materials are attached.

*****Multiple Component Spill or Leak Procedures*****

Steps to take if material is released or spilled

Wear appropriate protective equipment.
Wipe up the spill with absorbent material.
Wash the spill area.

Waste Disposal

Dispose in accordance with local, state and federal regulations.

YSI, Inc.                                October 30, 1990
MATERIAL SAFETY DATA SHEET PAGE 1

IDENTIFICATION

NAME: POTASSIUM CHLORIDE

SYNONYMS

CHLORID DEASELNY (CZECH) * CHLOROPOTASSURIL * DIPOTASSIUM DICHLORIDE * EMPLETS POTASSIUM CHLORIDE * ENSEAL * KALITABS * KACHLOR * KAON-CL * KAON-CL 10 * KAOCL TABS * KHARACTEL * K-LOR * KLOTRIX * K-LYTE/CL * K-PREDNE-OME * MONOPOTASSIUM CHLORIDE * PIKLOL * POTASSIUM MONOCHLORIDE * POTAVESCENT * REKAMAN * SLOW-K * TRIPOTASSIUM TRICHLORIDE *

RTCS NO: TS050000

POTASSIUM CHLORIDE

TOXICITY HAZARDS

IRRITATION DATA

EYE: RAT 500 MG/24H MLD

DATA

ORL-INF LD50: 938 MG/KG/2D
ORL-MAN LD50: 20 MG/KG
ORL-RTD LD50: 2600 MG/KG
IPR-RTD LD50: 660 MG/KG
IVN-RTD LD50: 142 MG/KG
ORL-MUS LD50: 1500 MG/KG
IPR-MUS LD50: 1181 MG/KG
IVN-MUS LD50: 117 MG/KG
ORL-GPG LD50: 2500 MG/KG

REVIEW, STANDARDS, AND REGULATIONS

NOMS 1974: HDZ 60360; NIS 97; TNF 14471; NOS 88; TNE 122749
NOS 1983: HDZ 60360; NIS 147; TNF 16061; NOS 125; TNE 387624; TFE 175287

EPA TSCA CHEMICAL INVENTORY, JUNE 1990

TARGET ORGAN DATA

BEHAVIORAL (CONVULSIONS OR EFFECT ON SEIZURE THRESHOLD)

BEHAVIORAL (CHANGE IN MOTOR ACTIVITY)

CARDIAC (ARRHYTHMIAS)

LUNGS, THORAX OR RESPIRATION (CYSPNAE)

LUNGS, THORAX OR RESPIRATION (CYANOSIS)

LUNGS, THORAX OR RESPIRATION (OTHER CHANGES)

GASTROINTESTINAL (NAUSEA OR VOMITING)

BLOOD (CHANGE IN CLOTTING FACTORS)

NUTRITIONAL AND GROSS METABOLIC (CHANGES IN: K)

ONLY SELECTED REGISTRY OF TOXIC EFFECTS OF CHEMICAL SUBSTANCES (RTCS)

CONTINUED ON NEXT PAGE
PRODUCT #: P4504
CAS #: 7447-40-7
MP: CLK

----------- TOXICITY HAZARDS -----------
DATA IS PRESENTED HERE. SEE ACTUAL ENTRY IN RTECS FOR COMPLETE INFORMATION.

----------- HEALTH HAZARD DATA -----------
ACUTE EFFECTS
HARMFUL IF SWALLOWED, INHALED, OR ABSORBED THROUGH SKIN.
CAUSES EYE AND SKIN IRRITATION.
MATERIAL IS IRRITATING TO MUCOUS MEMBRANES AND UPPER RESPIRATORY TRACT.
TO THE BEST OF OUR KNOWLEDGE, THE CHEMICAL, PHYSICAL, AND TOXICLOGICAL PROPERTIES HAVE NOT BEEN THOROUGHLY INVESTIGATED.

FIRST AID
IN CASE OF CONTACT, IMMEDIATELY FLUSH EYES WITH COPIOUS AMOUNTS OF WATER FOR AT LEAST 15 MINUTES.
IN CASE OF CONTACT, IMMEDIATELY WASH SKIN WITH SOAP AND COPIOUS AMOUNTS OF WATER.
IF INHALED, REMOVE TO FRESH AIR. IF NOT BREATHING GIVE ARTIFICIAL RESPIRATION. IF BREATHING IS DIFFICULT, GIVE OXYGEN.
IF SWALLOWED, WASH OUT MOUTH WITH WATER PROVIDED PERSON IS CONSCIOUS.
CALL A PHYSICIAN.
WASH CONTAMINATED CLOTHING BEFORE REUSE.

ADDITIONAL INFORMATION
INGESTION OF LARGE QUANTITIES CAN CAUSE WEAKNESS, GASTROINTESTINAL IRRITATION AND CIRCULATORY DISTURBANCES.

----------- PHYSICAL DATA -----------
MELTING PT: 770 C
SPECIFIC GRAVITY: 1.984
APPEARANCE AND ODOR
WHITE CRYSTALS

----------- FIRE AND EXPLOSION HAZARD DATA -----------
EXTINGUISHING MEDIA
WATER SPRAY.
CARBON DIOXIDE, DRY CHEMICAL POWDER OR APPROPRIATE FOAM.
SPECIAL FIREFIGHTING PROCEDURES
WEAR SELF-CONTAINED BREATHING APPARATUS AND PROTECTIVE CLOTHING TO
CONTINUED ON NEXT PAGE
PRODUCT #: P4504
CAS #: 7447-40-7
NF: CLK

------------ FIRE AND EXPLOSION HAZARD DATA -----------
PREVENT CONTACT WITH SKIN AND EYES.
UNUSUAL FIRE AND EXPLOSIONS HAZARDS.
EMITS TOXIC FUMES UNDER FIRE CONDITIONS.

------------ REACTIVITY DATA -------------
INCOMPATIBILITIES:
STRONG OXIDIZING AGENTS:
STRONG ACIDS
HAZARDOUS COMBUSTION OR DECOMPOSITION PRODUCTS:
HYDROGEN CHLORIDE GAS

-------------- SPILL OR LEAK PROCEDURES ------------
STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED.
WEAR SELF-CONTAINED BREATHING APPARATUS, RUBBER BOOTS AND HEAVY RUBBER GLOVES.
Sweep up, place in a bag and hold for waste disposal.
VENTILATE AREA AND WASH SPILL SITE AFTER MATERIAL PICKUP IS COMPLETE.

WASTE DISPOSAL METHOD:
FOR SMALL QUANTITIES: CAUTIOUSLY ADD TO A LARGE STIRRED EXCESS OF WATER. ADJUST THE PH TO NEUTRAL, SEPARATE ANY INSOLUBLE SOLIDS OR LIQUIDS AND PACKAGE THEM FOR HAZARDOUS-WASTE DISPOSAL. FLUSH THE AQUEOUS SOLUTION DOWN THE DRAIN WITH PLENTY OF WATER. THE HYDROLYSIS AND NEUTRALIZATION REACTIONS MAY GENERATE HEAT AND FUMES WHICH CAN BE CONTROLLED BY THE RATE OF ADDITION.

--- PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE ---
CHEMICAL SAFETY GOGGLES.
RUBBER GLOVES.
NIOSH/MSHA-APPROVED RESPIRATOR.
SAFETY SHOWER AND EYE BATH.
MECHANICAL EXHAUST REQUIRED.
AVOID CONTACT AND INHALATION.
DO NOT GET IN EYES, ON SKIN, OR CLOTHING.
WASH THOROUGHLY AFTER HANDLING.
HARMFUL SOLID.
IRRITANT.
KEEP TIGHTLY CLOSED.

CONTINUED ON NEXT PAGE
PRODUCT #: P4504
CAS #: 7447-40-7
MF: CLK

NAME: POTASSIUM CHLORIDE

--- PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE ---

HYGROSCOPIC
STORE IN A COOL DRY PLACE.
LABEL PRECAUTIONARY STATEMENTS
HARMFUL
HARMFUL BY INHALATION, IN CONTACT WITH SKIN AND IF SWALLOWED.
IRRITATING TO EYES, RESPIRATORY SYSTEM AND SKIN.
IN CASE OF CONTACT WITH EYES, RINSE IMMEDIATELY WITH PLENTY OF WATER AND SEEK MEDICAL ADVICE.
WEAR SUITABLE PROTECTIVE CLOTHING.

THE ABOVE INFORMATION IS BELIEVED TO BE CORRECT BUT DOES NOT PURPORT TO BE ALL INCLUSIVE AND SHALL BE USED ONLY AS A GUIDE. SIGMA SHALL NOT BE HELD LIABLE FOR ANY DAMAGE RESULTING FROM HANDLING OR FROM CONTACT WITH THE ABOVE PRODUCT. SEE REVERSE SIDE OF INVOICE OR PACKING SLIP FOR ADDITIONAL TERMS AND CONDITIONS OF SALE.

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SIGMA CHEMICAL COMPANY
THE WORLD'S FOREMOST MANUFACTURER OF RESEARCH BIOCHEMICALS AND DIAGNOSTIC REAGENTS

MATERIAL SAFETY DATA SHEET PAGE 4

CUST#: 4-069-97070
POS#: 05923/
50
5/26/94

POST OFFICE BOX 14008
SAINT LOUIS, MISSOURI 63178, USA
TAX: USA/CANADA 1-800-335-5652 OUTSIDE USA/CANADA 314-771-8757
TELEX: 910-761-0500 or 434475 ANSWERBACK "SIGMA CHEMICAL"

TELEPHONE: USA/CANADA 1-314-382-3010
OUTSIDE USA/CANADA CALL COLLECT 314-771-2750
IDENTIFICATION

PRODUCT #: I0385
NAME: IODINE ACS REAGENT

CAS #: 7553-56-2
MF: I2

SYNONYMS
IODIDE (FRENCH) • IODINE (ACGIH,OSHA) • IODINE CRYSTALS • IODINE SUBLIMED • IODIO (ITALIAN) • JOD (GERMAN, POLISH) • JOOD (DUTCH) •

RTECS NO: NN1575000

IODINE

TOXICITY DATA

<table>
<thead>
<tr>
<th>RTECS</th>
<th>TOXICITY</th>
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<tr>
<td>ORL-HMN</td>
<td>L00: 28 MG/KG</td>
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<tr>
<td>UNR-MAN</td>
<td>L00: 29 MG/KG</td>
</tr>
<tr>
<td>ORL-RAT</td>
<td>LD50: 14 GM/KG</td>
</tr>
<tr>
<td>SCU-RAT</td>
<td>LD50: 10500 MG/KG</td>
</tr>
<tr>
<td>ORL-MUS</td>
<td>LD50: 22 GM/KG</td>
</tr>
<tr>
<td>SCU-MUS</td>
<td>LD50: 8650 MG/KG</td>
</tr>
<tr>
<td>ORL-RBT</td>
<td>LD50: 10 GM/KG</td>
</tr>
</tbody>
</table>

REVIEW, STANDARDS, AND REGULATIONS

ACGIH TLV-CL 0.1 PPM 85INA8 5,323,86
EPA FIFRA 1988 PESTICIDE SUBJECT TO REGISTRATION OR RE-REGISTRATION
FEREAC 54,30848,89

OSHA PEL: CL 0.1 PPM (1 MG/M3) FEREAC 54,2923,89
OSHA PEL FINAL: CL 0.1 PPM (1 MG/M3) FEREAC 54,2923,89
NIOSH ACL TO IODINE-CL 0.1 PPM NIOSH# OHHS #92-100,92
NOS 1974: HZD 40030; NIS 51; TNF 7490; NOS 46; TNE 124917
NOS 1983: HZD 40030; NIS 63; TNF 6179; NOS 77; TNE 204902; TFE 129889
EPA TSCA CHEMICAL INVENTORY, JUNE 1990
EPA TSCA TEST SUBMISSION (TSCATS) DATA BASE, JULY 1992
NIOSH ANALYTICAL METHODS: SEE IODINE, 6005
OSHA ANALYTICAL METHOD #ID-177

CONTINUED ON NEXT PAGE
TARGET ORGAN DATA

GASTROINTESTINAL (HYPERMOTILITY, DIARRHEA)
GASTROINTESTINAL (OTHER CHANGES)
ENDOCRINE (EVIDENCE OF THYROID HYPERFUNCTION)
EFFECTS ON NEWBORN (VIABILITY INDEX)
EFFECTS ON NEWBORN (GROWTH STATISTICS)

ADDITIONAL INFORMATION

SKN-RBT LD50: 220MG/KG.
ONLY SELECTED REGISTRY OF TOXIC EFFECTS OF CHEMICAL SUBSTANCES (RTECS)
DATA IS PRESENTED HERE. SEE ACTUAL ENTRY IN RTECS FOR COMPLETE INFORMATION.

ACUTE EFFECTS

MAY BE FATAL IF INHALED, SWALLOWED, OR ABSORBED THROUGH SKIN.
MATERIAL IS EXTREMELY DESTRUCTIVE TO TISSUE OF THE MUCOUS MEMBRANES
AND UPPER RESPIRATORY TRACT, EYES AND SKIN.
INHALATION MAY BE FATAL AS A RESULT OF SPASM, INFLAMMATION AND EDEMA
OF THE LARYNX AND BRONCHI, CHEMICAL PNEUMONITIS AND PULMONARY EDEMA.
SYMPTOMS OF EXPOSURE MAY INCLUDE BURNING SENSATION, COUGHING,
WHEEZING, LARYNGITIS, SHORTNESS OF BREATH, HEADACHE, NAUSEA AND
VOMITING.
EXPOSURE CAN CAUSE:
STOMACH PAINS, VOMITING, DIARRHEA.
DAMAGE TO THE EYES
DERMATITIS

CONTINUED ON NEXT PAGE
MATERIAL SAFETY DATA SHEET

DATE: 12/17/92

CUST#: 4-069-97070

PRODUCT #: IO35
CAS #: 7553-56-2
MF: I2

NAME: IODINE ACS REAGENT

HEALTH HAZARD DATA

MAY CAUSE ALLERGIC REACTION.

TARGET ORGAN(S):
THYROID

FIRST AID

IN CASE OF CONTACT, IMMEDIATELY FLUSH EYES OR SKIN WITH COPIOUS AMOUNTS OF WATER FOR AT LEAST 15 MINUTES WHILE REMOVING CONTAMINATED CLOTHING AND SHOES.
ASSURE ADEQUATE FLUSHING OF THE EYES BY SEPARATING THE EYELIDS WITH FINGERS.
IF INHALED, REMOVE TO FRESH AIR. IF NOT BREATHING GIVE ARTIFICIAL RESPIRATION. IF BREATHING IS DIFFICULT, GIVE OXYGEN.
IF SWALLOWED, WASH OUT MOUTH WITH WATER PROVIDED PERSON IS CONSCIOUS.
CALL A PHYSICIAN.
DISCARD CONTAMINATED CLOTHING AND SHOES.

BOILING PT: 184.4 C
MELTING PT: 113.5 C
SPECIFIC GRAVITY: 4.930
VAPOR DENSITY: 9
VAPOR PRESSURE: .31 MM @ 25 C
APPEARANCE AND ODOR
SHINY GREY CHIPS

FIRE AND EXPLOSION HAZARD DATA

CONTINUOUS ON NEXT PAGE
FIRE AND EXPLOSION HAZARD DATA

DRY CHEMICAL POWDER.

SPECIAL FIREFIGHTING PROCEDURES
WEAR SELF-CONTAINED BREATHING APPARATUS AND PROTECTIVE CLOTHING TO
PREVENT CONTACT WITH SKIN AND EYES.
UNUSUAL FIRE AND EXPLOSION HAZARDS
EMITS TOXIC FUMES UNDER FIRE CONDITIONS.

REACTIVITY DATA

INCOMPATIBILITIES
MAGNESIUM
ZINC
AMMONIA
ALUMINUM
CORRODES STEEL

HAZARDOUS COMBUSTION OR DECOMPOSITION PRODUCTS
NATURE OF DECOMPOSITION PRODUCTS NOT KNOWN.

SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED
EVACUATE AREA.
WEAR SELF-CONTAINED BREATHING APPARATUS, RUBBER BOOTS AND HEAVY
RUBBER GLOVES.
COVER WITH DRY LIME OR SODA ASH, PICK UP, KEEP IN A CLOSED CONTAINER
AND HOLD FOR WASTE DISPOSAL.
VENTILATE AREA AND WASH SPILL SITE AFTER MATERIAL PICKUP IS COMPLETE.

CONTINUED ON NEXT PAGE
MATERIAL SAFETY DATA Sheet

WASTE DISPOSAL METHOD

MATERIAL IN THE ELEMENTAL STATE SHOULD BE RECOVERED FOR REUSE OR RECYCLING.
OBSERVE ALL FEDERAL, STATE AND LOCAL ENVIRONMENTAL REGULATIONS.

--- PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE ---

WEAR APPROPRIATE NIOSH/MSHA-APPROVED RESPIRATOR, CHEMICAL-RESISTANT GLOVES, SAFETY GOGGLES, OTHER PROTECTIVE CLOTHING.
SAFETY SHOWER AND EYE BATH.
USE ONLY IN A CHEMICAL FUME HOOD.
DO NOT BREATHE VAPOR.
AVOID CONTACT WITH EYES, SKIN AND CLOTHING.
AVOID PROLONGED OR REPEATED EXPOSURE.
WASH THOROUGHLY AFTER HANDLING.
CORROSIVE.
HIGHLY TOXIC.
SEVERE LACHRYMATORY.
HARMFUL VAPOR.
SENSITIZER.
KEEP TIGHTLY CLOSED.
STORE IN A COOL DRY PLACE.

LABEL PRECAUTIONARY STATEMENTS

HIGHLY TOXIC (USA DEFINITION)
TOXIC (EUROPEAN DEFINITION)
TOXIC BY INHALATION, IN CONTACT WITH SKIN AND IF SWALLOWED.
CAUSES BURNS.

CONTINUED ON NEXT PAGE
DATE: 12/17/92  
CUST#: 4-069-97070  
PG#:  

PRODUCT #: I0385  
CAS #: 7553-56-2  
MF: I2  

--- PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE ---  
MAY CAUSE SENSITIZATION BY INHALATION AND SKIN CONTACT.  

SEVERE LACHRYMATOR.  
TARGET ORGAN(S):  
THYROID  
IF YOU FEEL UNWELL, SEEK MEDICAL ADVICE (SHOW THE LABEL WHERE POSSIBLE).  
IN CASE OF CONTACT WITH EYES, RINSE IMMEDIATELY WITH PLENTY OF WATER AND SEEK MEDICAL ADVICE.  
WEAR SUITABLE PROTECTIVE CLOTHING, GLOVES AND EYE/FACE PROTECTION.  

ADDITIONAL INFORMATION  
MIXING IODINE, ANTIMONY AND AMMONIA RESULTED IN AN EXPLOSION. A VIOLENT REACTION OCCURS BETWEEN IODINE AND ACETALDEHYDE.  
THE ABOVE INFORMATION IS BELIEVED TO BE CORRECT BUT DOES NOT PURPORT TO BE ALL INCLUSIVE AND SHALL BE USED ONLY AS A GUIDE. SIGMA SHALL NOT BE HELD LIABLE FOR ANY DAMAGE RESULTING FROM HANDLING OR FROM CONTACT WITH THE ABOVE PRODUCT. SEE REVERSE SIDE OF INVOICE OR PACKING SLIP FOR ADDITIONAL TERMS AND CONDITIONS OF SALE.  
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6 OF 6
YSI Conductivity Calibrator Solutions

Instructions

YSI conductivity calibrator solutions are secondary standard solutions for the verification of conductivity cells together with conductance meters. The solutions are provided in the form of a primary reference solution (P.R.S.), a secondary reference solution (S.R.S.), and a calibration solution (C.S.). The P.R.S. is used to verify the performance of the conductivity cell and the S.R.S. is used to verify the performance of the conductance meter. The C.S. is used to verify the performance of the entire system, including the cell and the meter.

1. Prepare the P.R.S. by diluting a concentrated solution with deionized water.
2. Use the P.R.S. to verify the performance of the conductivity cell.
3. Use the S.R.S. to verify the performance of the conductance meter.
4. Use the C.S. to verify the performance of the entire system.

YSI Conductivity Calibrator Solution

<table>
<thead>
<tr>
<th>Number</th>
<th>Name</th>
<th>Conductivity</th>
<th>Resistance</th>
</tr>
</thead>
<tbody>
<tr>
<td>3161</td>
<td>1 US Quart</td>
<td>1,000</td>
<td>10%</td>
</tr>
<tr>
<td>3163</td>
<td>1 US Quart</td>
<td>10,000</td>
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<tr>
<td>3165</td>
<td>1 US Quart</td>
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<td>10%</td>
</tr>
<tr>
<td>3162</td>
<td>1 US Pt</td>
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<td>10%</td>
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<tr>
<td>3164</td>
<td>1 US Pt</td>
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</tr>
<tr>
<td>3169</td>
<td>1 US Pt</td>
<td>50,000</td>
<td>10%</td>
</tr>
</tbody>
</table>

Units of Measure

1 US Quart = 0.9462 L
1 US Pt = 0.4732 L
1 US Gallon = 3.785 L
1 S/m = 1 mho
1 mho = 1 Siemens
1 Siemens = 1 mho

YSI Incorporated

Yellow Springs Instrument Co., Inc. Yellow Springs, Ohio 45387 USA
Phone: (937) 767-9201 FAX: (937) 767-9311

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To use the cells before calibration, immerse them in the Calibrant or minimize evaporation of the Calibrant Solution when calibrating. If the cell is in a container, such as a test tube or a vial, with the cell being calibrated, the effect of the container must be minimized. Do not introduce any additional substances to the other container. If it is necessary to introduce any additional substances to the cell, make sure that the solution is clear and that the cell is at least two inches above the solution level. Check the calibration of the cell holder or cell before use.

For some solutions, such as the YSI 3165, 3169, 3467, and 3468 solutions, to which the cell is calibrated, it is necessary to calibrate the cell according to the following instructions:

1. **Temperature Calibration**:
   - **Temperature Correction Factor (F)**:
     - For each solution, the temperature correction factor is calculated based on the temperature of measurement. The correction factor is used to adjust the conductivity reading to the calibration temperature.

2. **Conductivity Calibration**:
   - For each solution, the conductivity of the solution at the calibration temperature is calculated using the following formula:
     
     \[ \text{Conductivity at calibration temperature} = \text{Conductivity at measured temperature} \times F \]

3. **Calibration Procedure**:
   - **Calibrator Setup**:
     - Connect the cell to the calibrator and adjust the temperature and conductivity settings as required.
   - **Conductivity Measurement**:
     - Measure the conductivity of the solution at the calibration temperature.
   - **Temperature Adjustment**:
     - Adjust the temperature to the desired level.
   - **Conductivity Adjustment**:
     - Adjust the conductivity to the desired level.

4. **Blank Solution**:
   - Prepare a blank solution of the same composition as the sample solution.
   - Measure the conductivity of the blank solution at the calibration temperature.
   - Subtract the conductivity of the blank solution from the conductivity of the sample solution to determine the conductivity of the sample.

5. **Sample Solution**:
   - Prepare a sample solution of the substance to be measured.
   - Measure the conductivity of the sample solution at the calibration temperature.
   - Subtract the conductivity of the blank solution from the conductivity of the sample solution to determine the conductivity of the sample.

6. **Error Analysis**:
   - Conductivity measurements are subject to error due to various factors, such as temperature, pressure, and purity of the solution.
   - Errors can be minimized by following the calibration procedures and using high-quality solutions.

7. **Error Correction**:
   - If errors are observed, the calibration procedures can be repeated to ensure accurate results.

By following these procedures, accurate and reliable measurements can be obtained for the conductivity of various substances.
APPENDIX B

EXPOSURE CONTROL PLAN
for
VOLUNTARY FIRST AID/CPR PROVIDERS
1.0 Introduction

This Exposure Control Plan presents health and safety guidelines for designated first aid and CPR care providers. In order to meet the requirements of OSHA 29 CFR §1910.151, during day shift operations, at least one person on site will be designated and adequately trained in first aid and CPR, in the requirements of the Bloodborne Pathogens Standard as listed in 29 CFR §1910.1030, IT Procedure HS5512, and in the contents of this plan.

1.1 Definition

Bloodborne pathogens are those agents (i.e., bacteria, virus, fungi) found in blood, blood components, certain body fluids, and other materials, objects, or surfaces that have had contact with blood that are capable of causing human disease or death to unprotected people who came into contact with blood or blood-affected items. Diseases caused by bloodborne pathogens include, but are not limited to, hepatitis B virus (HBV), human immunodeficiency virus (HIV), hepatitis C, malaria, and syphilis. The most significant and of greatest concern are HBV and HIV.

1.1.1 Hepatitis B Virus

Hepatitis B virus is the major bloodborne pathogen hazard that first aid/CPR care providers are more likely to encounter. The HBV can remain infectious for up to 10 days even in dried blood. The virus adversely affects 8,000 to 10,000 workers annually resulting in approximately 200 deaths each year.

1.1.1.1 Hepatitis Exposure Symptoms

Hepatitis means "inflammation of the liver" causing severe liver damage or cirrhosis. Exposure symptoms include fever, fatigue, nausea, vomiting, muscle aches, loss of appetite, and jaundice (yellowing of the eyes or skin). Hepatitis diagnosis is difficult because some symptoms are similar to the flu and may remain mild for an extended period of time.

Presently, no cure exists for hepatitis, but it can be prevented with a vaccination.

1.1.2 Human Immunodeficiency Virus

Human immunodeficiency virus attacks and deteriorates the body's immune system and eventually weakens it to the point that infection sets in causing the disease Acquired Immune Deficiency Syndrome (AIDS). Human immunodeficiency virus is primarily transmitted through sexual contact, but may also be transmitted through contact with blood and body
fluids. Human immunodeficiency virus is not transmitted by touching or working with people who are HIV-positive.

1.1.2.1 Human Immunodeficiency Virus Exposure Symptoms
Human immunodeficiency virus leads to AIDS-related illnesses which eventually cause neurological problems, cancer, pneumonia, and death. People carry the virus for many years of their lives without experiencing any symptoms. Upon development, symptoms may include weight loss, skin lesions, dry cough, fever, fatigue, diarrhea, or swelling of the lymph glands.

Presently, no cure exists for HIV or AIDS and no vaccination is currently available.

1.2 Exposure Determination
The purpose of the guidelines in this plan are designed to limit occupational exposure of site workers to infectious blood materials which could result in disease or possibly death. The contents of this plan are intended to protect the designated IT employees trained in first aid and CPR that are responsible for administering medical assistance to site workers.

1.2.1 Means of Transmission
The major activity that may expose any of these designated IT employees to bloodborne pathogens is their response and care to on-site personal injuries or decontamination of equipment/surfaces contaminated by blood or other potentially infectious materials during the incident.

These designated IT employees could be subject to bloodborne pathogens during rendering of first aid or CPR by accidental exposure due to:

- punctures through the skin with a contaminated sharp object (i.e., scissors);
- contact or absorption of blood or blood-contaminated objects through open or broken skin (i.e., cuts, scratches, rashes); and
- blood splashes to their eyes, nose, or mouth or other mucous membranes.

Workers can reduce their risk of contacting HBV or HIV by implementing the recommended work practices (outlined in this plan) before, during, and after responding to emergency medical incidents involving personal injuries.
1.3 Measures for Prevention

The establishment of work practice controls is an integral part of an effective exposure control plan in preventing accidental infection of employees. These work practices are designed to protect employees from reasonably foreseeable occupational exposures to bloodborne pathogens from blood and other potentially infectious material. The work practice controls outlined in this section are applicable to the administration of first aid in emergency situations and subsequent cleanup only.

1.3.1 Universal Precautions

Universal precautions is an approach to infection control which operates on the assumption that all human blood and bodily fluids are to be treated as if they are known to be contaminated with HIV, HBV, or other infectious diseases. Universal precautions shall be implemented whenever there exists a foreseeable potential for contact with blood or bodily fluids.

1.3.2 Engineering Controls

Due to the remote location of the worksite, the nature of work in outdoor locations with potential exposure to airborne chemical contaminants, and the potential for exposure being limited to emergency situations, the implementation of engineering controls is not feasible. Exposure control shall be accomplished through implementation of work practice controls and use of personal protective equipment.

1.3.3 Work Practice Controls

Work practice controls shall be instituted whenever foreseeable potential contact with, or exposure to, blood and bodily fluid exists. Examples of situations in which these controls are to be implemented include, but are not limited to, accidents or injuries in which administration of first aid is required, application of bandages to minor cuts and abrasions of another person, and contact with sores, wounds, or broken skin.

Following are specific work practice controls that shall be implemented:

- Open wounds or cuts will be promptly bandaged.

- Wash hands and face as soon as possible after administering first aid or CPR. If wash facilities are not readily available, stock disposable one-time use towelettes.

- No eating, drinking, or smoking is allowed in any work area where a potential exists for occupational exposure to blood borne pathogens.
Non-disposable equipment or materials that have or may have blood or infectious fluid contact must be washed immediately after their use. (A 1 to 10 solution of bleach and water is recommended proper decontamination.)

Any clothing that comes in contact with blood or infectious fluids shall be removed as soon as possible after administering first aid or CPR.

No personal clothing that comes in contact with blood or infectious fluids shall be laundered offsite.

Ensure that first-aid kits onsite are equipped with a pair of surgical gloves and CPR mouth pieces.

1.3.3.1 Minimization of Contact
Direct contact with blood and bodily fluids should be kept to an absolute minimum, as required in a particular situation. In situations where direct contact is likely, personal protective equipment shall be worn to help prevent infection.

Based upon professional judgment, an employee may choose to temporarily forego the use of PPE if he determines that the use of PPE will further jeopardize his well-being or that of the injured worker. This limited application must be carefully evaluated by the employee.

If this does occur, IT is obligated to investigate and document the circumstances in an effort to provide alternative means to avoid further occurrence.

1.3.4 Personal Protective Equipment
The following are specific personal protective equipment items that shall be implemented:

- Always wear hand (i.e. latex or nitrile surgical gloves) and eye (i.e. safety glasses, goggles) protection to administer or apply first aid or CPR.
- Always use CPR mouthpieces or ventilation devices.
- Inspect PPE prior to use to ensure it is in good working order and without flaws.
- Do not reuse gloves once removed.
- After use, remove gloves from top to bottom inside-out, not allowing unprotected skin to contact the exterior of the gloves.
1.3.5 Waste Handling
Disposable items that have or may have blood contact must be bagged separately from other trash. These wastes must be placed in leak proof containers or bags and labeled.

A collection container for contaminated articles will be available on-site. Wastes used in medical emergency treatment (i.e. gloves, towels, gauze) shall be disposed in the infectious waste container(s). The container will be replaced as needed and not be overfilled.

1.3.6 Waste Disposal
The waste will remain onsite in approved container(s) until an approved disposal facility capable of receiving medical uses is identified. Disposal of the infectious waste container(s) shall be in accordance with applicable local, state, and federal regulations.

1.4 Medical Requirements
The medical requirements of the exposure control plan include provision of a Hepatitis B vaccination to all exposed employees and post-exposure procedures and evaluation.

1.4.1 Hepatitis B Vaccination
All potentially exposed employees will have made available to them at no cost a Hepatitis B vaccination. The employee will also receive training as to the vaccine's efficacy, safety, benefits, and consequences prior to administration. The vaccination series shall be initiated within 24 hours of providing first aid/CPR in an incident and shall be administered under the supervision of a licensed physician. Employees may at their own discretion decline the vaccination, in which case documentation of declination will be completed and employees may be assigned immediately. If an employee covered by this exposure plan decides to accept the vaccination at a later date, the vaccination will be offered at that time at no cost to the employee.

1.4.2 Post-Exposure Procedures and Evaluation
Subsequent to all reported exposure incidents, a confidential medical evaluation and follow-up shall be made available to each employee exposed in the incidents.

1.4.2.1 Documentation Procedures
Documentation of the exposure incident shall be recorded as soon as possible, and include the route(s) of exposure, the circumstances surrounding the incident, and the identification of the source individual. Additionally, each incident shall be placed on the "first aid incident list" attached to the location OSHA Log of Occupational Injuries and Illnesses.
1.4.2.2 Blood Testing

1.4.2.2.1 Source Individuals
As soon as feasible, the source individual in an exposure incident will be asked to consent to a blood test to determine HBV and HIV infectivity. Where applicable laws require employee consent, documented consent shall be obtained prior to testing. If an employee refuses the blood test, documentation of the refusal will be made. Documentation of the test results shall be made available to the exposed employee(s). All results should be kept confidential, as criminal and civil penalties may be charged against persons negligently or wilfully releasing such information, depending on local laws.

1.4.2.2.2 Exposed Employees
Exposed employees will be asked to consent to a blood test for HBV and HIV serological status. If consent to HIV testing is denied, the blood sample will be preserved for 90 days, within such time the employee may elect to consent to the HIV test.

1.4.3 Post-Exposure Medical Evaluations
Exposed employees shall receive a healthcare professional’s written opinion for post-exposure evaluations. The written opinion shall include the results of the evaluation and any medical conditions resulting from the exposure incident which requires further medical treatment.

1.5 Hazard Communication

1.5.1 Warning Labels
Containers used for disposal of blood contaminated supplies and waste will be labeled in accordance with the word "biohazard."

1.5.2 Warning Signs
There are no designated areas for medical treatment on site, since first aid will be provided on an emergency basis only, and therefore warning signs are not applicable. In cases of potential exposure observers and non essential personnel should be verbally warned to keep a safe distance from injured personnel.

1.5.3 Employee Training Program
All associates who are first aid/CPR trained and may provide assistance shall be trained in the requirements for voluntary providers as described in HS512 and this HSP Addendum, and the general provisions of HS512.
1.6 Recordkeeping

1.6.1 Training Records
All employees selected to attend the training program that covers the contents of this plan shall sign the Acknowledgment Form and the Training Attendance Form.

The training record will contain the date; training outline; name and qualifications of the trainer, and names and job titles of attendees.

At the completion of the training program, all participants must take and pass the training quiz.

The training records will be maintained by the IT Training Department for at least three years from the training date.

1.6.2 Medical Records
Medical records necessary for IT designated employees must include documentation on HBV vaccination status, medical follow-up, post-exposure testing, and a medical professional’s written evaluation.

1.6.2.1 Confidentiality
The employee medical records will be forwarded to Environmental Medicine Resources, Inc. for inclusions in the employee’s medical file:

ENVIRONMENTAL MEDICINE RESOURCES, INC.
4360 Chamblee Dunwoody Road
Suite 202
Atlanta, GA 30341

1.6.2.2 Maintenance and Transfer of Records
IT Corporation shall maintain the employee medical records for the duration of the employee’s employment plus 30 years thereafter.

If, for whatever reason, IT Corporation no longer does business and no successor exists, IT Corporation will notify the Director of NIOSH in writing three months prior to the disposal of records. If so directed, the records shall be transferred to the Director of NIOSH.
1.6.3 Incident Recording

An incident that occurs as a result of rendering emergency medical care will be recorded on the OSHA 200 log as OSHA defines work-related injuries and illnesses.
Exposure Control Plan
Acknowledgment Form

I have read, understand, and will abide by the procedures set forth in this Exposure Control Plan.

I will comply with all of the provisions of this Exposure Control Plan and with any additional health and safety requirements which may be required by IT Corporation.

<table>
<thead>
<tr>
<th>Name (Print)</th>
<th>Signature</th>
<th>Company</th>
<th>Date</th>
</tr>
</thead>
</table>
Bloodborne Pathogens
Employee Training Quiz

Name (Print):                                      Date:__________

Job Title/Position:

Trainer’s Name/Qualifications:

Check the correct responses (T = True; F = False).

T   F  1. It is the responsibility of the employer to provide personal protective equipment to employees who have occupational exposure to blood or body fluids.

T   F  2. The most common communicable bloodborne disease today is Human Immunodeficiency Virus (HIV).

T   F  3. Persons at risk for exposure to Hepatitis B (HBV) may include emergency responders, residential and nursing home workers, custodians/janitors, law enforcement/corrections personnel, and health care workers.

T   F  4. The HBV vaccination is the best way to prevent AIDS.

T   F  5. Universal Precautions means that you must use Personal Protective Equipment only when you come into direct contact with the blood and/or body fluids of someone you don’t know.

T   F  6. An Exposure Incident means that blood or body fluids have entered through the skin or mucous membranes.

T   F  7. Washing your hands often with soap and warm water is a good way to reduce spreading diseases.

T   F  8. All potentially infectious waste is to be disposed of in a clear plastic bag so that any bloody materials may be readily seen by the custodian.

T   F  9. You should always report an Exposure Incident to your supervisor or First Aid Attendant.

Signature:                                     Score:_____

Signature of Trainer: