



Engineers, Inc.

**LINDLEY SOUTH LANDFILL
LEACHATE STORAGE FACILITY
SITE No. 851008
STEUBEN COUNTY, NEW YORK**

**OPERATION AND
MAINTENANCE MANUAL**

00000851008

APRIL 1999

**LINDLEY SOUTH LANDFILL
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SITE No. 851008
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**OPERATION AND
MAINTENANCE MANUAL**



C&S Engineers, Inc.
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APRIL 1999

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O&M MANUAL

LEACHATE STORAGE FACILITY

Lindley South Landfill

1. GENERAL DESCRIPTION

The Lindley South Leachate Storage Facility serves the Lindley Landfill, Steuben County, as a leachate storage and transfer facility prior to shipment to the Bath Leachate Treatment Facility for treatment and disposal. In 1997 the existing leachate storage facility was upgraded to increase its storage capacity and improve operations.

1.1. Normal Operation

The upgraded Leachate Storage Facility consists of an underground storage tank, above ground storage tank, Pump House, truck loading pad, related piping and auxiliary equipment. The Pump House contains three sets of pumps, including two Leachate Transfer Pumps, two Tank Fill Pumps and duplex sump pumps. The underground tank was retained from the previous leachate collection facility and is reused in the new facility. The above ground tank is equipped with a secondary containment system consisting of a containment wall, floor sump and associated piping connecting the sump to the duplex sump pumps.

Leachate is conveyed to the underground storage tank by gravity using three perforated leachate collection pipes. The underground tank is equipped with an ultrasonic liquid level sensor. When the leachate level in the underground tank reaches a preset elevation, one of the two Tank Fill Pumps automatically transfers leachate to the above-ground storage tank. The Tank Fill Pump controls were designed to operate the pumps up to the high leachate level of 28 feet in the above ground tank. Manual operation of the pumps is also possible, however, operators' supervision is required to avoid overfilling of the above ground storage tank.

Two Leachate Transfer Pumps are provided to transfer leachate from the above ground storage tank to a tanker truck for shipment to a treatment facility. The Leachate Transfer Pumps are operated manually by a truck driver, one pump at a time. There is a Pump Control Panel mounted on the front outside wall of the Pump House to select a pump and to Start/Stop its operation. The duration of each pumping cycle must be controlled using the level sensor readings and truck fill gage to avoid truck overfilling.

In the event of accidental leachate spills, above ground tank leaks, and to collect contaminated rain and snow water from the truck loading pad and secondary containment, there is a leachate collection system that will convey contaminated liquid to a sump located in the Pump House.

2. INVENTORY OF EQUIPMENT

The major items of mechanical equipment and their corresponding specifications and capacities are listed below:

2.1. Tank Fill Pumps

Manufacturer	Peerless
Model:	8796, self priming
Size:	1 1/2 x 1 1/2 - 8
Rated Capacity:	30 gpm @ 38-feet TDH 80 gpm @ 24-Feet TDH
Seals:	Mechanical, A.E.S. Engineering, Model SCOS 1
Motor:	1.5 HP, 1800 rpm, TEFC
Power:	230V, 1 phase, 60m Hz

2.2. Leachate Transfer Pumps

Manufacturer	Peerless
Model:	8196MT
Size:	4 x 6 -10
Rated Capacity:	500 gpm @ 20.5-feet TDH
Seals:	Mechanical, A.E.S. Engineering, Model SCOS 1
Motor:	5 HP, 1200 rpm, TEFC
Power:	230V, 1 phase, 60m Hz

2.3. Sump Pumps

Manufacturer	Peerless
Model:	LGL - 2
Size:	2-inch
Rated Capacity:	60 gpm @ 20-feet TDH 30 gpm @ 40-feet THD
Motor:	1 HP, 1800 rpm, TEFC
Power:	230V, 1 phase, 60m Hz

2.4. Storage Tank

Manufacturer	Aquastore
Model:	2034
Size:	20-feet nominal diameter 33-feet nominal sidewall height
Rated Capacity:	75,000 gallons
Secondary containment:	19-feet nominal sidewall height
Containment capacity:	62,600 gallons
Construction:	Bolted, glass-coated

2.5. Ultrasonic Level Sensors

Manufacturer	Milltronics
Model:	HydroRanger, Programmable Level Control
Location:	Underground tank Above ground tank

3. OPERATION OF LEACHATE STORAGE FACILITY

The Lindley South Leachate Storage Facility was designed to provide operational flexibility as described in the following sections.

3.1. Tank Fill Pumps

The pump control panel located in the Pump House allows the following modes of pump operation selectable by Hand-Off-Auto (HOA) switches (one for each pump):

- a. In the Auto mode the following automatic pump controls are active:
 - Lead/Lag pump alteration
 - Start/Stop control utilizing a 4-20mA signal from the ultrasonic underground tank level sensor. Dual pump operation is provided at higher underground storage tank levels.
 - Pump emergency shut-off if leachate level in the above ground storage tank reaches 28 feet.
- b. In the Hand mode the pumps can be turned On/Off by an operator.
- c. In the OFF mode the pumps do not operate.

An ultrasonic level sensor in the underground storage tank was programmed as follows (the levels can be field modified by the operators if needed):

Depth of Leachate in the Underground Storage Tank	Pump Action
0.5 feet	Both Pumps Off
1.5 feet	Lead Pump On
2.5 feet	Lag Pump On

These levels are displayed on the control panel of the Tank Fill Pumps under a label "Leachate Pump". The leachate levels in the above ground storage tank are also displayed on the same panel and are labeled "Above ground". The control panel contains two HydroRanger panels that display the above levels and allow manual programming of the level settings. For programming instructions the operators should refer to the manufacturer's operation manual.

At the operator's discretion, the Tank Fill Pumps can be run manually by turning the Hand/Off/Automatic (HOA) switch to Hand. The operator should be cautioned that during manual operation the above ground storage tank could be overfilled, therefore the leachate levels in both tanks must be constantly monitored.

There is no remote annunciation of an alarm when the Tank Fill Pumps reach the high liquid level in the above ground tank, regardless of the Auto or Manual mode of operation. In this case, the pump controls will not allow further transfer to the above ground tank. Therefore, an immediate transfer of leachate to a tanker truck is required. Otherwise leachate from the underground tank may flood the surrounding area if the underground tank's leachate level continues to rise.

The discharge pipe from the Tank Fill Pumps also serves as a discharge header for the duplex sump pumps; for more information on simultaneous operation of both pumps refer to the paragraph on the sump pump operation.

3.2. Leachate Transfer Pumps

The Leachate Transfer Pumps are manually operated by truck drivers from the control panel located on the outside wall of the Pump House, northeast corner. There is an automatic butterfly valve in the pump discharge header; the valve must be open immediately prior to a Leachate Transfer Pump start-up and closed at the end of pumping. The electrical controls in the pump control panel are interlocked with the valve controls to maintain required automatic sequencing of the pumps and valve. To transfer leachate from the storage tank to the tanker, the following procedure must be followed:

- a. Select pump No. 1 or 2 using the pump selector switch. Manually alternate pumps each time a truck is filled.

- b. Record liquid level in the above ground storage tank (level indicator is located in the top center of this panel - reading is in feet).
- c. Pull mushroom style button to start the pump, make sure that the light indicating Valve Open position comes on to verify valve opening.
- d. The selected Leachate Transfer Pump should automatically start filling a tanker. It will continue operating until the tanker gets full or the tank leachate reaches the low elevation of 3.5-feet and the low level light comes on.
- e. When tanker truck is full, (as determined from a truck fill gage) push the mushroom button to stop the pump. The valve will then close automatically and flow of leachate will stop.
- f. Record leachate elevation in the storage tank and the amount of gallons transferred based on the Leachate Storage Tank Capacity Chart.

The pump control panel receives a signal from the above ground tank ultrasonic level sensor and displays a low water level alarm light, high water level alarm light, and continuous reading of the leachate level in the tank. There is no remote annunciation of an alarm condition in the tank, therefore the tank should be inspected daily to verify the tank fill status and pump operation.

To keep track of the amount of leachate removed from the tank and shipped to the Bath Leachate Treatment Plant, each truck driver is required to fill a "delivery slip" documenting the Leachate Storage Tank levels prior to and after withdrawal, and a corresponding number of gallons of leachate. The "delivery slip" is then presented to the Bath treatment plant operator upon the truck's arrival. The Bath Treatment Plant keeps the records of the amount of leachate treated and prepares monthly reports.

3.3. Sump Pumps

Accidental leachate spills and rain and snow water collected within the truck loading pad and secondary containment drain to a sump located inside the Pump House. The sump contains a duplex sump pump system, related piping and valves to automatically transfer the sump content to the above ground storage tank via the discharge header of the Tank Fill Pumps.

The sump pumps are controlled by the Sump Pump Control Panel and level probes and operate in a typical duplex pump manner as described below:

- a. When liquid level in the sump rises to a predetermined level, the lead pump will turn on and operate until the level in the sump decreases to an "All Off" point. If the influent flow exceeds the single pump capacity and the level continues to rise, the lag pump will come on. Both pumps will operate until the "All Off" level in the sump is reached.
- b. The pumps are alternated automatically.

- c. There is also a Hand/Off/Automatic (HOA) selector switch in the Sump Pump Control Panel which allows manual operation of the pumps. Caution should be observed when operating in this mode as the pumps will run dry and damage may occur.

The discharge header from the sump pumps is connected to the discharge header from the Tank Fill Pumps; both headers are equipped with shut-off and check valves to allow simultaneous operation of all pumps, if necessary.

4. FROST PROTECTION

The above ground tank is equipped with a mixer to prevent freezing of the tank contents. A thermostat mounted on the East outside wall of the Pump House turns the mixer on when ambient air temperature falls below 35 degrees F. The mixer is powered by a submersible, explosion proof motor.

All above ground suction and discharge pipes to the above ground storage tank are heat traced and insulated.

5. INSPECTION AND MAINTENANCE

5.1. Inspections

Facility inspections will be performed quarterly, in conjunction with the quarterly site inspections of the landfill cap. During the inspections, the pumps and control panel will be examined to verify proper operation and settings. The overall facility will also be examined for leakage at fittings, mechanical joints, or around the base of the storage tank. Any observed leakage of mechanical systems will be repaired promptly.

5.2. Sampling Procedures

Leachate sampling will be performed quarterly, consistent with the current sampling procedures implemented at the Lindley Landfill facility. Sampling will be comprised of three routine events and one baseline event annually. Samples will be extracted from the underground storage tank within the landfill limits.

5.3. Health and Safety

The C&S Engineers, Inc., health and safety plan from the South Landfill closure project is appended to this manual under Appendix A, and is included for reference only. Health and safety considerations for those activities that on-site personnel may be engaged in during the quarterly inspections and sampling must be addressed in site-specific Health and Safety Plans prepared by each contractor entering the site.

5.4. Operations and Maintenance

The Operation and Maintenance Manual submitted by the Contractor, Orchard Earth & Pipe Corp., for the Leachate Storage Facilities at the Lindley South Landfill, includes manufacturers' information on the following equipment:

- Heat Trace System for the above ground pipes
- Ultrasonic Level Monitors
- Leachate Storage Tank
- Pumps and Control Panels
- Pressure Gauges

The above manuals should be consulted for detailed information on maintenance requirements, troubleshooting and repairs.

APPENDIX A

NOTIFICATION OF APPLICABILITY

The following Health and Safety Plan was prepared by C&S Engineers, Inc., in May 1998 for their employees and certified specifically for the administration and inspection of the Lindley South Landfill closure construction performed from June 1998 through October 1998.

Future activities at the site must be performed in accordance with individual site-specific Health and Safety Plans prepared by each contractor entering the site. The use of any portion of the following Health and Safety Plan in connection with any such future activity, or incorporation of any part of this plan into any other document without the express written consent of C&S Engineers, Inc., is strictly prohibited.

C & S Engineers, Inc.

5-10-99



Engineers, Inc.

**LINDLEY SOUTH LANDFILL
ENGINEERED CAP
STEUBEN COUNTY, NEW YORK**

HEALTH AND SAFETY PLAN

MAY 1998

Michael L. Howe, CIH

**LINDLEY SOUTH LANDFILL
ENGINEERED CAP
STEUBEN COUNTY, NEW YORK**

HEALTH AND SAFETY PLAN

***C&S ENGINEERS, INC.*
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MAY 1998

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HEALTH AND SAFETY PLAN

SECTION 1 – GENERAL INFORMATION

The Health and Safety Plan (HASP) described in this document will address health and safety considerations for all those activities that personnel employed by C&S Engineers, Inc., may be engaged in during construction of the engineered cap at the Lindley South Landfill in Steuben County, New York, and will be implemented by the Health and Safety Officer (HSO) during site work.

Compliance with this HASP is required of all C&S personnel who enter this site. The content of the HASP may change or undergo revision based upon additional information made available to the health, safety, and training (H&S) committee, monitoring results or changes in the technical scope of work. Any changes proposed must be reviewed by the H&S committee. This HASP was written specifically for those employees of C&S Engineers, Inc., and is not intended for use by others.

The construction contractor for the project is Tug Hill Construction, Inc., of Felts Mills, New York. All site control and project safety issues shall be coordinated through the construction contractor.

Responsibilities

Project Manager:	James Dickens (C&S Engineers, Inc.)
Work Phone: (315) 455-2000	
Site Health and Safety Officer:	John Virginia (C&S Engineers, Inc.)
Work Phone: (607) 523-8873	
Emergency Coordinator:	John Virginia (C&S Engineers, Inc.)
Work Phone: (607) 523-8892	

Emergency Phone Numbers

Fire Department:	(607)-937-5403
Ambulance:	(607)-936-4177
Police:	(607)-962-2112
Hospital:	(607)-937-7265 (607)-737-7806
Poison Control Center:	(800) 822-9761
Oil Spills and Hazardous Material Spills:	(800) 457-7362

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SECTION 2 — HEALTH AND SAFETY PERSONNEL

2.1 Health and Safety Personnel Designations

The following information briefly describes the health and safety designations and general responsibilities which may be employed for the Lindley South Landfill engineered cap construction project.

2.2 Project Manager (PM)

The PM is responsible for the overall project including the implementation of the HASP. Specifically, this includes allocating adequate manpower, equipment, and time resources to conduct site activities safely.

2.3 Health and Safety Officer (HSO)

The HSO is the person on-site responsible for assuring that personnel under direction comply with the requirements of the HASP and that personal protective equipment needed for site work is available.

2.4 Emergency Coordinator

The Emergency Coordinator is responsible for implementation of the Emergency Plan as presented in Section 13 of this HASP, establishment and supervision of the emergency response team, and conducting training programs for personnel assigned duties on the emergency response team.

SECTION 3 — PERTINENT SITE INFORMATION

3.1 Site Description

The Town of Lindley Landfill is a total of 123 acres in size and is located in the Town of Lindley, Steuben County, New York. The Lindley South Landfill is a 16 acre section of the overall landfill, situated on the south side of Gibson Road and approximately 4,000 feet west of Glendenning Creek Road.

The engineered cap construction project is a heavy civil construction project involving the installation of a synthetic liner cover, a gas venting system, and soil protective/topsoil layers. The project includes the installation of a gravel service road and a perimeter fence.

3.2 Site History

Waste disposal operations began at the Lindley South Landfill in 1977. Disposal methods were reportedly with written approval of NYSDEC and generally in accordance with accepted practices at that time. Municipal solid waste material was accepted at the site from 11 towns within Steuben County between 1977 and 1983. In addition to municipal waste material, industrial waste w

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reportedly disposed of by the Corning Glass Works Company during 1979 and 1980, including lead fines, calcium fluoride sludge, and asbestos material. All landfill activities were stopped at the site in 1983 when the maximum capacity of the landfill was reached. Upon completion of the landfill activity, a 2 foot thick cap of natural material from the site was placed and seeded.

Although the landfill is unlined and there were no leachate collection, removal, or storage provisions incorporated into the landfill's original construction, a retrofitted leachate collection and storage system was installed in 1986. The system consists of 8-inch diameter perforated PVC piping enclosed in crushed stone buried within the waste mass along the North and East edges of the landfill, and interconnecting with the existing French drain system previously installed in 1978 along the south side of the landfill.

As a result of a Phase II site investigation completed in 1990, which identified potential leachate contamination and migration proximate to the site, the Lindley South Landfill was subsequently classified by the NYSDEC as a Class 2 Site (Site No. #851008) on the New York State Registry of Inactive Hazardous Waste Sites. In April 1995, Steuben County entered into an Order on Consent for the completion of a Remedial Investigation/Feasibility Study and appropriate remedial efforts at the site. This project is being performed as a result of the Remedial Investigation/Feasibility Study findings.

SECTION 4 — HAZARD ASSESSMENT AND HAZARD COMMUNICATION

The most likely routes of exposure during construction activities include skin absorption and inhalation due to exposure to leachate and gases, and limited exposure to waste, during site intrusive activities. The chemical hazards which may be associated with site activities were determined through examination of historical analytical data from groundwater, surface water, sediments, leachate, and air emission samples. A copy of the analytical data is presented in Appendix A and available Material Safety Data Sheets (MSDS) for these parameters are provided in Appendix B.

Mechanical hazards associated with heavy equipment must be recognized at the site. Additionally, physical hazards must be recognized. The ground surface may be littered with sharp objects such as scrap metal and glass, and the possibility of tripping or falling exists in most areas. During warm weather, contacts with vectors such as bees or wasps is also a concern.

It is assumed that site workers have the potential to be exposed to concentrations of hazardous substances. Relatively low concentrations of several hazardous substances have been identified in various media samples obtained from the site, including leachate, sediments, groundwater, surface water, and air. It is difficult to draw a correlation between the concentrations of contaminants found in one media and the potential for exposure to these contaminants to site workers. However, their presence may indicate that some potential for exposure to these compounds exist, and the requirements for protective measures and monitoring of exposure is based on this potential. Pertinent information regarding various hazardous substances identified is discussed below.

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Benzene, CAS number 71-43-2—Benzene in its pure form is a colorless liquid with an aromatic odor. It is flammable and highly toxic. It is not expected that benzene will be present in a pure form but rather in low concentrations in the parts per billion range in the landfill. Benzene is classified as a potential human carcinogen by the American Conference of Governmental Hygienists (ACGIH). Exposure occurs primarily by inhalation and by skin absorption to a lesser degree. The federal Occupational Safety and Health Administration (OSHA) regulates worker exposure to benzene. Employers must assure that no employee is exposed to an airborne concentration of benzene in excess of one part of benzene per million parts of air (1 ppm) as an 8-hour time weighted average (TWA). In addition, no employee shall be exposed to an airborne concentration of benzene in excess of five (5) ppm as averaged over any 15 minute period. This limit is referred to as the Short-term Exposure Limit (STEL).

Toluene, CAS number 108-88-3—Toluene is a colorless liquid with an odor similar to benzene. It is flammable with explosive limits in air of 1.1 - 7.1%. It is toxic by inhalation, ingestion and skin absorption. Exposure to high concentrations in air cause central nervous system depression. It is expected that if toluene is present, it will be in low concentrations in the parts per billion range in the landfill. OSHA limits airborne exposure to 200 ppm as an eight hour TWA and to 300 ppm as a ceiling limit. OSHA has also established a 500 ppm 10-minute maximum peak. The ACGIH recommends that exposure be limited to 50 ppm as an eight-hour TWA.

Methylene Chloride, CAS number 75-09-2—(synonym: dichloromethane) Methylene Chloride is a colorless, volatile liquid with a penetrating ether-like odor. It is an eye, skin, and respiratory tract irritant. It is also a mild central nervous system depressant with exposure generally occurring through inhalation. Methylene chloride is a suspected human carcinogen. OSHA limits exposure to 25 ppm as an eight-hour TWA, and to 125 ppm as a STEL. The ACGIH recommends that exposure be limited to 50 ppm as an eight-hour TWA. If methylene chloride is present at the landfill, the airborne concentrations are expected to be very low or not detectable.

Trichloroethene, CAS number 79-01-6—(synonym: Trichloroethylene) Trichloroethene is a nonflammable mobile gas with a characteristic odor resembling that of chloroform. Moderate exposure can cause symptoms similar to alcohol inebriation. High concentrations of Trichloroethene can cause a narcotic effect. Trichloroethene has been found to induce hepocellular carcinomas. Heavy exposure has also been found to cause death by ventricular fibrillation. OSHA limits exposure to 100 ppm as an eight-hour TWA, with a ceiling limit of 200 ppm and a 300 ppm 5-minute maximum peak in any two hour period. ACGIH recommends exposure be limited to 50 ppm as an eight-hour TWA.

1,2-Dichloroethane, CAS number 107-06-2—(synonym: Ethylene Dichloride) 1,2-Dichloroethane has a characteristic pleasant odor and a sweet taste. Vapors of 1,2-Dichloroethane have been found to be irritating to the lungs and eyes and may disturb balance cause abdominal cramping. This substance has been listed as a carcinogen by the USEPA. OSHA limits exposure to 50 ppm as an eight-hour TWA, with a ceiling limit of 100 ppm and a 200 ppm 5-minute maximum peak in any three hour period. ACGIH recommends exposure be limited to 10 ppm as an eight-hour TWA.

Acetone, CAS number 67-64-1 (synonym - dimethylketone; 2-propanone). Acetone is a colorless

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volatile liquid with a pungent odor and sweetish taste. Acetone is extremely flammable and is considered a fire risk and is generally characterized by low to moderate toxicity by ingestion and inhalation. Prolonged or repeated topical use may cause dryness. Inhalation may produce headache, fatigue, excitement, bronchial irritation, and in large amounts narcosis. OSHA limits exposure to 1000 ppm as an eight-hour TWA. ACGIH recommends exposure be limited to 500 ppm as an eight-hour TWA.

2-Butanone, CAS number 78-93-1 (synonym - methyl ethyl ketone). 2-Butanone is a colorless liquid with an acetone-like odor and is a narcotic by inhalation. 2-Butanone should be considered a fire risk. OSHA limits exposure to 200 ppm as an eight-hour TWA.

Tetrachloroethene, CAS 127-18-4—(synonym: Tetrachloroethylene). Tetrachlorethane is a colorless nonflammable liquid with a an ethereal odor. In high concentrations tetrachlorethane can have a narcotic effect and can cause a defatting effect on the skin leading to dermatitis. OSHA limits exposure to 100 ppm as an eight-hour TWA, with a ceiling limit of 200 ppm and a 300 ppm 5-minute maximum peak in any three hour period. ACGIH recommends exposure be limited to 25 ppm as an eight-hour TWA.

PCB (Aroclor). PCBs are highly toxic colorless liquids. PCBs induce toxic effects in humans including chloracne, pigmentation of skin and nails, excessive eye discharge, swelling of eyelids, distinctive hair follicles, and gastrointestinal disturbances. PCB's have been listed as carcinogens by the USEPA and may also cause liver damage.

Cresol, CAS 1319-77-3—(synonym: 4 - Methylphenol). Cresol is a colorless or pinkish liquid with a sweet, tarry odor similar to phenol or creosote. It is eye, skin and respiratory tract irritant. It is a central nervous system depressant and a poison with exposure generally occurring through inhalation or skin absorption. OSHA limits airborne exposure to 5 ppm as an eight hour TWA. Exposure exceeding this limit may cause breathing difficulty, mental confusion and eventually lead to respiratory failure.

Lead, CAS 7439-92-1. Metallic lead is a heavy, ductile, soft gray solid. OSHA considers "Lead" to mean metallic lead, all inorganic lead compounds such as lead oxides and lead salts, and a class of organic lead compounds called soaps. All other organic lead compounds are excluded from this definition. Lead is a central nervous system poison with exposure generally occurring through inhalation or ingestion of lead bearing dusts. Symptoms of lead poisoning include weakness, insomnia, anemia, abdominal pain and tremors. OSHA limits exposure to lead to 0.050 mg/m³ as an eight hour TWA, and an action limit of 0.030 mg/m³.

SECTION 5 — TRAINING

5.1 Basic Training Required

Completion of the 40-hour Health and Safety Training for Hazardous Waste Operations and three days on the job training under the supervision of a qualified person is required for all employees who will

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perform work in areas where the potential for a toxic exposure exists.

5.2 Advanced Training

Advanced training, as necessary, will be provided to any personnel who will be expected to perform site work utilizing Level A protection or other specialized operation to be undertaken at the site.

5.3 Site-Specific Training

Training will be provided that specifically addresses the activities, procedures, monitoring, and equipment for the site operations prior to going on site. Training will include familiarization with site and facility layout, known and potential hazards, and emergency services at the site, and details of the provisions contained within this HASP. This training will also allow field workers to clarify anything they do not understand and to reinforce their responsibilities regarding safety and operations for their particular activity.

5.4 Safety Briefings

C&S project personnel will be given briefings by the HSO on a daily or as needed basis to further assist site personnel in conducting their activities safely. Pertinent information will be provided when new operations are to be conducted. Changes in work practices must be implemented due to new information made available, or if site or environmental conditions change. Briefings will also be given to facilitate conformance with prescribed safety practices. When conformance with these practices is not being followed, or if deficiencies are identified during safety audits the project manager will be notified.

5.5 First Aid and CPR

The HSO will identify those individuals requiring this training in order to oversee emergency treatment if so required during field activities. It is expected that a selected number of field workers will have First Aid training and some members of the field team will have CPR training. These courses will be consistent with the requirements of the American Red Cross Association.

SECTION 6 — ZONES

6.1 Site Zones

Three types of site activity zones are identified for the engineered cap construction activities, including the Work Zone, Contamination Reduction Zone, and the Support Zone.

6.1.1 Work Zone (Exclusion Zone)

The Work Zone, or exclusion zone, is the area where contamination is known to be or likely to be present or area where activity is being conducted which has the potential to cause harm. The

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Work Zone will be any area of intrusive activity. It is anticipated that the location of the Work Zone will change as construction activities progress. No one may enter the Work Zone without the necessary protective equipment and without permission from the HSO.

6.1.2 Contamination Reduction Zone

The Contamination Reduction Zone is the area where personal and equipment decontamination will be conducted.

6.1.3 Support Zone

The Support Zone is considered the uncontaminated area. This area may include the C&S trailer command post or pre-work area which will provide for communications and emergency response. Appropriate safety and support equipment also will be located in this zone.

SECTION 7 — PERSONAL PROTECTIVE EQUIPMENT

7.1 General

The level of protection to be worn by field personnel will be defined and controlled by the HSO. Depending upon the type and levels of waste material present at the site, varying degrees of protective equipment will be needed. If the possible hazards are unknown, a reasonable level of protection will be taken until sampling and monitoring results can ascertain potential risks. The levels of protection listed below are based on USEPA Guidelines. A list of the appropriate clothing for each level is also provided.

Level A protection must be worn when a reasonable determination has been made that the highest available level of respiratory, skin, eye, and mucous membrane protection is needed. It should be noted that while Level A provides maximum available protection, it does not protect against all possible hazards. Consideration of the heat stress that can arise from wearing Level A protection should also enter into the decision making process.

Level A protection includes:

- Open Circuit, pressure-demand SCBA
- Totally encapsulated chemical resistant suit
- Gloves, inner (surgical type)
- Gloves, outer, chemical protective
- Boots, chemical protective

Level B protection must be used when the highest level of respiratory protection is needed, but hazardous material exposure to the few unprotected areas of the body (i.e., the back of the neck) is unlikely.

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HEALTH AND SAFETY PLAN

Level B protection includes:

- Open circuit, pressure-demand SCBA or pressure airline with escape air bottle
- Chemical protective clothing: Overalls and long sleeved jacket; disposal chemical resistant coveralls; coveralls; one or two piece chemical splash suit with hood
- Gloves, inner (surgical type)
- Gloves, outer, chemical protective
- Boots, chemical protective

Level C protection will be used when the required level of respiratory protection is known, or reasonably assumed, to be not greater than the level of protection afforded by air purifying respirators; and hazardous materials exposure to the few unprotected areas of the body (i.e., the back of the neck) is unlikely.

Level C protection includes:

- Full or half face air-purifying respirator
- Chemical protective clothing: Overalls and long-sleeve jacket; disposable chemical resistant coveralls; coveralls; one or two piece chemical splash suit
- Gloves, inner (surgical type)
- Gloves, outer, chemical protective
- Boots, chemical protective

Level D is the basic work uniform. It cannot be worn on any site where respiratory or skin hazards exist.

Level D protection includes:

- Safety boots/shoes
- Safety glasses
- Hard Hat with optional face shield

Note that the use of SCBA and airline equipment is contingent upon the user receiving special training in the proper use and maintenance of such equipment.

7.2 Personal Protective Equipment - Specific

Level D with some modification will be required when working in the work zone on this site. In addition to the basic work uniform specified by Level D protection, chemical protective gloves with a surgical type inner liner will be required when contact with soil, leachate or landfill material is likely. An upgrade to a higher level (Level C) of protection may occur if determined necessary by the HSO.

C&S ENGINEERS, INC.
HEALTH AND SAFETY PLAN

SECTION 8 — MONITORING PROCEDURES

8.1 Monitoring During Site Operations

All site environmental monitoring and meteorological monitoring of climatic conditions will be performed by the construction contractor in accordance with Section 8 of the contractor's Site Specific Health and Safety Plan.

8.2 Personnel Monitoring Procedures

Monitoring of C&S personnel may be performed as a contingency measure in the event that VOC concentrations are consistently above the established action level for the project, as identified in the contractor's Site Specific Health and Safety Plan. If the concentration of VOCs is above this action level, then amendments to the HASP must be made before work can continue at the site.

8.3 Medical Surveillance Procedures for Evidence of Personal Exposure

All C&S Engineers Inc. personnel who will be performing field work at the site must be medically qualified. Additional medical testing may be required by the HSO in consultation with the company physician if an overt exposure or accident occurs, or if other site conditions warrant further medical surveillance.

8.4 Heat Stress Monitoring

It is anticipated that heat stress may be a concern. Guidance relating to heat stress control is presented in Appendix C of this HASP.

SECTION 9 — COMMUNICATIONS

A telephone will be located in the C&S trailer for communication with emergency support services/facilities. Guidance relating to site communications which may be implemented depending on conditions and circumstances is presented in Appendix D of this HASP.

SECTION 10 — SAFETY CONSIDERATIONS FOR SITE OPERATIONS

10.1 General

Standard safe work practices that will be followed include:

- Do not climb over/under drums, or other obstacles.
- Do not enter the work zone alone.

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HEALTH AND SAFETY PLAN

- Practice contamination avoidance, on and off-site.
- Plan activities ahead of time, use caution when conducting concurrently running activities.
- No eating, drinking, chewing or smoking is permitted in work zones.
- Due to the unknown nature of waste placement at the site, extreme caution should be practiced during excavation activities.
- Apply immediate first aid to any and all cuts, scratches, abrasions, etc.
- Be alert to your own physical condition. Watch your buddy for signs of fatigue, exposure, etc.
- A work/rest regimen will be initiated when ambient temperatures and protective clothing create a potential heat stress situation.
- No work will be conducted without adequate natural light or without appropriate supervision.
- Task safety briefings will be held prior to onset of task work.
- Ignition of flammable liquids within or through improvised heating devices (barrels, etc.) or space heaters is forbidden.
- Entry into areas of spaces where toxic or explosive concentrations of gases or dust may exist without proper equipment is prohibited.
- Any injury or unusual health effect must be reported to the site health and safety officer.
- Prevent splashing or spilling of potentially contaminated materials.
- Use of contact lenses is prohibited while on site.
- Beards and other facial hair that would impair the effectiveness of respiratory protection are prohibited.
- Field crew members should be familiar with the physical characteristics of the work, including:
 - Wind direction in relation to potential hazardous sources
 - Accessibility to co-workers, equipment, and vehicles
 - Communication
 - Hot Zones (areas of known or suspected contamination)
 - Site Access
 - Nearest water sources
- The number of personnel and equipment in potentially contaminated areas should be minimized consistent with site operations.

C&S ENGINEERS, INC.

HEALTH AND SAFETY PLAN

10.2 Field Operations

10.2.1 Intrusive Operations

An HSO or designee will be present on-site during all intrusive work, e.g., drilling operations, excavations, trenching, and will provide monitoring to oversee that appropriate levels of protection and safety procedures are utilized by C&S Engineers, Inc., personnel.

The use of salamanders or other equipment with an open flame is prohibited and the use of protective clothing especially hard hats and boots, will be required during drilling or other heavy equipment operations. All contaminated equipment, e.g., augers, split spoons, drill pipe, backhoe, bucket, etc., will be placed on liner material when not in use, or when awaiting and during steam cleaning.

Communications will be maintained at all times.

10.2.2 Excavation Trenching

Guidance relating to safe work practices for C&S Engineers, Inc., employees regarding excavating/trenching operation is presented in Appendix E of this HASP.

SECTION 11 — DECONTAMINATION PROCEDURES

Decontamination involves physically removing contaminants and/or converting them chemically into innocuous substances. Only general guidance can be given on methods and techniques for decontamination. Decontamination methods will include:

- Removal and disposal of protective equipment
- Removal and thorough cleaning of protective equipment with detergent and water
- Thorough cleansing of the face and hands with soap and warm water

Decontamination procedures are designed to:

- Remove contaminants.
- Avoid spreading the contamination from the work zone.
- Avoid exposing unprotected personnel outside of the work zone to contaminants.

Contamination avoidance is the first and best method for preventing spread of contamination from a hazardous site. Each person involved in site operations must practice the basic methods of contamination avoidance listed below. Additional precautions may be required in the HASP.

- Know the limitations of all protective equipment being used.
- Do not enter a contaminated area unless it is necessary to carry out a specific objective.
- When in a contaminated area, avoid touching anything unnecessarily.

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- Walk around pools of liquids, discolored areas, or any area that shows evidence of possible contamination.
- Walk upwind of contamination, if possible.
- Do not sit or lean against anything in a contaminated area. If you must kneel (e.g., to take samples), use a plastic ground sheet.
- If at all possible, do not set sampling equipment directly on contaminated areas. Place equipment on a protective cover such as a ground cloth.
- Use the proper tools necessary to safely conduct the work.

Specific methods that may reduce the chance of contamination are:

- Use of remote sampling techniques.
- Opening containers by non-manual means.
- Bagging monitoring instruments.
- Use of drum grapples.
- Watering down dusty areas.

Equipment which will need to be decontaminated includes tools, monitoring equipment, and personal protective equipment. Items to be decontaminated will be brushed off, rinsed, and dropped into a plastic container supplied for that purpose. They will then be washed with a detergent solution and rinsed with clean water. Monitoring instruments will be wrapped in plastic bags prior to entering the field in order to reduce the potential for contamination. Instrumentation that is contaminated during field operations will be carefully wiped down.

Heavy equipment, if utilized for operations where it may be contaminated, will have prescribed decontamination procedures to prevent hazardous materials from potentially leaving the site. The on-site contractor will be responsible for decontaminating all construction equipment prior to demobilization.

SECTION 12 — DISPOSAL PROCEDURES

All discarded materials, waste materials, or other objects shall be handled in such a way as to reduce or eliminate the potential for spreading contamination, creating a sanitary hazard, or causing litter to be left on-site. All potentially contaminated materials, e.g., clothing, gloves, etc., will be bagged or drummed as necessary and segregated for proper disposal. All contaminated waste materials shall be disposed of as required by the provisions included in the contract and consistent with regulatory provisions.

All non-contaminated materials shall be collected and bagged for appropriate disposal.

C&S ENGINEERS, INC.
HEALTH AND SAFETY PLAN

SECTION 13 — EMERGENCY PLAN

As a result of the hazards at the site, and the conditions under which operations are conducted, there is the possibility of emergency situations. This section has established procedures for the implementation of an emergency plan.

13.1 Emergency Coordinator

The Site Emergency Coordinator is John Virginia, C&S Resident Project Representative.

The Site Emergency Coordinator shall implement the emergency plan whenever conditions at the site warrant such action. The Site Emergency Coordinator will be responsible for assuring the evacuation, emergency treatment, emergency transport of site personnel as necessary, and notification of emergency response units (refer to phone listing in the beginning of this HASP) and the appropriate management staff.

13.2 Evacuation

In the event of an emergency situation, such as fire, explosion, significant release of toxic gases, etc., all personnel will evacuate and assemble in a designated assembly area (most likely the project trailer). The Emergency Coordinator will have authority to contact outside services as required. Under no circumstances will incoming personnel or visitors be allowed to proceed into the area once the emergency signal has been given. The Emergency Coordinator must see that access for emergency equipment is provided and that all ignition sources have been shut down once the alarm has been sounded.

Once the safety of all personnel is established, the Fire Department and other emergency response groups will be notified by telephone of the emergency.

13.3 Potential or Actual Fire or Explosion

Immediately evacuate the site and notify local fire and police departments, and other appropriate emergency response groups, if LEL values are above 25% in the work zone or if an actual fire or explosion has taken place.

13.4 Environmental Incident (spread or release of contamination)

Control or stop the spread of contamination if possible. Notify the Emergency Coordinator and the Project Manager. Other appropriate response groups will be notified as appropriate.

13.5 Personnel Injury

Emergency first aid shall be applied on-site as necessary. Then, decontaminate (en route if necessary) and transport the individual to nearest medical facility if needed.

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HEALTH AND SAFETY PLAN

The ambulance/rescue squad shall be contacted for transport as necessary in an emergency. The directions to the hospital and a map are found in Figure 1.

13.6 Personnel Exposure

- Skin Contact:** Use copious amounts of soap and water. Wash/rinse affected area thoroughly, then provide appropriate medical attention. Eyes should be thoroughly rinsed with water for at least 15 minutes.
- Inhalation:** Move to fresh air and/or, if necessary, decontaminate and transport to emergency medical facility.
- Ingestion:** Contact the Poison Control Center, decontaminate and transport to emergency medical facility.
- Puncture Wound/
Laceration:** Decontaminate, if possible, and transport to emergency medical facility. HSO will provide medical data sheets to medical personnel as requested.

13.7 Adverse Weather Conditions

In the event of adverse weather conditions, the HSO will determine if work can continue without sacrificing the health and safety of C&S field workers.

13.8 Incident Investigation and Reporting

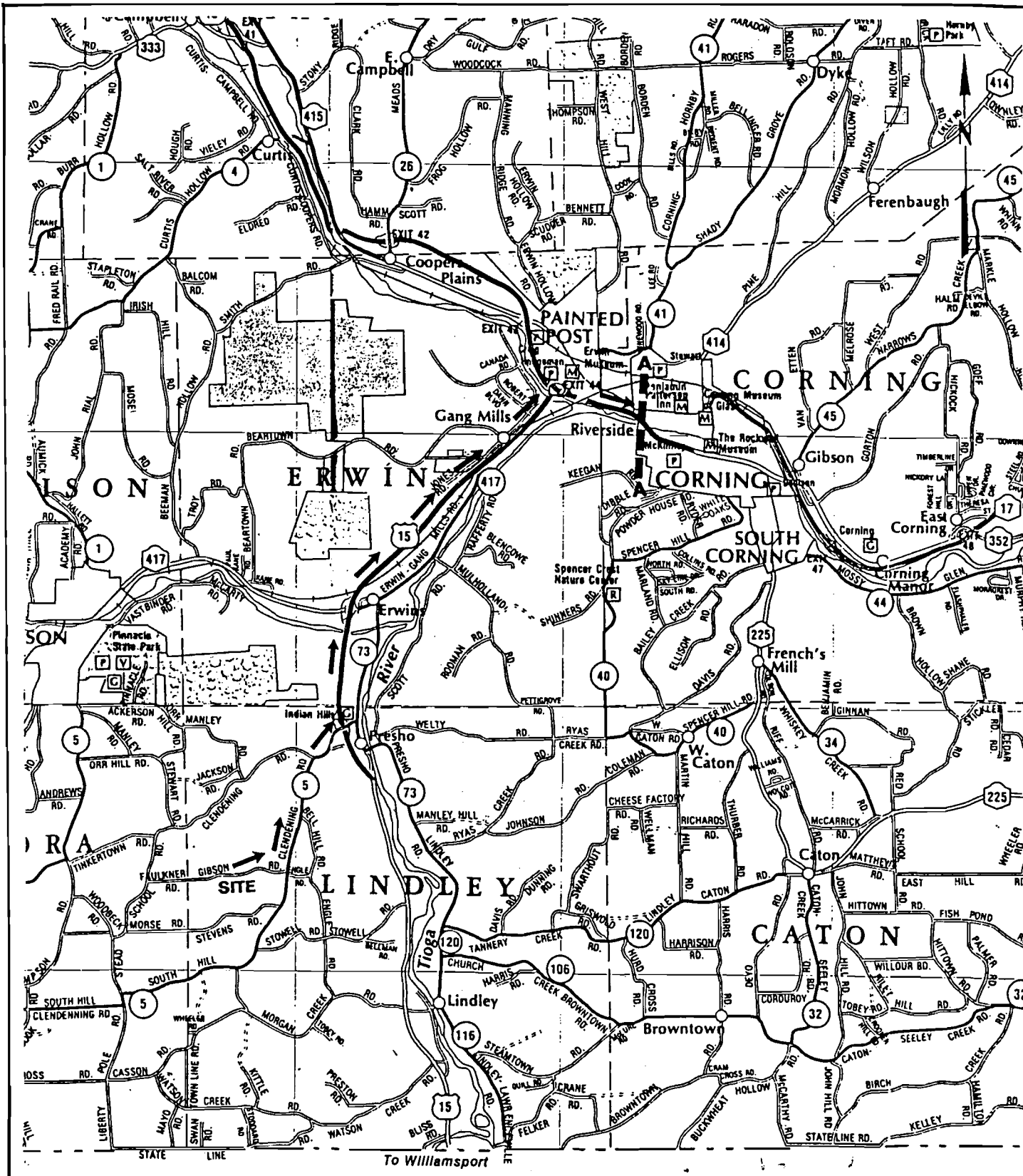
In the event of an incident, procedures discussed in the C&S incident investigation and reporting policy, which is presented in Appendix F of this HASP, shall be followed.

SECTION 14 — COMMUNITY RELATIONS

Community relations may be a sensitive matter. All C&S employees should be aware of issues associated with this specific site. Conversations with community members not involved in activities at the site should be limited. Conversations between site workers off the site, in restaurants, etc., should not include discussions of the potential hazards on the site nor should negative statements be made regarding the site.

SECTION 15 — AUTHORIZATIONS

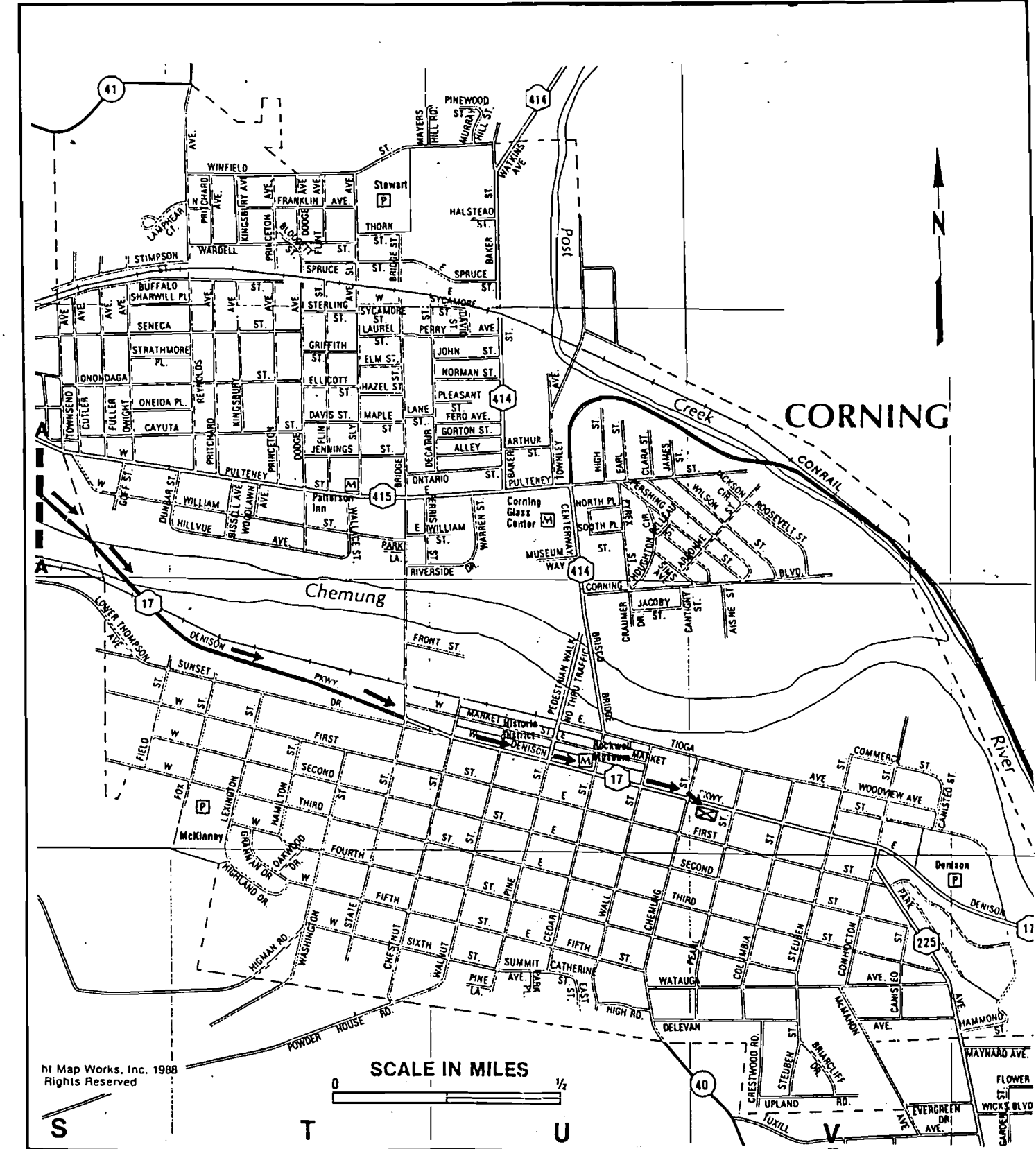
C&S personnel authorized to enter the Site while operations are being conducted must be approved by the HSO. Authorization will involve completion of appropriate training courses, medical examination requirements, and review of this HASP. No C&S personnel should enter the work zone alone. Each C&S employee should check in with the HSO or Project Manager prior to entering the work zones.



RURAL ROUTE FROM SITE TO CORNING

Scale: 1" = 2 Miles

REFER TO CORNING MAP
SHEET NO. 2



CITY ROUTE

HOSPITAL

LINDLEY SOUTH LANDFILL
STEBUEN COUNTY, NEW YORK
HEALTH & SAFETY PLAN
HOSPITAL ROUTE

C&S Engineers, Inc.

SCALE: AS SHOWN

FIGURE

APPENDIX A

ANALYTICAL DATA

Town of Lindley - Steuben County
Phase II Investigations - Filtered Metals

		Class GA	Class GA	Groundwater Samples					Leachate	Surface Water Samples		
Parameters	Units	Standard	Guidance	GW-1	GW-2	GW-3	GW-4	GW-5	L-4	SW-5	SW-6	SW-7
Aluminum	ug/l	100	3	156	100	100	100	100	6090	1180	515000	1640
Antimony	ug/l			60	60	60	60	60	60	60	60	60
Arsenic	ug/l	25		5	5	5	5	12.7	16	5	78.1	10.6
Barium	ug/l	1000	3	52	82	115	25	254	1080	51.1	8110	863
Beryllium	ug/l			2	2	2	2	2	2	2	28	2
Cadmium	ug/l	10		5	5	5	5	5	111	5	2111	5.4
Calcium	ug/l		35000	86400	59200	75200	245000	234000	1620000	84500	610000	354000
Chromium	ug/l	50		10	10	10	10	10	82	10	635	13
Cobalt	ug/l	5		10	10	10	10	10	70.2	10	535	13
Copper	ug/l	200	3	10	10	10	10	10	10	16.6	1150	10
Iron	ug/l	300		614	227	86	43	8750	895000	2180	1610000	72200
Lead	ug/l	25		5	5	5	5	5	13.8	5	5130	10.3
Magnesium	ug/l		35000	32300	54700	37300	68400	62500	337000	13100	255000	84100
Manganese	ug/l	300		1100	620	693	2410	25400	66700	62.7	44900	30200
Mercury	ug/l	2		0.2	0.2	0.2	0.2	0.2	0.2	0.2	1.3	0.2
Nickel	ug/l		3	15	15	15	15	15	215	15	1080	19
Potassium	ug/l			3960	2970	18500	3620	1290	350000	1720	56300	39300
Selenium	ug/l	10		5	5	5	5	50	5	5	50	5
Silver	ug/l	50	3	10	10	10	10	10	10	10	10	10
Sodium	ug/l	20000		29700	17000	31900	78400	30600	1060000	5420	56300	152000
Thallium	ug/l			5	5	5	5	5	5	5	5	5
Vanadium	ug/l		3	10	10	10.6	10	10	310	10	789	20
Zinc	ug/l	300		11	20	15.6	25	19	1970	18.7	28900	236

APPENDIX A

ANALYTICAL DATA

Town of Lindley - Steuben County
Phase II Investigations - Filtered Metals

		Class GA	Class GA	Groundwater Samples					Leachate	Surface Water Samples		
Parameters	Units	Standard	Guidance	GW-1	GW-2	GW-3	GW-4	GW-5	L-4	SW-5	SW-6	SW-7
Aluminum	ug/l	100	3	156	100	100	100	100	6090	1180	515000	1640
Antimony	ug/l			60	60	60	60	60	60	60	60	60
Arsenic	ug/l	25		5	5	5	5	12.7	16	5	78.1	10.6
Barium	ug/l	1000	3	52	82	115	25	254	1080	51.1	8110	863
Beryllium	ug/l			2	2	2	2	2	2	2	28	2
Cadmium	ug/l	10		5	5	5	5	5	111	5	2111	5.4
Calcium	ug/l		35000	86400	59200	75200	245000	234000	1620000	84500	610000	354000
Chromium	ug/l	50		10	10	10	10	10	82	10	635	13
Cobalt	ug/l	5		10	10	10	10	10	70.2	10	535	13
Copper	ug/l	200		10	10	10	10	10	10	16.6	1150	10
Iron	ug/l	300		614	227	86	43	8750	895000	2180	1610000	72200
Lead	ug/l	25		5	5	5	5	5	13.8	5	5130	10.3
Magnesium	ug/l			32300	54700	37300	68400	62500	337000	13100	255000	84100
Manganese	ug/l	300		1100	620	693	2410	25400	66700	62.7	44900	30200
Mercury	ug/l	2		0.2	0.2	0.2	0.2	0.2	0.2	0.2	1.3	0.2
Nickel	ug/l			15	15	15	15	15	215	15	1080	19
Potassium	ug/l			3960	2970	18500	3620	1290	350000	1720	56300	39300
Selenium	ug/l	10		5	5	5	5	50	5	5	50	5
Silver	ug/l	50		10	10	10	10	10	10	10	10	10
Sodium	ug/l	20000		29700	17000	31900	78400	30600	1060000	5420	56300	152000
Thallium	ug/l			5	5	5	5	5	5	5	5	5
Vanadium	ug/l			10	10	10.6	10	10	310	10	789	20
Zinc	ug/l	300		11	20	15.6	25	19	1970	18.7	28900	236

Town of Lindley Landfill - Steuben County
Phase II Investigations - Volatile Organic Data

Parameter	Class GA Standard	Class GA Guidance	Groundwater Monitoring Wells					Leachate	Surface Water Samples			
			GW-1	GW-2	GW-3	GW-4	GW-5	L-4	SW-5	SW-6	SW-7	SW-8
Units			ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l
Methylene Chloride	5		4	5	6	6	20	1800	5	18	280	7
Acetone			12	32	16	33	120	9600	8	150	1000	94
1,1-Dichloroethene	5											
1,1-Dichloroethane	5						11					
Carbon Disulfide										5		96
Total 1,2-Dichloroethene												
2-Butanone				48			340	23000		250	2600	130
1,2-Dichloroethane	5											
1,1,1-Trichloroethane	5											
Carbon Tetrachloride	5											
Trichloroethene	5											
Benzene	0.7											
2-Methyl-2-Pentanone	5											
Tetrachloroethene	5											
Toluene	5						8	450		9		17
Chlorobenzene	5											
Total Xylenes	5											
Ethylbenzene	5											
Phenol	1						3	460		2	15	
2-Methylphenol							2	54				
4-Methylphenol								5400		31	600	
Benzoic Acid							36			12	650	
Diethylphthalate		50					2	320		2	16	
4,4-DDE					0.06							
4,4-DDD					0.02							
4,4-DDT					0.1							
Aroclor 1248				3.4								
Bis(2-ethylhexyl)phthalate	50		11	6	13		14		9	12	6	680

Town of Lindley South Landfill
Phase II Investigations - Volatile Organic Data

Parameter	Air Monitoring Samples		
	Vent-7	Vent-8	GW-3
Units	ug/Cu. M.	ug/Cu. M.	ug/Cu. M.
Methylene Chloride	4500	4200	3.3
Acetone	870	560	36
1,1-Dichloroethene	9.6		
1,1-Dichloroethane	830	770	
Carbon Disulfide			
Total 1,2-Dichloroethene	79	62	
2-Butanone	1100	1800	6.6
1,2-Dichloroethane	22	19	
1,1,1-Trichloroethane	200	89	1.1
Carbon Tetrachloride			0.5
Trichloroethene	1100	840	
Benzene	59	51	1.5
2-Methyl-2-Pentanone		98	
Tetrachloroethene	850	690	
Toluene	1100	1520	2.2
Chlorobenzene		27	
Total Xylenes	570	940	2.3
Ethylbenzene	110	170	4.3

Quarterly Leachate Analytical Data - Water Quality and Metal Parameters

Parameters	Units	GA Standard	L-1	L-1	L-2	L-2	L-3	L-3
	Date	Sampled	01/23/95	04/18/95	01/23/95	04/18/95	01/23/95	04/18/95
NO3/NO2	mg/l	10	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Alk.	mg/l		1300	1800	930	520	990	810
Chloride	mg/l	250	160	240	100	610	150	220
COD	mg/l		1500	1900	680	700	940	1000
NH3	mg/l	2.0	33	44	31	74	0.6	<0.5
Sulfate	mg/l	250	12	10	14	< 10	6	39
TDS	mg/l	500	2200	4000	1200	2200	2800	4200
TOC	mg/l		250	560	220	460	460	640
Phenol	mg/l	0.001	0.56	0.18	<0.005	0.24	0.34	<0.05
Cadmium	mg/l	0.01	<0.005	<0.005	<0.005	0.008	<0.005	<0.005
Calcium	mg/l		150	190	150	230	110	120
Iron	mg/l	0.3	31	38	62	93	1.9	1.5
Lead	mg/l	0.025	0.008	0.014	0.019	0.011	0.017	0.018
Mg	mg/l	35	58	83	39	66	45	59
Mn	mg/l	0.3	3.1	4.3	4.4	5.9	1.8	0.96
K	mg/l		46	75	24	64	12	17
Sodium	mg/l	20	170	380	63	160	200	320
Hardness	mg/l		610	820	540	850	460	540

Quarterly Surface Water Analytical Data

Parameters	Units	GA Standard	SW-1	SW-1	SW-2	SW-2	SW-3	SW-3
Date		Sampled	01/23/95	04/17/95	01/23/95	04/17/95	01/23/95	04/17/95
NO3/NO2	mg/l	10	<0.2	<0.2	0.3	<0.2	<0.3	0.2
Alk.	mg/l		120	96	64	69	<100	130
Chloride	mg/l	250	6	8	22	24	23	35
COD	mg/l		<20	<20	<20	<20	110	140
NH3	mg/l	2	<0.5	<0.5	0.5	0.5	5.1	0.7
Sulfate	mg/l	250	<5	11	17	25	13	26
TDS	mg/l	500	130	150	110	160	240	340
TOC	mg/l		3	5	3	8	23	43
Phenol	mg/l	0.001	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Cadmium	mg/l	0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Calcium	mg/l		27	26	22	23	26	32
Iron	mg/l	0.3	0.56	0.45	0.87	0.87	4.9	2.2
Lead	mg/l	0.025	0.013	0.001	0.009	<0.001	0.011	0.002
Mg	mg/l	35	4.8	5	5	5.7	7	9.1
Mn	mg/l	0.3	0.04	0.05	0.04	0.03	0.11	0.15
K	mg/l		1.5	1.1	1.5	1.3	3.2	2.2
Sodium	mg/l	20	6.7	7.5	9.3	13	15	25
Hardness	mg/l		87	86	76	81	94	120

APPENDIX B

MATERIAL SAFETY DATA SHEETS (MSDS)

**** MATERIAL SAFETY DATA SHEET ****

Benzene
02610

**** SECTION 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION ****

MSDS Name: Benzene

Catalog Numbers:

S79920ACS, B243 4, B243-4, B2434, B245 4, B245 500, B245-4, B245-500, B2454
B245500, B245J4, B411 1, B411 4, B411-1, B411-4, B4111, B4114, B414-1

Synonyms:

Benzol, coal naphtha, cyclohexatriene, phenyl hydride, pyrobenzol.

Company Identification: Fisher Scientific

1 Reagent Lane

Fairlawn, NJ 07410

For information, call: 201-796-7100

Emergency Number: 201-796-7100

For CHEMTREC assistance, call: 800-424-9300

For International CHEMTREC assistance, call: 703-527-3887

**** SECTION 2 - COMPOSITION, INFORMATION ON INGREDIENTS ****

CAS#	Chemical Name	%	EINECS#
71-43-2	Benzene	99%	200-753-7

Hazard Symbols: T F

Risk Phrases: 11 45 48/23/24/25

**** SECTION 3 - HAZARDOUS IDENTIFICATION ****

EMERGENCY OVERVIEW

Appearance: colourless, Flash Point: 12 deg F.

Danger! Extremely flammable liquid. Harmful if inhaled. May be harmful if absorbed through the skin. Aspiration hazard. Poison! May cause central nervous system effects. May cause eye and skin irritation. May cause respiratory and digestive tract irritation. May cause reproductive and fetal effects. Cancer hazard. May cause blood abnormalities. Harmful or fatal if swallowed.

Target Organs: Blood, central nervous system, bone marrow, immune system.

Potential Health Effects

Eye:

Causes eye irritation. May cause slight transient injury.

Skin:

Causes skin irritation. May be absorbed through the skin in harmful amounts. Direct contact with the liquid may cause erythema and vesiculation. Prolonged or repeated contact has been associated with the development of a dry scaly dermatitis or with secondary infections.

Ingestion:

Aspiration hazard. May cause central nervous system depression, characterized by excitement, followed by headache, dizziness, drowsiness, and nausea. Advanced stages may cause collapse, unconsciousness, coma and possible death due to respiratory failure. May cause effects similar to those for inhalation exposure. Aspiration of material into the lungs may cause chemical pneumonitis, which may be fatal.

Inhalation:

May cause respiratory tract irritation. May cause adverse central nervous system effects including headache, convulsions, and possible death. May cause drowsiness, unconsciousness, and central nervous system depression. Central nervous system effects may include confusion, ataxia, vertigo, tinnitus, weakness, disorientation, lethargy, drowsiness, and finally coma. Exposure may lead to irreversible bone marrow injury. Exposure may lead to aplastic anemia.

Chronic:

Possible cancer hazard based on tests with laboratory animals. Prolonged or repeated exposure may cause adverse reproductive effects. May cause bone marrow abnormalities with damage to blood forming tissues. May cause anemia and other blood cell abnormalities. Chronic exposure has been associated with an increased incidence of leukemia and multiple myelomas. Immunodepressive effects have been reported. Animal studies have reported fetotoxicity (growth retardation) and teratogenicity (exencephaly, angulated ribs, dilated brain ventricles).

**** SECTION 4 - FIRST AID MEASURES ****

Eyes:

Flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower lids. Get medical aid

immediately.

Skin:

Get medical aid immediately. Immediately flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes.

Ingestion:

Do NOT induce vomiting. If victim is conscious and alert, give 2-4 capfuls of milk or water. Never give anything by mouth to an unconscious person. Possible aspiration hazard. Get medical aid immediately.

Inhalation:

Get medical aid immediately. Remove from exposure to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Notes to Physician:

Treat symptomatically and supportively.

**** SECTION 5 - FIRE FIGHTING MEASURES ****

General Information:

Containers can build up pressure if exposed to heat and/or fire. As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Water runoff can cause environmental damage. Dike and collect water used to fight fire. Vapors can travel to a source of ignition and flash back. Extremely flammable. Material will readily ignite at room temperature. Use water spray to keep fire-exposed containers cool. Containers may explode in the heat of a fire. Vapors may be heavier than air. They can spread along the ground and collect in low or confined areas. Vapors may form an explosive mixture with air.

Extinguishing Media:

Use water spray to cool fire-exposed containers. Water may be ineffective. Do NOT use straight streams of water. For large fires, use water spray, fog or regular foam. For small fires, use dry chemical, carbon dioxide, water spray or regular foam. Cool containers with flooding quantities of water until well after fire is out.

Autoignition Temperature: 1044 deg F (562.22 deg C)

Flash Point: 12 deg F (-11.11 deg C)

NFPA Rating: health-2; flammability-3; reactivity-0

Explosion Limits, Lower: 1.3%

Upper: 7.1%

**** SECTION 6 - ACCIDENTAL RELEASE MEASURES ****

General Information: Use proper personal protective equipment as indicated in Section B.

Spills/Leaks:

Use water spray to dilute spill to a non-flammable mixture. Avoid runoff into storm sewers and ditches which lead to waterways. Use water spray to disperse the gas/vapor. Remove all sources of ignition. Absorb spill using an absorbent, non-combustible material such as earth, sand, or vermiculite. A vapor suppressing foam may be used to reduce vapors.

**** SECTION 7 - HANDLING and STORAGE ****

Handling:

Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Ground and bond containers when transferring material. Do not get in eyes, on skin, or on clothing. Empty containers retain product residue, (liquid and/or vapor), and can be dangerous. Keep container tightly closed. Avoid contact with heat, sparks and flame. Do not ingest or inhale. Use only in a chemical fume hood. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat, sparks or open flames.

Storage:

Keep away from heat, sparks, and flame. Keep away from sources of ignition. Store in a tightly closed container. Keep from contact with oxidizing materials. Store in a cool, dry, well-ventilated area away from incompatible substances.

**** SECTION 8 - EXPOSURE CONTROLS, PERSONAL PROTECTION ****

Engineering Controls:

Use only under a chemical fume hood.

Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Benzene	0.5 ppm / 1.6 mg/m3; 2.5 ppm STEL; 8 mg/m3 STEL	0.1 ppm TWA; NIOSH Potential Occupational Carcinogen - see	10 ppm TWA (apply only to exempt industry segments); 1 p

Appendix A 300 ppm IDLH (not considering carcinogenic effects)	ppm TWA, 3 ppm S TEL, 0.5 ppm TWA action limit to Cancer haz ard; Flammabl e (see 29 CFR 19 10.1028)
--	--

OSHA Vacated PELs:

Benzene:

10 ppm TWA (unless specified in 1910.1028)

Personal Protective Equipment

Eyes:

Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133.

Skin:

Wear appropriate protective gloves to prevent skin exposure.

Clothing:

Wear appropriate protective clothing to prevent skin exposure.

Respirators:

Follow the OSHA respirator regulations found in 29CFR 1910.134. Always use a NIOSH-approved respirator when necessary.

**** SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES ****

Physical State:	Liquid
Appearance:	colourless
Odor:	sweetish odor - aromatic odor
pH:	Not available.
Vapor Pressure:	100 mm Hg
Vapor Density:	2.7 (Air=1)
Evaporation Rate:	2.8 (Ether=1)
Viscosity:	0.647mPa at 20C
Boiling Point:	176 deg F
Freezing/Melting Point:	42 deg F
Decomposition Temperature:	Not available.

Solubility: Slightly soluble.
Specific Gravity/Density: 0.88
Molecular Formula: C₆H₆
Molecular Weight: 78.042

**** SECTION 10 - STABILITY AND REACTIVITY ****

Chemical Stability:

Stable under normal temperatures and pressures.

Conditions to Avoid:

Incompatible materials, ignition sources, excess heat.

Incompatibilities with Other Materials:

Benzene is incompatible with arsenic pentafluoride + potassium methoxide, diborane, hydrogen + raney nickel, interhalogens, oxidants, uranium hexafluoride, bromine pentafluoride, chlorine, chlorine trifluoride, chromic anhydride, nitryl perchlorate, oxygen, ozone, perchlorates, perchloryl fluoride + aluminum chloride, permanganates + sulfuric acid, potassium peroxide and silver perchlorate, iodine heptafluoride, and dioxygen difluoride.

Hazardous Decomposition Products:

Irritating and toxic fumes and gases.

Hazardous Polymerization: Has not been reported.

**** SECTION 11 - TOXICOLOGICAL INFORMATION ****

RTECS#:

CAS# 71-43-2; CY1400000

LD50/LC50:

CAS# 71-43-2; Inhalation, mouse: LC50 = 9980 ppm; Inhalation, rat: LC50 = 10000 ppm/7H; Oral, mouse: LD50 = 4700 mg/kg; Oral, rat: LD50 = 930 mg/kg; Skin, rabbit: LD50 = 19400 mg/kg.

Carcinogenicity:

Benzene -

ACGIH: A1-confirmed human carcinogen

California: carcinogen - initial date 2/27/87

NIOSH: occupational carcinogen

NTP: Known carcinogen

OSHA: Select carcinogen

IARC: Group 1 carcinogen

Epidemiology:

IARC has concluded that epidemiological studies have established the relationship between benzene exposure and the development of acute myelogenous leukemia, and that there is

sufficient evidence that benzene is carcinogenic to humans. Animal studies have demonstrated fetotoxicity (growth retardation) and teratogenicity (exencephaly, angulated ribs, dilated brain ventricles).

Teratogenicity:

Experimental teratogen. Animal studies have demonstrated fetotoxicity (growth retardation) and teratogenicity (exencephaly, angulated ribs, dilated brain ventricles).

Reproductive Effects:

Experimental reproductive effects have been reported.

Neurotoxicity:

No information available.

Mutagenicity:

Chromosomal aberrations have been noted in animal tests.

Other Studies:

Please refer to RTECS CY1400000 for additional data.

**** SECTION 12 - ECOLOGICAL INFORMATION ****

Ecotoxicity:

Minnow (distilled water) lethal, 5 ppm/6H. Sunfish (tap water) TL_M=20 ppm/24H. Striped bass TL_M96=100-10 ppm.

Environmental Fate:

No information reported.

Physical/Chemical:

No information available.

Other:

None.

**** SECTION 13 - DISPOSAL CONSIDERATIONS ****

Dispose of in a manner consistent with federal, state, and local regulations.

RCRA D-Series Maximum Concentration of Contaminants:

CAS# 71-43-2: waste number D018; regulatory level = 0.5 mg/L.

RCRA D-Series Chronic Toxicity Reference Levels: CAS#

71-43-2: chronic toxicity reference level = 0.005 mg/L.

RCRA F-Series: None listed.

RCRA P-Series: None listed.

RCRA U-Series: CAS# 71-43-2: waste number U019

(Ignitable waste; Toxic waste).

CAS# 71-43-2 is banned from land disposal according

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FROM : FISHER SCIENTIFIC

to ACMA

**** SECTION 14 - TRANSPORT INFORMATION ****

US DOT

Shipping Name: RQ, BENZENE

Hazard Class: 3

UN Number: UN1114

Packing Group: II

IMO

No information available.

IATA

No information available.

RID/AQR

No information available.

Canadian T00

Shipping Name: BENZENE

Hazard Class: 3(9.2)

UN Number: UN1114

Other Information: FLASHPOINT -11 C

**** SECTION 15 - REGULATORY INFORMATION ****

US FEDERAL

TSCA

CAS# 71-43-2 is listed on the TSCA inventory.

Health & Safety Reporting List

None of the chemicals are on the Health & Safety Reporting List.

Chemical Test Rules

None of the chemicals in this product are under a Chemical Test Rule.

Section 12b

None of the chemicals are listed under TSCA Section 12b.

TSCA Significant New Use Rule

None of the chemicals in this material have a SNUR under TSCA.

SARA

Section 302 (RQ)

Final RQ = 10 pounds (4.54 kg); receives an adjustable RQ of 10 pounds

Section 302 (TPQ)

None of the chemicals in this product have a TPQ.

SARA Codes

CAS # 71-43-2; acute, chronic, flammable.

Section 313

This material contains Benzene (CAS# 71-43-2, >99%), which is subject

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FROM : FISHER SCIENTIFIC

to the reporting requirements of Section 313 of SARA Title III and
40 CFR Part 373.

Clean Air Act:

CAS# 71-43-2 is listed as a hazardous air pollutant (HAP).

This material does not contain any Class 1 Ozone depleters.

This material does not contain any Class 2 Ozone depleters.

Clean Water Act:

CAS# 71-43-2 is listed as a Hazardous Substance under the CWA.

CAS# 71-43-2 is listed as a Priority Pollutant under the Clean Water
Act.

CAS# 71-43-2 is listed as a Toxic Pollutant under the Clean Water
Act.

OSHA:

None of the chemicals in this product are considered highly hazardous
by OSHA.

STATE

Benzene can be found on the following state right to know lists:
California, New Jersey, Florida, Pennsylvania, Minnesota,
Massachusetts.

The following statement(s) is(are) made in order to comply with
the California Safe Drinking Water Act:

WARNING: This product contains Benzene, a chemical known to the state
of California to cause cancer.

California No Significant Risk Level:

CAS# 71-43-2: no significant risk level = 7 ug/day

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols: T F

Risk Phrases:

R 11 Highly flammable.

R 45 May cause cancer.

R 48/23/24/25 Toxic: danger of serious damage to
health by prolonged exposure through inhalation,
contact with skin and if swallowed.

Safety Phrases:

S 45 In case of accident or if you feel unwell, seek
medical advice immediately (show the label where
possible).

S 53 Avoid exposure - obtain special instructions
before use.

WGK (Water Danger/Protection)

CAS# 71-43-2: 3

Canada

CAS# 71-43-2 is listed on Canada's DSL/MSL List.
This product has a WHMIS classification of B2, D2A.
CAS# 71-43-2 is not listed on Canada's Ingredient Disclosure List.

Exposure Limits

CAS# 71-43-2: DEL-AUSTRALIA: TWA 5 ppm (16 mg/m³); Carcinogen. DEL-BEL
GIUM: TWA 10 ppm (32 mg/m³); Carcinogen JAN9. DEL-CZECHOSLOVAKIA: TWA 10
mg/m³; STEL 20 mg/m³. DEL-DENMARK: TWA 5 ppm (16 mg/m³); Skin; Carcinogen?
DEL-FINLAND: TWA 5 ppm (15 mg/m³); STEL 10 ppm (30 mg/m³); Skin; CAR. DEL
-FRANCE: TWA 5 ppm (16 mg/m³); Carcinogen. DEL-GERMANY: Skin; Carcinogen.
DEL-HUNGARY: STEL 5 mg/m³; Skin; Carcinogen. DEL-INDIA: TWA 10 ppm (30 mg/
m³); Carcinogen. DEL-JAPAN: TWA 10 ppm (32 mg/m³); STEL 25 ppm (80 mg/m³)
; CAR. DEL-THE NETHERLANDS: TWA 10 ppm (30 mg/m³); Skin. DEL-THE PHILIPPI
NES: TWA 25 ppm (80 mg/m³); Skin. DEL-POLAND: TWA 30 mg/m³; Skin. DEL-RUSS
IA: TWA 10 ppm (5 mg/m³); STEL 25 ppm (15 mg/m³); Skin; CAR. DEL-SWEDEN: TW
A 1 ppm (3 mg/m³); STEL 5 ppm (16 mg/m³); Skin; CAR. DEL-SWITZERLAND: TWA
5 ppm (16 mg/m³); Skin; Carcinogen. DEL-THAILAND: TWA 10 ppm (30 mg/m³); S
TEL 25 ppm (7 mg/m³). DEL-TURKEY: TWA 20 ppm (64 mg/m³); Skin. DEL-UNITE
D KINGDOM: TWA 10 ppm (30 mg/m³). DEL IN BULGARIA, COLOMBIA, JORDAN, KO
REA check ACGIH TLV. DEL IN NEW ZEALAND, SINGAPORE, VIETNAM check ACGI
TLV

**** SECTION 16 - ADDITIONAL INFORMATION ****

MSDS Creation Date: 1/05/1995 Revision #17 Date: 12/12/1997.

The information above is believed to be accurate and represents the best
information currently available to us. However, we make no warranty of
merchantability or any other warranty, express or implied, with respect to
such information, and we assume no liability resulting from its use. Users
should make their own investigations to determine the suitability of the
information for their particular purposes. In no way shall Fisher be liable
for any claims, losses, or damages of any third party or for lost profits
or any special, indirect, incidental, consequential or exemplary
damages, however arising, even if Fisher has been advised of
the possibility of such damages.

**** MATERIAL SAFETY DATA SHEET ****

Toluene
23590

**** SECTION 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION ****

MSDS Name: Toluene

Catalog Numbers:

S80229, S80229-1, S80229-2, S80229HPLC, S80229SPEC, BPT290RS-115,
BPT290RS-200, BPT290RS-28, BPT290RS-50, BW1671004, NC9475555, S802292MF,
T289-4, T290 1, T290 4, T290-1, T290-4, T2901, T2904, T290J4, T290RS115,
T290RS200, T290RS28, T290RS50, T290SK 1, T290SK 4, T290SK-1, T290SK-4,
T290SK1, T290SK4, T290SS115, T291 4, T291-4, T2914, T2914LC, T2914LOT009,
T2914LOT010, T291J4, T313 4, T313-4, T3134, T313SK 4, T313SK-4, T313SK4,
T323 20, T323 4, T323-20, T323-4, T32320, T3234, T324 1, T324 20, T324 200,
T324 4, T324 500, T324-1, T324-20, T324-200, T324-4, T324-500, T3241,
T32420, T32420 001, T324200, T32420001, T3244, T324500, T324F8115, T324F819,
T324F8200, T324F850, T324J4, T324R8115, T324R819, T324R8200, T324R850,
T324RS115, T324RS200, T324RS28, T324RS50, T324S 4, T324S-4, T324S4,
T324SK 4, T324SK-4, T324SK4, T324SK4LC, T324SS115, T324SS200, T324SS28,
T324SS50, T324S20, T330 4, T330-4, T3304

Synonyms:

Methacide, methylbenzene, methylbenzol, phenylmethane, toluol.

Company Identification: Fisher Scientific

1 Reagent Lane

Fairlawn, NJ 07410

For information, call: 201-796-7100

Emergency Number: 201-796-7100

For CHEMTREC assistance, call: 800-424-9300

For International CHEMTREC assistance, call: 703-527-3887

**** SECTION 2 - COMPOSITION, INFORMATION ON INGREDIENTS ****

CAS#	Chemical Name	X	EINECS#
108-88-3	Benzene, methyl-	199	203-625-9

Hazard Symbols: XM F

Risk Phrases: 11 20

**** SECTION 3 - HAZARDS IDENTIFICATION ****

EMERGENCY OVERVIEW

Appearance: colourless. Flash Point: 40 deg F.
Danger! Flammable liquid. May cause skin irritation. Harmful if inhaled. This substance has caused adverse reproductive and fetal effects in animals. May cause central nervous system depression. Aspiration hazard. May be absorbed through the skin. Poison! May cause liver and kidney damage. Causes digestive and respiratory tract irritation. Harmful or fatal if swallowed. Causes eye irritation and possible transient injury.
Target Organs: Kidneys, central nervous system, liver.

Potential Health Effects

Eye:

Causes eye irritation. May result in corneal injury. Vapors may cause eye irritation.

Skin:

May cause skin irritation. Prolonged and/or repeated contact may cause irritation and/or dermatitis. May be absorbed through the skin.

Ingestion:

Aspiration hazard. May cause irritation of the digestive tract. May cause effects similar to those for inhalation exposure. Aspiration of material into the lungs may cause chemical pneumonitis, which may be fatal.

Inhalation:

Inhalation of high concentrations may cause central nervous system effects characterized by headache, dizziness, unconsciousness and coma. Inhalation of vapor may cause respiratory tract irritation. May cause liver and kidney damage. Vapors may cause dizziness or suffocation. Overexposure may cause dizziness, tremors, restlessness, rapid heart beat, increased blood pressure, hallucinations, acidosis, kidney failure, .

Chronic:

Prolonged or repeated skin contact may cause dermatitis. May cause cardiac sensitization and severe heart abnormalities. May cause liver and kidney damage.

**** SECTION 4 - FIRST AID MEASURES ****

Eyes:

Flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower lids. Get medical aid immediately.

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FROM : FISHER SCIENTIFIC

Skin:

Flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get medical aid if irritation develops or persists.

Ingestion:

Do NOT induce vomiting. If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Possible aspiration hazard. Get medical aid immediately.

Inhalation:

Get medical aid immediately. Remove from exposure to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Notes to Physician:

Causes cardiac sensitization to endogenous catecholamines which may lead to cardiac arrhythmias. Do NOT use adrenergic agents such as epinephrine or pseudoepinephrine.

**** SECTION 5 - FIRE FIGHTING MEASURES ****

General Information:

Containers can build up pressure if exposed to heat and/or fire. As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Water runoff can cause environmental damage. Dike and collect water used to fight fire. Vapors may form an explosive mixture with air. Vapors can travel to a source of ignition and flash back. Flammable Liquid. Can release vapors that form explosive mixtures at temperatures above the flashpoint. Use water spray to keep fire-exposed containers cool. Water may be ineffective. Material is lighter than water and a fire may be spread by the use of water. Vapors may be heavier than air. They can spread along the ground and collect in low or confined areas. Containers may explode when heated.

Extinguishing Media:

Use water spray to cool fire-exposed containers. Water may be ineffective. Do NOT use straight streams of water. For small fires, use dry chemical, carbon dioxide, water spray or regular foam. Cool containers with flooding quantities of water until well after fire is out. For large fires, use water spray, fog or regular foam.

Autoignition Temperature: 896 deg F (480.00 deg C)

Flash Point: 40 deg F (4.44 deg C)

NFPA Rating: health-2; flammability-3; reactivity-0

Exposure Limits, Lower: 1.1
Upper: 7.1

**** SECTION 6 - ACCIDENTAL RELEASE MEASURES ****

General Information: Use proper personal protective equipment as indicated in Section 8.

Spills/Leaks:

Avoid runoff into storm sewers and ditches which lead to waterways. Remove all sources of ignition. Absorb spill using an absorbent, non-combustible material such as earth, sand, or vermiculite. A vapor suppressing foam may be used to reduce vapors. Water spray may reduce vapor but may not prevent ignition in closed spaces.

**** SECTION 7 - HANDLING and STORAGE ****

Handling:

Wash thoroughly after handling. Use with adequate ventilation. Ground and bond containers when transferring material. Avoid contact with eyes, skin, and clothing. Empty containers retain product residue, (liquid and/or vapor), and can be dangerous. Keep container tightly closed. Avoid contact with heat, sparks and flame. Avoid ingestion and inhalation. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat, sparks or open flames.

Storage:

Keep away from heat, sparks, and flame. Keep away from sources of ignition. Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances.

**** SECTION 8 - EXPOSURE CONTROLS, PERSONAL PROTECTION ****

Engineering Controls:

Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits.

Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Benzene, methyl-	50 ppm / 188 mg/m3	100 ppm TWA; 375 mg/m3 TWA 500 ppm IDLH	200 ppm TWA; C 300 ppm; C 300 ppm

OSHA Vacated PELs:
Benzene, nethyl-
100 ppm TWA; 375 mg/m3 TWA

Personal Protective Equipment

Eyes:

Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133.

Skin:

Wear appropriate protective gloves to prevent skin exposure.

Clothing:

Wear appropriate protective clothing to prevent skin exposure.

Respirators:

Follow the OSHA respirator regulations found in 29CFR 1910.134. Always use a NIOSH-approved respirator when necessary.

**** SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES ****

Physical State:	Liquid
Appearance:	colourless
Odor:	sweetish odor - pleasant odor
pH:	Not available.
Vapor Pressure:	10 mm Hg
Vapor Density:	3.1 (Air=1)
Evaporation Rate:	2.4 (Butyl acetate=1)
Viscosity:	0.59 cP at 68F.
Boiling Point:	232 deg F
Freezing/Melting Point:	-139 deg F
Decomposition Temperature:	Not available.
Solubility:	0.6 mg/L H2O at 68F.
Specific Gravity/Density:	0.9 (Water=1)
Molecular Formula:	C6H5CH3
Molecular Weight:	92.056

**** SECTION 10 - STABILITY AND REACTIVITY ****

Chemical Stability:

Stable under normal temperatures and pressures.

Conditions to Avoid:

Incompatible materials, ignition sources, excess heat.

Incompatibilities with Other Materials:

Nitrogen tetroxide, nitric acid + sulfuric acid, silver perchlorate, strong oxidizers, sodium difluoride, .

Hazardous Decomposition Products:

Carbon monoxide, carbon dioxide.

Hazardous Polymerization: Has not been reported.

**** SECTION 11 - TOXICOLOGICAL INFORMATION ****

RTECS#:

CAS# 108-88-3; X55250000

LD50/LC50:

CAS# 108-88-3; Inhalation, mouse: LC50 = 400 ppm/24H; Inhalation, rat: LC50 = 49 gm/m3/4H; Oral, rat: LD50 = 636 mg/kg; Skin, rabbit: LD50 = 12124 mg/kg.

Carcinogenicity:~~Benzene, methyl-~~

ACGIH: A4 - Not Classifiable as a Human Carcinogen

IARC: Group 3 carcinogen

Epidemiology:

No information available.

Teratogenicity:

Specific developmental abnormalities included craniofacial effects involving the nose and tongue, musculoskeletal effects, urogenital and metabolic effects in studies on mice and rats by the inhalation and oral routes of exposure. Some evidence of fetotoxicity with reduced fetal weight and retarded skeletal development has been reported in mice and rats.

Reproductive Effects:

Effects on fertility such as abortion were reported in rabbits by inhalation. Paternal effects were noted in rats by inhalation. These effects involved the testes, sperm duct and epididymis.

Neurotoxicity:

No information available.

Mutagenicity:

No information available.

Other Studies:

None.

**** SECTION 12 - ECOLOGICAL INFORMATION ****

Ecotoxicity:

Bluegill LC50=17 mg/L/24H Shrimp LC50=4.3 ppm/96H Fathead minnow
LC50=36.2 mg/L/96H Sunfish (fresh water) TLm=1180 mg/L/96H

Environmental Fate:

From soil, substance evaporates and is microbially biodegraded. In
water, substance volatilizes and biodegrades.

Physical/Chemical:

Photochemically produced hydroxyl radicals degrade substance.

Other:

None.

**** SECTION 13 - DISPOSAL CONSIDERATIONS ****

Dispose of in a manner consistent with federal, state, and local regulations.

RCRA D-Series Maximum Concentration of Contaminants:

None listed.

RCRA D-Series Chronic Toxicity Reference Levels: None
listed.

RCRA F-Series: None listed.

RCRA P-Series: None listed.

RCRA U-Series: CAS# 108-88-3; waste number U220.

CAS# 108-88-3 is banned from land disposal according
to RCRA.

**** SECTION 14 - TRANSPORT INFORMATION ****

US DOT

Shipping Name: TOLUENE

Hazard Class: 3

UN Number: UN1294

Packing Group: II

IMO

No information available.

IATA

No information available.

RID/ADR

No information available.

Canadian TOG

Shipping Name: TOLUENE

Hazard Class: 3(9.2)

UN Number: UN1294

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FROM : FISHER SCIENTIFIC

Other Information: FLASHPOINT 4 C

**** SECTION 15 - REGULATORY INFORMATION ****

US FEDERAL
TSCA

CAS# 108-88-3 is listed on the TSCA inventory.
Health & Safety Reporting List
CAS# 108-88-3: Effective Date: October 4, 1982; Sunset Date: October 4
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.
Section 12b
None of the chemicals are listed under TSCA Section 12b.
TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.

SARA

Section 302 (RQ)
final RQ = 1000 pounds (454 kg)
Section 302 (TPQ)
None of the chemicals in this product have a TPQ.
SARA Codes
CAS # 108-88-3; acute; flammable.
Section 313
This material contains Benzene, methyl- (CAS# 108-88-3, 99%), which
is subject to the reporting requirements of Section 313 of SARA Title
III and 40 CFR Part 373.

Clean Air Act:

CAS# 108-88-3 is listed as a hazardous air pollutant (HAP).
This material does not contain any Class 1 Ozone depleters.
This material does not contain any Class 2 Ozone depleters.

Clean Water Act:

CAS# 108-88-3 is listed as a Hazardous Substance under the CWA.
CAS# 108-88-3 is listed as a Priority Pollutant under the Clean Water
Act.
CAS# 108-88-3 is listed as a Toxic Pollutant under the Clean Water
Act.

OSHA:

None of the chemicals in this product are considered highly hazardous
by OSHA.

STATE

Benzene, methyl- can be found on the following state right to know
lists: California, New Jersey, Florida, Pennsylvania, Minnesota,
Massachusetts.

#775 P.67/79

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1998.06-20

412 490 8098

FROM : FISHER SCIENTIFIC

WARNING: This product contains Benzene, methyl-, a chemical known to the state of California to cause birth defects or other reproductive harm.

California No Significant Risk Level:

None of the chemicals in this product are listed.

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols: XN F

Risk Phrases:

R 11 Highly flammable.

R 20 Harmful by inhalation.

Safety Phrases:

S 16 Keep away from sources of ignition - No smoking.

S 25 Avoid contact with eyes.

S 29 Do not empty into drains.

S 33 Take precautionary measures against static discharges.

WGK (Water Danger/Protection)

CAS# 108-88-3: 2

Canada

CAS# 108-88-3 is listed on Canada's DSL/MSL List.

This product has a WHMIS classification of B2, D2B.

CAS# 108-88-3 is not listed on Canada's Ingredient Disclosure List.

Exposure Limits

CAS# 108-88-3: OEL-AUSTRALIA:TWA 100 ppm (375 mg/m3);STEL 150 ppm (560 mg/m3). OEL-BELGIUM:TWA 100 ppm (377 mg/m3);STEL 150 ppm (565 mg/m3). OEL-CZECHOSLOVAKIA:TWA 200 mg/m3;STEL 1000 mg/m3. OEL-DENMARK:TWA 50 ppm (190 mg/m3);Skin. OEL-FINLAND:TWA 100 ppm (375 mg/m3);STEL 150 ppm;Skin. OEL-FRANCE:TWA 100 ppm (375 mg/m3);STEL 150 ppm (560 mg/m3). OEL-GERMANY:TWA 100 ppm (380 mg/m3). OEL-HUNGARY:TWA 100 mg/m3;STEL 300 mg/m3;Skin. OEL-JAPAN:TWA 100 ppm (380 mg/m3). OEL-THE NETHERLANDS:TWA 100 ppm (375 mg/m3);Skin. OEL-THE PHILIPPINES:TWA 100 ppm (375 mg/m3). OEL-POLAND:TWA 100 mg/m3. OEL-RUSSIA:TWA 100 ppm;STEL 50 mg/m3. OEL-SWEDEN:TWA 50 ppm (200 mg/m3);STEL 100 ppm (400 mg/m3);Skin. OEL-SWITZERLAND:TWA 100 ppm (380 mg/m3);STEL 500 ppm. OEL-THAILAND:TWA 200 ppm;STEL 300 ppm. OEL-TURKEY:TWA 200 ppm (750 mg/m3). OEL-UNITED KINGDOM:TWA 100 ppm (375 mg/m3);STEL 150 ppm;Skin. OEL IN BULGARIA, COLOMBIA, JORDAN, KOREA check ACGIH TLV. OEL IN NEW ZEALAND, SINGAPORE, VIETNAM check ACGI TLV

**** SECTION 16 - ADDITIONAL INFORMATION ****

NSUS Creation Date: 1/04/1995 Revision #24 Date: 12/12/1997

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no way shall Fisher be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, however arising, even if Fisher has been advised of the possibility of such damages.

Dichloromethane
14930

*** MATERIAL SAFETY DATA SHEET ***

*** SECTION I - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION ***

MSDS Name: Dichloromethane

Catalog Numbers:

S71971, S71971-1, S80084, S80084-1, S80084-2SPEC, S80084HPLC, S80084SPEC,
01424LOT013, 01424LOT014, 0142RS50, 0143RS115, 0143RS200, 0143RS28,
0143RS50, BP1186 4, BP1186-4, BP11864, BP11864 001, BP11864001, BP1186RS115
BP1186RS200, BP1186RS28, BP1186RS50, BP1186RS 115, BP1186RS 200,
BP1186RS 30, BP1186RS 50, BP1186RS115, BP1186RS200, BP1186RS28, BP1186RS30,
BP1186RS50, BPD143RS-115, BPD143RS-200, BPD143RS-28, BPD143RS-50,
BWA250RT50, D123-1, D142 4, D142-4, D1424, D1424LOT011, D1424LOT012,
D142SS115, D142SS200, D142SS28, D142SS50, D143 1, D143 4, D143-1, D143-4,
D1431, D1434, D1434LC, D1434LOT002, D143SK 1, D143SK 4, D143SK-1, D143SK-4,
D143SK1, D143SK4, D143SK4001, D143SS-11, D143SS-115, D143SS-20, D143SS-200,
D143SS-30, D143SS-50, D143SS115, D143SS28, D143SS50, D150 1, D150 4, D150-1
D150-4, D1501, D1504, D150J4, D150SK 1, D150SK 4, D150SK-1, D150SK-4,
D150SK1, D150SK4, D150SS 200, D150SS 30, D150SS 50, D150SS-11, D150SS-115,
D150SS-20, D150SS-200, D150SS-30, D150SS-50, D150SS200, D150SS30, D150SS50,
D151 1, D151 4, D151-1, D151-4, D1511, D1514, D1514002, D1514003, D1514004,
D1514LC, D1514LOT029, D1514LOT030, D1514LOT038, D1514LOT039, D1514LOT040,
D1514LOT043, D1514LOT044, D1514LOT046, D1514LOT047, D1514LOT049,
D1514LOT052, D1514LOT053, D1514LOT054, D1514LOT062, D151RS200, D151RS20,
D151SS115, D151SS200, D151SS28, D151SS50, D152-4, D154 4, D1544,
D1544LOT009, D1544LOT031, D1544LOT038, D1544LOT039, D35 1, D35 4, D35-1,
D35-4, D351, D354, D37 1, D37 20, D37 200, D37 200 001, D37 200 002, D37 4,
D37 500, D37-1, D37-20, D37-200, D37-4, D37-500, D371, D3720, D37200,
D37200 001, D37200 002, D37200001, D37200002, D37200004, D374, D37500,
D37F8115, D37F819, D37F8200, D37F850, D37R8115, D37R819, D37R8200, D37R850,
D37RS115, D37RS200, D37RS28, D37RS50, D37SK 4, D37SK-4, D37SK4, D37SS 115,
D37SS-115, D37SS-200, D37SS-30, D37SS-50, D37SS115, D37SS200, D37SS28,
D37SS50, FLBP1186RS-115, FLBP1186RS-200, FLBP1186RS-28, FLBP1186RS-50,
FLD142RS-115, FLD142RS-200, FLD142RS-28, FLD142RS-50, D142RS115, D142RS200,
D142RS28, D142RS50, S80084-1MF*, S800842SPEC, S80084MF*

Synonyms:

Methylene chloride, methylene dichloride, freon30

Company Identification: Fisher Scientific

1 Reagent Lane

Fairlawn, NJ 07410

For information, call: 201-796-7100
Emergency Number: 201-796-7100
For CHEMTREC assistance, call: 800-424-9300
For International CHEMTREC assistance, call: 703-527-3887

**** SECTION 2 - COMPOSITION, INFORMATION ON INGREDIENTS ****

CAS#	Chemical Name	%	EINECS#
75-09-2	Methane, dichloro-	100	200-838-9

Hazard Symbols: XN
Risk Phrases: 40

**** SECTION 3 - HAZARDS IDENTIFICATION ****

EMERGENCY OVERVIEW

Appearance: colourless.

Caution! May cause respiratory tract irritation. May cause digestive tract irritation. May be harmful if swallowed. May cause central nervous system depression. May be absorbed through the skin. May cause fetal effects based upon animal studies. May cause reproductive effects based upon animal studies. May cause severe eye and skin irritation with possible burns. May cause cancer based on animal studies. May be harmful if inhaled.

Target Organs: Blood, central nervous system.

Potential Health Effects

Eyes:

Contact with eyes may cause severe irritation, and possible eye burns.

Skin:

May be absorbed through the skin. Causes irritation with burning pain, itching, and redness. Prolonged exposure may result in skin burns.

Ingestion:

May cause irritation of the digestive tract. May cause central nervous system depression, characterized by excitement, followed by headache, dizziness, drowsiness, and nausea. Advanced stages may cause collapse, unconsciousness, coma and possible death due to respiratory failure.

Inhalation:

Inhalation of high concentrations may cause central nervous system effects characterized by headache, dizziness, unconsciousness and coma. Causes respiratory tract irritation. May cause blood changes. Overexposure may cause an increase in carboxyhemoglobin levels in the blood.

Chronic:

Possible cancer hazard based on tests with laboratory animals. Prolonged or repeated skin contact may cause dermatitis. May cause fetal effects.

****** SECTION 4 - FIRST AID MEASURES ********Eyes:**

Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower lids. Get medical aid immediately.

Skin:

Get medical aid. Immediately flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes.

Ingestion:

If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid immediately.

Inhalation:

Get medical aid immediately. Remove from exposure to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Notes to Physician:

Treat symptomatically and supportively.

****** SECTION 5 - FIRE FIGHTING MEASURES ********General Information:**

As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Vapors mixed with air in proper proportion will propagate a flame.

Extinguishing Media:

In case of fire, use water, dry chemical, chemical foam, or alcohol-resistant foam. Use water spray to cool fire-exposed containers.

Autoignition Temperature: 1033 deg F (556.11 deg C)

~~Flash Point: Not applicable.~~

NFPA Rating: health-2; flammability-1; reactivity-0

Explosion Limits, Lower: 15.1 @ 1030C

Upper: 17.3 @ 1480C

**** SECTION 6 - ACCIDENTAL RELEASE MEASURES ****

General Information: Use proper personal protective equipment as indicated in Section 8.

Spills/Leaks:

Absorb spill with inert material, (e.g., dry sand or earth), then place into a chemical waste container.

**** SECTION 7 - HANDLING and STORAGE ****

Handling:

Wash thoroughly after handling. Use with adequate ventilation. Avoid contact with eyes, skin, and clothing. Keep container tightly closed. Avoid ingestion and inhalation.

Storage:

Store in a tightly closed container. Keep from contact with oxidizing materials. Store in a cool, dry, well-ventilated area away from incompatible substances.

**** SECTION 8 - EXPOSURE CONTROLS, PERSONAL PROTECTION ****

Engineering Controls:

Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits.

Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Methane, dichloro-	50 ppm ; 174 mg/m3	NIOSH Potential Occupational Carcinogen - see Appendix A 2300 ppm IDLH (not considering carcinogenic effects)	25 ppm TWA; 125 ppm STEL (15 min TWA); 25 ppm TW A (8 hr.); 125 ppm STEL (15 min.); 12.5 ppm Act ion Level (see 29 CFR 19.1051)

OSHA Vacated PELs:
Methane, dichloro-:
500 ppm TWA

Personal Protective Equipment

Eyes:

Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133.

Skin:

Wear appropriate protective gloves to prevent skin exposure.

Clothing:

Wear appropriate protective clothing to prevent skin exposure.

Respirators:

Follow the OSHA respirator regulations found in 29CFR 1910.134. Always use a NIOSH-approved respirator when necessary.

**** SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES ****

Physical State:	Liquid
Appearance:	colourless
Odor:	ethereal odor
pH:	Not available.
Vapor Pressure:	350 mm Hg @ 20
Vapor Density:	2.9 (Air=1)
Evaporation Rate:	Not available.
Viscosity:	Not available.
Boiling Point:	104 deg F
Freezing/Melting Point:	-142 deg F
Decomposition Temperature:	Not available.
Solubility:	Moderately soluble in water.
Specific Gravity/Density:	1.33 (Water=1)
Molecular Formula:	CH2Cl2
Molecular Weight:	84.92

**** SECTION 10 - STABILITY AND REACTIVITY ****

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FROM : FISHER SCIENTIFIC

Chemical Stability:

Stable.

Conditions to Avoid:

Incompatible materials, strong oxidants.

Incompatibilities with Other Materials:

Incompatible with strong oxidizers. Can react dangerously with nitrogen tetroxide, liquid oxygen, potassium, sodium, sodium-potassium alloys, lithium, potassium hydroxide with N-methyl-N-nitroso urea, potassium t-butoxide, and finely powdered aluminum and magnesium. occurred with mixtures of thin materials and liquid ammonia or dimethylaminopropylamine.

Hazardous Decomposition Products:

Hydrogen chloride, phosgene, carbon monoxide, carbon dioxide.

Hazardous Polymerization: Has not been reported.

**** SECTION 11 - TOXICOLOGICAL INFORMATION ****

RTECS#:

CAS# 75-09-2: PA8050000

LD50/LC50:

CAS# 75-09-2: Inhalation, mouse: LC50 = 14400 ppm/7H; Inhalation, rat: LC50 = 88 gm/m³/30M; Oral, rat: LD50 = 1600 mg/kg.

Carcinogenicity:

Methane, dichloro-

ACGIH: A3 - Animal Carcinogen

California: carcinogen - initial date 4/1/88

NIOSH: occupational carcinogen

NTP: Suspect carcinogen

OSHA: Possible Select carcinogen

IARC: Group 2B carcinogen

Epidemiology:

No data available.

Teratogenicity:

No data available.

Reproductive Effects:

No data available.

Neurotoxicity:

No data available.

Mutagenicity:

No data available.

Other Studies:

No data available.

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FROM : FISHER SCIENTIFIC

*** SECTION 12 - ECOLOGICAL INFORMATION ***

Ecotoxicity:

This chemical has a moderate potential to affect some aquatic organisms. It is resistant to biodegradation, and has a low potential to persist in the aquatic environment. 96-hr. EC50 (loss of equilibrium): Fathead minnow: 99mg/L; 96-hr. EC10: 66.3 mg/L. Bluegill sunfish: 96-hr. LC50=220 mg/L; Water flea: 24-hr. LC50=2270 mg/L; No observed effect level: 1550 mg/L.

Environmental Fate:

This material is not likely to bioconcentrate.

Physical/Chemical:

Not available.

Other:

Not available.

*** SECTION 13 - DISPOSAL CONSIDERATIONS ***

Dispose of in a manner consistent with federal, state, and local regulations.

RCRA D-Series Maximum Concentration of Contaminants:

None listed.

RCRA B-Series Chronic Toxicity Reference Levels: None listed.

RCRA F-Series: None listed.

RCRA P-Series: None listed.

RCRA U-Series: CAS# 75-09-2; waste number U080.

CAS# 75-09-2 is banned from land disposal according to RCRA.

*** SECTION 14 - TRANSPORT INFORMATION ***

US DOT

Shipping Name: DICHLORDMETHANE

Hazard Class: 6.1

UN Number: UN1593

Packing Group: III

IMO

No information available.

IATA

No information available.

RID/ADR

No information available.

Canadian TDG

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FROM : FISHER SCIENTIFIC

Shipping Name: METHYLENE CHLORIDE
Hazard Class: 6.1
UN Number: UN1593

**** SECTION 15 - REGULATORY INFORMATION ****

US FEDERAL
TSCA

CAS# 75-09-2 is listed on the TSCA inventory.
Health & Safety Reporting List
CAS# 75-09-2: Effective Date: October 4, 1982; Sunset Date: October 4,
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.
Section 12b
None of the chemicals are listed under TSCA Section 12b.
TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.

SARA

Section 302 (RQ)
final RQ = 1000 pounds (454 kg)
Section 302 (TPQ)
None of the chemicals in this product have a TPQ.
SARA Codes
CAS# 75-09-2: acute, chronic.
Section 313
This material contains Methane, dichloro- (CAS# 75-09-2, 100X), which
is subject to the reporting requirements of Section 313 of SARA
Title III and 40 CFR Part 373.

Clean Air Act:

CAS# 75-09-2 is listed as a hazardous air pollutant (HAP).
This material does not contain any Class 1 Ozone depleters.
This material does not contain any Class 2 Ozone depleters.

Clean Water Act:

None of the chemicals in this product are listed as Hazardous
Substances under the CWA.
CAS# 75-09-2 is listed as a Priority Pollutant under the Clean Water
Act.
None of the chemicals in this product are listed as Toxic Pollutants
under the CWA.

OSHA:

None of the chemicals in this product are considered highly hazardous
by OSHA.

STATE

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FROM : FISHER SCIENTIFIC

Methane, dichloro- can be found on the following state right to know lists: California, New Jersey, Florida, Pennsylvania, Minnesota, Massachusetts.

The following statement(s) is(are) made in order to comply with the California Safe Drinking Water Act:

WARNING: This product contains Methane, dichloro-, a chemical known to the state of California to cause cancer.

California No Significant Risk Level:

CAS# 75-09-2: no significant risk level = 50 ug/day

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols: XN

Risk Phrases:

R 40 Possible risks of irreversible effects.

Safety Phrases:

S 24/25 Avoid contact with skin and eyes.

S 36/37 Wear suitable protective clothing and gloves.

S 23C Do not breathe vapour.

WGK (Water Danger/Protection)

CAS# 75-09-2: 2

Canada

CAS# 75-09-2 is listed on Canada's DSL/NDSL List.

This product has a WHMIS classification of D1B, D2A.

CAS# 75-09-2 is not listed on Canada's Ingredient Disclosure List.

Exposure Limits

CAS# 75-09-2: DEL-AUSTRALIA: TWA 100 ppm (350 mg/m³); Carcinogen. DEL-AUSTRIA: TWA 100 ppm (360 mg/m³). DEL-BELGIUM: TWA 50 ppm (174 mg/m³); Carcinogen. DEL-CZECHOSLOVAKIA: TWA 500 mg/m³; STEL 2500 mg/m³. DEL-DENMARK: TWA 50 ppm (175 mg/m³); Skin; Carcinogen. DEL-FINLAND: TWA 100 ppm (350 mg/m³); STEL 250 ppm (870 mg/m³). DEL-FRANCE: TWA 100 ppm (360 mg/m³); STEL 500 ppm (1800 mg/m³). DEL-GERMANY: TWA 100 ppm (360 mg/m³); Carcinogen. DEL-HUNGARY: STEL 10 mg/m³; Carcinogen. DEL-JAPAN: TWA 100 ppm (350 mg/m³). DEL-THE NETHERLANDS: TWA 100 ppm (350 mg/m³); STEL 500 ppm. DEL-THE PHILIPPINES: TWA 500 ppm (1740 mg/m³). DEL-POLAND: TWA 50 mg/m³. DEL-RUSSIA: TWA 100 ppm; STEL 50 mg/m³. DEL-SWEDEN: TWA 35 ppm (120 mg/m³); STEL 70 ppm (25 mg/m³); Skin. DEL-SWITZERLAND: TWA 100 ppm (360 mg/m³); STEL 500 ppm. DEL-THAILAND: TWA 500 mg/m³; STEL 1000 mg/m³. DEL-TURKEY: TWA 500 ppm (1740 mg/m³). DEL-UNITED KINGDOM: TWA 100 ppm (350 mg/m³); STEL 250 ppm. DEL IN BULGARIA, COLOMBIA, JORDAN, KOREA check ACGIH TLV. DEL IN NEW ZEALAND, SINGAPORE, VIETNAM check ACGI TLV

**** SECTION 16 - ADDITIONAL INFORMATION ****

MSDS Creation Date: 1/11/1995 Revision #50 Date: 12/12/1997

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#775 P.59/79

12:55

1998-05-20

412 490 8098

FROM : FISHER SCIENTIFIC

**** MATERIAL SAFETY DATA SHEET ****

Trichloroethylene
23850

**** SECTION 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION ****

MSDS Name: Trichloroethylene

Catalog Numbers:

SB0327ACS-1, SB0327ACS-2, NC9323848, SB0232, SB0237ACS-1, SB0237ACS-2,
T340 4, T340-4, T3404, T341 20, T341 4, T341 500, T341-20, T341-4, T341-500
T34120, T3414, T341500, T341J4, T403 4, T403-4, T4034

Synonyms:

Ethylene trichloride, triclene, trichloroethene, benzinol cecolene

Company Identification: Fisher Scientific

1 Reagent Lane

Fairlawn, NJ 07410

For information, call: 201-796-7100

Emergency Number: 201-796-7100

For CHEMTREC assistance, call: 800-424-9300

For International CHEMTREC assistance, call: 703-527-3887

**** SECTION 2 - COMPOSITION, INFORMATION ON INGREDIENTS ****

CAS#	Chemical Name	%	EINECS#
79-01-6	Trichloroethylene	100	201-167-4

Hazard Symbols: XN

Risk Phrases: 40 52/53

**** SECTION 3 - HAZARDS IDENTIFICATION ****

EMERGENCY OVERVIEW

Appearance: clear, colorless.

Warning! May cause central nervous system depression. Aspiration hazard. May cause liver damage. May cause reproductive effects based on animal studies. Causes eye and skin irritation. May cause respiratory and digestive tract irritation. May cause cancer based on animal studies. Potential cancer hazard.

Target Organs: Central nervous system, liver.

~~Potential Health Effects~~

Eye:

Causes moderate eye irritation. May result in corneal injury. Contact produces irritation, tearing, and burning pain.

Skin:

Causes mild skin irritation. Prolonged and/or repeated contact may cause defatting of the skin and dermatitis. May cause peripheral nervous system function impairment including persistent neuritis, and temporary loss of touch. Damage to the liver and other organs has been observed in workers who have been overexposed.

Ingestion:

Aspiration hazard. May cause irritation of the digestive tract. Aspiration of material into the lungs may cause chemical pneumonitis, which may be fatal.

Inhalation:

Inhalation of high concentrations may cause central nervous system effects characterized by headache, dizziness, unconsciousness and coma. May cause respiratory tract irritation. May cause liver abnormalities. May be harmful if inhaled. May cause peripheral nervous system effects.

Chronic:

Possible cancer hazard based on tests with laboratory animals. Chronic inhalation may cause effects similar to those of acute inhalation. Prolonged or repeated skin contact may cause defatting and dermatitis. May cause peripheral nervous system function impairment including persistent neuritis, and temporary loss of touch. Damage to the liver and other organs has been observed in workers who have been overexposed.

**** SECTION 4 - FIRST AID MEASURES ****

Eyes:

Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower lids. Get medical aid immediately.

Skin:

Get medical aid if irritation develops or persists. Flush skin with plenty of soap and water.

Ingestion:

If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Possible aspiration hazard. Get medical aid immediately.

Inhalation:

Get medical aid immediately. Remove from exposure to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Notes to Physician:

Treat symptomatically and supportively.

**** SECTION 5 - FIRE FIGHTING MEASURES ****

General Information:

As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Vapors can travel to a source of ignition and flash back. Combustion generates toxic fumes. Containers may explode in the heat of a fire.

Extinguishing Media:

Use water spray to cool fire-exposed containers. In case of fire use water spray, dry chemical, carbon dioxide, or chemical foam.

Autoignition Temperature: 778 deg F (414.44 deg C)

Flash Point: Not applicable.

NFPA Rating: health-2; flammability-1; reactivity-0

Explosion Limits, Lower: 12.5

Upper: 90.0

**** SECTION 6 - ACCIDENTAL RELEASE MEASURES ****

General Information: Use proper personal protective equipment as indicated in Section 8.

Spills/Leaks:

Absorb spill with inert material, (e.g., dry sand or earth), then place into a chemical waste container. Remove all sources of ignition. Provide ventilation.

**** SECTION 7 - HANDLING and STORAGE ****

Handling:

Wash thoroughly after handling. Use only in a well ventilated area. Ground and bond containers when transferring material. Avoid contact with eyes, skin, and clothing. Empty containers retain product residue, (liquid and/or vapor), and can be dangerous. Avoid ingestion and inhalation. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat, sparks or open flames.

Storage:

Keep away from sources of ignition. Store in a tightly closed container. Keep from contact with oxidizing materials. Store in a cool, dry, well-ventilated area away from incompatible substances.

**** SECTION 8 - EXPOSURE CONTROLS, PERSONAL PROTECTION ****

Engineering Controls:

Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits.

Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Trichloroethylene	50 ppm ; 269 mg/m3; 100 ppm STEL; 537 mg/m3 STEL	NIOSH Potential Occupational Carcinogen - see Appendix A; see Appendix C for supplementary exposure limits 1000 ppm IDLH (not considering carcinogenic effects)	100 ppm TWA; C 200 ppm; C 200 ppm

OSHA Vacated PELs:

Trichloroethylene:

50 ppm TWA; 270 mg/m3 TWA

Personal Protective Equipment

Eyes:

Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133.

Skin:

Wear appropriate protective gloves to prevent skin exposure.

Clothing:

Wear appropriate protective clothing to prevent skin exposure.

Respirators:

Follow the OSHA respirator regulations found in 29CFR 1910.134. Always use a NIOSH-approved respirator when necessary.

**** SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES ****

Physical State:	Liquid
Appearance:	clear, colorless
Odor:	sweetish odor - chloroform-like
pH:	Not available.
Vapor Pressure:	58 mm Hg @20C
Vapor Density:	4.53
Evaporation Rate:	0.69 (CCl4=1)
Viscosity:	0.0055 poise
Boiling Point:	189 deg F
Freezing/Melting Point:	-121 deg F
Decomposition Temperature:	Not available.
Solubility:	Insoluble in water.
Specific Gravity/Density:	1.47 (water=1)
Molecular Formula:	C2HCl3
Molecular Weight:	131.366

**** SECTION 10 - STABILITY AND REACTIVITY ****

Chemical Stability:

Stable under normal temperatures and pressures.

Conditions to Avoid:

Incompatible materials, ignition sources, oxidizers.

Incompatibilities with Other Materials:

Alkalis (sodium hydroxide), chemically active metals (aluminum, beryllium, lithium, magnesium), epoxies and oxidants. Can react violently with aluminum, barium, lithium, magnesium, liquid oxygen, ozone, potassium hydroxide, potassium nitrate, sodium, sodium hydroxide, titanium, and nitrogen dioxide. Reacts with water under heat and pressure to form hydrogen chloride gas.

Hazardous Decomposition Products:

Hydrogen chloride, carbon dioxide, chloride fumes.

Hazardous Polymerization: Has not been reported.

**** SECTION 11 - TOXICOLOGICAL INFORMATION ****

RTECS#:

#775 P.34/79

12:45

1998.05-20

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FROM : FISHER SCIENTIFIC

CAS# 79-01-6; KX4330000

LD50/LC50:

CAS# 79-01-6: Inhalation, mouse: LC50 = 8450 ppm/4H; Oral, mouse:
LD50 = 2402 mg/kg; Oral, rat: LD50 = 5650 mg/kg; Skin, rabbit: LD50 =
120 gm/kg.

Carcinogenicity:

Trichloroethylene -

ACGIH: A5-not suspected as a human carcinogen

California: carcinogen - initial date 4/1/88

NIOSH: occupational carcinogen

OSHA: Possible Select carcinogen

IARC: Group 2A carcinogen

Epidemiology:

Suspected carcinogen with experimental carcinogenic, tumorigenic, and teratogenic data.

Teratogenicity:

No information available.

Reproductive Effects:

Experimental reproductive effects have been observed.

Neurotoxicity:

No information available.

Mutagenicity:

Human mutation data has been reported. IARC and the National Toxicology Program (NTP) stated that variability in the mutagenicity test results with trichloroethylene may be due to the presence of various stabilizers used in TCE which are mutagens (e.g. epoxybutane, epichlorohydrin).

Other Studies:

None.

**** SECTION 12 - ECOLOGICAL INFORMATION ****

Ecotoxicity:

Bluegill sunfish, LD50= 44,700 ug/L/96Hr. Fathead minnow, LC50=40.7 ng/L/96Hr.

Environmental Fate:

In air, substance is photooxidized and is reported to form phosgene, dichloroacetyl chloride, and formyl chloride. In water, it evaporates rapidly.

Physical/Chemical:

No information available.

Other:

None.

**** SECTION 13 - DISPOSAL CONSIDERATIONS ****

Dispose of in a manner consistent with federal, state, and local regulations.

RCRA D-Series Maximum Concentration of Contaminants:

CAS# 79-01-6; waste number D040; regulatory level = 0.5 mg/L.

RCRA D-Series Chronic Toxicity Reference Levels: CAS#

79-01-6; chronic toxicity reference level = 0.005 mg/L.

RCRA F-Series: None listed.

RCRA P-Series: None listed.

RCRA U-Series: CAS# 79-01-6; waste number U228.

CAS# 79-01-6 is banned from land disposal according to RCRA.

**** SECTION 14 - TRANSPORT INFORMATION ****

US DOT

Shipping Name: TRICHLOROETHYLENE

Hazard Class: 6.1

UN Number: UN1710

Packing Group: III

IMO

No information available.

IATA

No information available.

RIO/ADR

No information available.

Canadian TDG

Shipping Name: TRICHLOROETHYLENE

Hazard Class: 6.1(9.2)

UN Number: UN1710

**** SECTION 15 - REGULATORY INFORMATION ****

US FEDERAL

TSCA

CAS# 79-01-6 is listed on the TSCA inventory.

Health & Safety Reporting List

None of the chemicals are on the Health & Safety Reporting List.

Chemical Test Rules

None of the chemicals in this product are under a Chemical Test Rule.

Section 12b

None of the chemicals are listed under TSCA Section 12b.

TSCA Significant New Use Rule

None of the chemicals in this material have a SNUR under TSCA.

SARA

Section 302 (RQ)

final RQ = 100 pounds (45.4 kg)

Section 302 (TPQ)

None of the chemicals in this product have a TPQ.

SARA Codes

CAS# 79-01-6: acute, chronic, reactive.

Section 313

This material contains Trichloroethylene (CAS# 79-01-6, 100%), which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.

Clean Air Act:

CAS# 79-01-6 is listed as a hazardous air pollutant (HAP).

This material does not contain any Class 1 Ozone depleters.

This material does not contain any Class 2 Ozone depleters.

Clean Water Act:

CAS# 79-01-6 is listed as a Hazardous Substance under the CWA.

CAS# 79-01-6 is listed as a Priority Pollutant under the Clean Water Act.

CAS# 79-01-6 is listed as a Toxic Pollutant under the Clean Water Act.

OSHA:

None of the chemicals in this product are considered highly hazardous by OSHA.

STATE

Trichloroethylene can be found on the following state right to know lists: California, New Jersey, Florida, Pennsylvania, Minnesota, Massachusetts.

The following statement(s) is(are) made in order to comply with the California Safe Drinking Water Act:

WARNING: This product contains Trichloroethylene, a chemical known to the state of California to cause cancer.

California No Significant Risk Level:

CAS# 79-01-6: ingestion: no significant risk level = 50 ug/day; inhalat

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols: XN

Risk Phrases:

R 40 Possible risks of irreversible effects.

R 52/53 Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Safety Phrases:

- S 23 Do not inhale gas/fumes/vapour/spray.
- S 36/37 Wear suitable protective clothing and gloves.
- S 61 Avoid release to the environment. Refer to special instructions/Safety data sheets.

WGK (Water Danger/Protection)

CAS# 79-01-6: 3

Canada

CAS# 79-01-6 is listed on Canada's DSL/NDSL List.
This product has a WHMIS classification of D18, D28.
CAS# 79-01-6 is not listed on Canada's Ingredient Disclosure List.

Exposure Limits

CAS# 79-01-6: DEL-AUSTRALIA: TWA 50 ppm (270 mg/m³); STEL 200 ppm (1080 mg/m³). DEL-BELGIUM: TWA 50 ppm (269 mg/m³); STEL 200 ppm (1070 mg/m³). DEL-CZECHOSLOVAKIA: TWA 250 mg/m³; STEL 1250 mg/m³. DEL-DENMARK: TWA 30 ppm (160 mg/m³). DEL-FINLAND: TWA 30 ppm (160 mg/m³); STEL 45 ppm (240 mg/m³); Skin. DEL-FRANCE: TWA 75 ppm (405 mg/m³); STEL 200 ppm (1080 mg/m³). DEL-GERMANY: TWA 50 ppm (270 mg/m³); Carcinogen. DEL-HUNGARY: TWA 10 ng/m³; STEL 40 ng/m³. DEL-JAPAN: TWA 50 ppm (270 mg/m³). DEL-THE NETHERLANDS: TWA 35 ppm (190 mg/m³); STEL 100 ppm. DEL-THE PHILIPPINES: TWA 100 ppm (535 mg/m³). DEL-POLAND: TWA 50 ng/m³. DEL-RUSSIA: TWA 50 ppm; STEL 10 ng/m³. DEL-SWEDEN: TWA 10 ppm (50 ng/m³); STEL 25 ppm (140 mg/m³). DEL-THAILAND: TWA 100 ppm; STEL 200 ppm. DEL-TURKEY: TWA 100 ppm (535 mg/m³). DEL-UNITED KINGDOM: TWA 100 ppm (535 mg/m³); STEL 150 ppm; Skin. DEL IN BULGARIA, COLOMBIA, JORDAN, KOREA check ACGIH TLV. DEL IN NEW ZEALAND, SINGAPORE, VIETNAM check ACGI TLV

**** SECTION 16 - ADDITIONAL INFORMATION ****

MSDS Creation Date: 2/10/1995 Revision #15 Date: 12/12/1997

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no way shall Fisher be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if Fisher has been advised of

the possibility of such damages.

#775 P.39/79

12:47

1998.05-20

412 490 8098

FROM : FISHER SCIENTIFIC

*** MATERIAL SAFETY DATA SHEET ***

1,2-Dichloroethane
09390

**** SECTION 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION ****

MSDS Name: 1,2-Dichloroethane

Catalog Numbers:

S79997, S79997SPEC, BP1100-500, E175 20, E175 4, E175 500, E175-20, E175-4,
E175-500, E17520, E1754, E1754LC, E175500, E175J4, E190 4, E190-4, E1904

Synonyms:

Ethylene dichloride, 1,2- ethylene dichloride, glycol
dichloride, ethane 1,2-dichloro-

Company Identification: Fisher Scientific

1 Reagent Lane

Fairlawn, NJ 07410

For information, call: 201-796-7100

Emergency Number: 201-796-7100

For CHEMTREC assistance, call: 800-424-9300

For International CHEMTREC assistance, call: 703-527-3887

**** SECTION 2 - COMPOSITION, INFORMATION ON INGREDIENTS ****

CAS#	Chemical Name	X	EINECS#
107-06-2	Ethane, 1,2-dichloro-	100	203-458-1

Hazard Symbols: T F

Risk Phrases: 11 22 36/37/38 45

**** SECTION 3 - HAZARDS IDENTIFICATION ****

EMERGENCY OVERVIEW

Appearance: colourless. Flash Point: 58 F.

Warning! Flammable liquid. May cause central nervous system
depression. May cause liver and kidney damage. Causes digestive and
respiratory tract irritation. May cause severe eye and skin
irritation with possible burns. May cause cancer based on animal
studies.

Target Organs: Kidneys, central nervous system, liver.

Potential Health Effects

Eyes:

Contact with liquid or vapor causes severe burns and possible irreversible eye damage. Vapors may cause eye irritation.

Skin:

Exposure may cause irritation and possible burns. May be absorbed through the skin.

Ingestion:

May cause central nervous system depression, kidney damage, and liver damage. May cause gastrointestinal irritation with nausea, vomiting and diarrhea. May cause effects similar to those for inhalation exposure.

Inhalation:

Inhalation of high concentrations may cause central nervous system effects characterized by headache, dizziness, unconsciousness and coma. Causes respiratory tract irritation. May cause liver and kidney damage.

Chronic:

Possible cancer hazard based on tests with laboratory animals. Prolonged or repeated skin contact may cause dermatitis. Prolonged or repeated eye contact may cause conjunctivitis. May cause liver and kidney damage.

**** SECTION 4 - FIRST AID MEASURES ****

Eyes:

Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower lids. Get medical aid immediately.

Skin:

Get medical aid. Flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes.

Ingestion:

If victim is conscious and alert, give 2-4 cupfuls of milk or water. Get medical aid immediately.

Inhalation:

Get medical aid immediately. Remove from exposure to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Notes to Physician:

Treat symptomatically and supportively.

Antidote:

None reported.

**** SECTION 5 - FIRE FIGHTING MEASURES ****

General Information:

As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Vapors can travel to a source of ignition and flash back.

Extinguishing Media:

For small fires, use dry chemical, carbon dioxide, water spray or alcohol-resistant foam. Use water spray to cool fire-exposed containers. Water may be ineffective.

Autoignition Temperature: 775 deg F (412.78 deg C)

Flash Point: 58 deg F (14.44 deg C)

NFPA Rating: health-2; flammability-3; reactivity-0

Explosion Limits, Lower: 6.2

Upper: 15.9

**** SECTION 6 - ACCIDENTAL RELEASE MEASURES ****

General Information: Use proper personal protective equipment as indicated in Section 8.

Spills/Leaks:

Absorb spill with inert material, (e.g., dry sand or earth), then place into a chemical waste container. Remove all sources of ignition. Use a spark-proof tool.

**** SECTION 7 - HANDLING and STORAGE ****

Handling:

Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Use only in a well ventilated area. Use with adequate ventilation. Do not get on skin and clothing. Empty containers retain product residue, (liquid and/or vapor), and can be dangerous. Keep container tightly closed. Avoid contact with heat, sparks and flame. Do not ingest or inhale. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat, sparks or open flames.

Storage:

Keep away from heat, sparks, and flame. Store in a tightly closed container. Keep from contact with oxidizing materials. Store in a cool, dry, well-ventilated area away from incompatible substances.

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*** SECTION 8 - EXPOSURE CONTROLS, PERSONAL PROTECTION ***

Engineering Controls:

Local exhaust ventilation may be necessary to control any air contaminants to within their TLVs during the use of this product.

Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Ethane, 1,2-dichloro-	10 ppm ; 40 mg/m3	1 ppm TWA; 4 ng/m3 TWA; NIOSH Potential Occupational Carcinogen - see Appendix A ; see Appendix C for supplementary exposure limits 50 ppm IDLH (not considering carcinogenic effects)	50 ppm TWA; C 100 ppm; C 100 ppm

OSHA Vacated PELs:

Ethane, 1,2-dichloro-:
1 ppm TWA; 4 mg/m3 TWA

Personal Protective Equipment

Eyes:

Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133.

Skin:

Wear appropriate protective gloves to prevent skin exposure.

Clothing:

Wear appropriate protective clothing to prevent skin exposure.

Respirators:

Follow the OSHA respirator regulations found in 29CFR

1910.134. Always use a NIOSH-approved respirator when necessary.

**** SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES ****

Physical State: Liquid
Appearance: colourless
Odor: chloroform-like
pH: Not available.
Vapor Pressure: 66 mm Hg @ 20 C
Vapor Density: 3.5 (Air=1)
Evaporation Rate: 0.3 (Butyl acetate=1)
Viscosity: Not available.
Boiling Point: 101 deg F
Freezing/Melting Point: -31.9 deg F
Decomposition Temperature: Not available.
Solubility: Slightly soluble in water
Specific Gravity/Density: 1.26 (Water=1)
Molecular Formula: C2H4Cl2
Molecular Weight: 98.934

**** SECTION 10 - STABILITY AND REACTIVITY ****

Chemical Stability:
Stable.

Conditions to Avoid:

Incompatible materials, ignition sources, excess heat, electrical sparks.

Incompatibilities with Other Materials:

Incompatibilities with strong oxidizers, aluminum, ketone solvents, bases, organic peroxides, alkali metals, reducing agents or nitric acid. Explosions have occurred with mixtures of this materials and liquid ammonia or dimethylaminopropylamine.

Hazardous Decomposition Products:

Hydrogen chloride, carbon monoxide, carbon dioxide.

Hazardous Polymerization: Has not been reported.

**** SECTION 11 - TOXICOLOGICAL INFORMATION ****

RTECS#:

CAS# 107-06-2: R10525000

LD50/LC50:

CAS# 107-06-2: Inhalation, rat: LC50 =1000 ppm/7H; Oral, mouse: LD50

= 413 mg/kg; Oral, Rabbit: LD50 = 880 mg/kg; Oral, Rat: LD50 = 670 mg/kg; Skin, Rabbit: LD50 = 2800 mg/kg.

Carcinogenicity:

Ethane, 1,2-dichloro-

ACGIH: A4 - Not Classifiable as a Human Carcinogen

California: carcinogen - initial date 10/1/87

NIOSH: occupational carcinogen

NTP: Suspect carcinogen

OSHA: Possible Select carcinogen

IARC: Group 2B carcinogen

Epidemiology:

No data available.

Teratogenicity:

May cause decreased fertility and other adverse effects in pregnant female rats and the progeny of the first generation, but not of the second, by giving them repeated 4-hr/day exposures to 57 mg/m3.

Death, 1hl-rat, TCLo=20100 ug/m3/1H (female 7-14D post); Stunted

fetus, Oral-rat, TDLo=1260 mg/kg (6-15D preg) Developmental

abnormalities; Craniofacial, 1hl-mouse, TCLo=100 ppm/7H (female

6-15D post); Musculoskeletal, Oral-rat, TDLo=1260 mg/kg (6-15D preg)

Reproductive Effects:

No data available.

Neurotoxicity:

No data available.

Mutagenicity:

This material may have mutagenic potential at high concentrations.

but the relationship of mutagenesis and carcinogenic effect is not yet clear because activity for the two responses is not consistent between organs or species.

Other Studies:

None.

****** SECTION 12 - ECOLOGICAL INFORMATION ********Ecotoxicity:**

This chemical is expected to cause little oxygen depletion in aquatic systems. It has a low potential to affect aquatic organisms.

Sheepshead minnow: 24-, 48-, and 96-hr. LC50=8130 mg/L, LT320 mg/L;

Bluegill sunfish: 96-hr. LC50=550 mg/L; Water flea: 24- and

48-hr. LC50=250 mg/L and 220mg/L; Brine shrimp: 24-hr. LC50=320 mg/L.

Environmental Fate:

This material is not likely to bioconcentrate.

Physical/Chemical:

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Not available.

Other:

None.

**** SECTION 13 - DISPOSAL CONSIDERATIONS ****

Dispose of in a manner consistent with federal, state, and local regulations.

RCRA D-Series Maximum Concentration of Contaminants:

CAS# 107-06-2; waste number D028; regulatory level ::

0.5 mg/L.

RCRA D-Series Chronic Toxicity Reference Levels: CAS#

107-06-2; chronic toxicity reference level = 0.005

mg/L.

RCRA F-Series: None listed.

RCRA P-Series: None listed.

RCRA U-Series: CAS# 107-06-2; waste number U077.

CAS# 107-06-2 is banned from land disposal according
to RCRA.

**** SECTION 14 - TRANSPORT INFORMATION ****

US DOT

Shipping Name: ETHYLENE DICHLORIDE-POISON

Hazard Class: 3

UN Number: UN1184

Packing Group: II

IMO

No information available.

IATA

No information available.

RID/AOR

No information available.

Canadian TCG

Shipping Name: ETHYLENE DICHLORIDE

Hazard Class: 3(6.1)(9.2)

UN Number: UN1184

Other Information: FLASHPOINT 13 C

**** SECTION 15 - REGULATORY INFORMATION ****

US FEDERAL

TSCA

CAS# 107-06-2 is listed on the TSCA inventory.

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FROM : FISHER SCIENTIFIC

Health & Safety Reporting List

CAS# 107-06-2; Effective Date: June 1, 1987; Sunset Date: June 1, 1997

Chemical Test Rules

None of the chemicals in this product are under a Chemical Test Rule.

Section 12b

None of the chemicals are listed under TSCA Section 12b.

TSCA Significant New Use Rule

None of the chemicals in this material have a SNUR under TSCA.

SARA

Section 302 (RQ)

Final RQ = 100 pounds (45.4 kg)

Section 302 (TPQ)

None of the chemicals in this product have a TPQ.

SARA Codes

CAS # 107-06-2: acute, chronic, flammable.

Section 313

This material contains Ethane, 1,2-dichloro- (CAS# 107-06-2, 100%), which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.

Clean Air Act:

CAS# 107-06-2 is listed as a hazardous air pollutant (HAP).

This material does not contain any Class 1 Ozone depleters.

This material does not contain any Class 2 Ozone depleters.

Clean Water Act:

CAS# 107-06-2 is listed as a Hazardous Substance under the CWA.

CAS# 107-06-2 is listed as a Priority Pollutant under the Clean Water Act.

CAS# 107-06-2 is listed as a Toxic Pollutant under the Clean Water Act.

OSHA:

None of the chemicals in this product are considered highly hazardous by OSHA.

STATE

Ethane, 1,2-dichloro- can be found on the following state right to know lists: California, New Jersey, Florida, Pennsylvania, Minnesota, Massachusetts.

The following statement(s) is(are) made in order to comply with the California Safe Drinking Water Act:

WARNING: This product contains Ethane, 1,2-dichloro-, a chemical known to the state of California to cause cancer.

California No Significant Risk Level:

CAS# 107-06-2: no significant risk level = 10 ug/day

European/International Regulations

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FROM : FISHER SCIENTIFIC

European Labeling in Accordance with EC Directives

Hazard Symbols: T F

Risk Phrases:

- R 11 Highly flammable.
- R 22 Harmful if swallowed.
- R 36/37/38 Irritating to eyes, respiratory system and skin.
- R 45 May cause cancer.

Safety Phrases:

- S 45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).
- S 53 Avoid exposure - obtain special instructions before use.

WGK (Water Danger/Protection)

CAS# 107-06-2: 3

Canada

CAS# 107-06-2 is listed on Canada's DSL/MSL List.
This product has a WHMIS classification of B2, D1A, D2A.
CAS# 107-06-2 is not listed on Canada's Ingredient Disclosure List.

Exposure Limits

CAS# 107-06-2: OEL-ARAB Republic of Egypt: TWA 5 ppm (2 mg/m³), OEL-AUSTRALIA: TWA 10 ppm (40 mg/m³), OEL-AUSTRIA: TWA 20 ppm (80 mg/m³), OEL-BELGIUM: TWA 10 ppm (40 mg/m³), OEL-DENMARK: TWA 1 ppm (4 mg/m³); Skin.
OEL-FINLAND: TWA 10 ppm (40 mg/m³); STEL 20 ppm (80 mg/m³); CAR. OEL-FRANCE: TWA 10 ppm (40 mg/m³), OEL-GERMANY: Carcinogen, OEL-HUNGARY: STEL 4 mg/m³; Carcinogen, OEL-JAPAN: TWA 10 ppm (40 mg/m³), OEL-THE NETHERLANDS: TWA 50 ppm (200 mg/m³), OEL-THE PHILIPPINES: TWA 50 ppm (200 mg/m³), OEL-L-RUSSIA: TWA 10 ppm, OEL-SWEDEN: TWA 1 ppm (4 mg/m³); STEL 5 ppm (20 mg/m³); Skin; CAR. OEL-SWITZERLAND: TWA 10 ppm (40 mg/m³); STEL 20 ppm (80 mg/m³), OEL-TURKEY: TWA 50 ppm (200 mg/m³), OEL-UNITED KINGDOM: TWA 10 ppm (40 mg/m³); STEL 15 ppm (60 mg/m³), OEL IN BULGARIA, COLOMBIA, JORDAN, KOREA check ACDIH TLV, OEL IN NEW ZEALAND, SINGAPORE, VIETNAM check ACDI TLV

*** SECTION 16 - ADDITIONAL INFORMATION ***

MSDS Creation Date: 1/10/1995 Revision #11 Date: 12/12/1997

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

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12:51

1998.05-20

412 490 8098

FROM : FISHER SCIENTIFIC

**** MATERIAL SAFETY DATA SHEET ****

Acetone
00140

**** SECTION 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION ****

MSDS Name: Acetone

Catalog Numbers:

AC177170200, AC400100025, AC400100040, AC423240040, AC423240200, S70090,
S70091-1, S7025, A11 1, A11 20, A11 200, A11 4, A11-1, A11-20, A11-200,
A11-4, A111, A11200, A114, A115 4, A115-4, A1154, A16F-1GAL, A16P 4, A16P-4
A16P4, A16S 20, A16S 20 001, A16S 4, A16S-20, A16S-4, A16S20, A16S20001,
A16S4, A16S4LC, A18 1, A18 20, A18 200, A18 200 001, A18 4, A18 500, A18-1,
A18-20, A18-200, A18-4, A18-500, A181, A1820, A18200, A18200001, A1820LC,
A1820LOT003, A184, A184LC, A184LOT001, A18500, A18J500, A18P4, A18RB115,
A18RB19, A18RB200, A18RB50, A18RS115, A18RS200, A18RS28, A18RS50, A18S 4,
A18S-4, A18S4, A18SK 4, A18SK-4, A18SK4, A18SK4LC, A18SS 200, A18SS 50,
A18SS-115, A18SS-200, A18SS-30, A18SS-50, A18SS200, A18SS50, A19 1, A19 4,
A19-1, A19-4, A191, A194, A20-1, A40 4, A40-4, A404, A404LOT007, A404LOT008
A404LOT009, A928 4, A9284, A929 4, A929-1, A929-4, A9294, A9294LC, -
A9294LOT001, A9294LOT012, A9294LOT014, A9294LOT017, A9294LOT018,
A9294LOT019, A9294LOT021, A9294LOT022, A9294LOT024, A929J4, A929RS115,
A929RS200, A929RS28, A929RS50, A929SS115, A929SS200, A929SS28, A929SS50,
A930-4, A946 4, A946-4, A9464, A946FB200, A946RB115, A946RB19, A946RB200,
A946RB50, A949 1, A949 4, A949-1, A949-4, A9491, A9494, A9494LOT004,
A949CU50, A949J4, A949LC, A949RS115, A949RS200, A949RS28, A949RS50,
A949SK-1, A949SK-4, A949SS 115, A949SS 200, A949SS 30, A949SS 50, A949SS-11
A949SS-115, A949SS-20, A949SS-200, A949SS-30, A949SS-50, A949SS115,
A949SS200, A949SS30, A949SS50, BPA946RB-115, BPA946RB-19, BPA946RB-200,
BPA946RB-50, FLA929RS-115, FLA929RS-200, FLA929RS-28, FLA929RS-50,
HC 300 1GAL, HC3001GAL, NC9475452, NC9475533, QUANT001B4, S70091,
S70091HPLC, S70091SPEC

Synonyms:

Dimethylformaldehyde, dimethyl ketone, 2-propanone, pyroacetic acid,
pyroacetic ether

Company Identification: Fisher Scientific
1 Reagent Lane
Fairlawn, NJ 07410

For information, call: 201-796-7100

Emergency Number: 201-796-7100

For CHEMTREC assistance, call: 800-424-9300

For International CHEMTREC assistance, call: 703-527-3887

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12:35

1998.05-20

412 490 8098

FROM : FISHER SCIENTIFIC

**** SECTION 2 - COMPOSITION, INFORMATION ON INGREDIENTS ****

CAS#	Chemical Name	%	EINECS#
67-64-1	2-propanone	99	200-662-2

Hazard Symbols: F

Risk Phrases: 11

**** SECTION 3 - HAZARDS IDENTIFICATION ****

EMERGENCY OVERVIEW

Appearance: colourless. Flash Point: -4 deg F.

Danger! Extremely flammable liquid. May cause central nervous system depression. May cause liver and kidney damage. Causes eye and skin irritation. Causes digestive and respiratory tract irritation.

Target Organs: Kidneys, central nervous system, liver, respiratory system.

Potential Health Effects

Eye:

Produces irritation, characterized by a burning sensation, redness, tearing, inflammation, and possible corneal injury.

Skin:

Exposure may cause irritation characterized by redness, dryness, and inflammation.

Ingestion:

May cause irritation of the digestive tract. May cause central nervous system depression, kidney damage, and liver damage. Symptoms may include: headache, excitement, fatigue, nausea, vomiting, stupor, and coma.

Inhalation:

Inhalation of high concentrations may cause central nervous system effects characterized by headache, dizziness, unconsciousness and coma. Causes respiratory tract irritation. May cause liver and kidney damage. May cause motor incoordination and speech abnormalities.

Chronic:

Prolonged or repeated skin contact may cause dermatitis. Chronic inhalation may cause effects similar to those of acute inhalation.

**** SECTION 4 - FIRST AID MEASURES ****

Eyes:

Flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower lids. Get medical aid immediately.

Skin:

Flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get medical aid if irritation develops or persists.

Ingestion:

If victim is conscious and alert, give 2-4 cupfuls of milk or water. Get medical aid immediately.

Inhalation:

Get medical aid immediately. Remove from exposure to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Notes to Physician:

Treat symptomatically and supportively.

**** SECTION 5 - FIRE FIGHTING MEASURES ****

General Information:

Containers can build up pressure if exposed to heat and/or fire. As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Vapors can travel to a source of ignition and flash back. Use water spray to keep fire-exposed containers cool.

Extinguishing Media:

For small fires, use dry chemical, carbon dioxide, water spray or alcohol-resistant foam. For large fires, use water spray, fog, or alcohol-resistant foam.

Autoignition Temperature: 869 deg F (465.00 deg C)

Flash Point: -4 deg F (-20.00 deg C)

NFPA Rating: health-1; flammability-3; reactivity-0

Explosion Limits, Lower: 2.5

Upper: 12.8

**** SECTION 6 - ACCIDENTAL RELEASE MEASURES ****

General Information: Use proper personal protective equipment as indicated in Section 8.

Spills/Leaks:

Absorb spill with inert material, (e.g., dry sand or earth), then

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place into a chemical waste container. Wear appropriate protective clothing to minimize contact with skin. Remove all sources of ignition.

**** SECTION 7 - HANDLING and STORAGE ****

Handling:

Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Use with adequate ventilation. Avoid contact with eyes, skin, and clothing. Empty containers retain product residue, (liquid and/or vapor), and can be dangerous. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat, sparks or open flames.

Storage:

Keep away from sources of ignition. Store in a tightly closed container.

**** SECTION 8 - EXPOSURE CONTROLS, PERSONAL PROTECTION ****

Engineering Controls:

Use process enclosure, local exhaust ventilation, or other engineering controls to control airborne levels below recommended exposure limits.

Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
2-propanone	500 ppm / 1188 mg/m3; 750 ppm STEL / 1782 mg/m3 STEL	250 ppm TWA; 590 mg/m3 TWA 2500 ppm IDLH (lower explosive level)	1000 ppm TWA; 2400 mg/m3 TWA

OSHA Vacated PELs:

2-propanone:
750 ppm TWA; 1800 mg/m3 TWA

Personal Protective Equipment

Eyes:

Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face

protection regulations in 29 CFR 1910.133.

Skin:

Wear appropriate protective gloves to prevent skin exposure.

Clothing:

Wear appropriate protective clothing to prevent skin exposure.

Respirators:

Follow the OSHA respirator regulations found in 29CFR 1910.134. Always use a NIOSH-approved respirator when necessary.

**** SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES ****

Physical State: Liquid
Appearance: colourless
Odor: sweetish odor
pH: 7
Vapor Pressure: 180 mm Hg
Vapor Density: 2.0 (Air=1)
Evaporation Rate: 7.7 (n-Butyl acetate=1)
Viscosity: Not available
Boiling Point: 133.2 deg F
Freezing/Melting Point: -139.6 deg F
Decomposition Temperature: Not available.
Solubility: Soluble.
Specific Gravity/Density: 0.79 (Water=1)
Molecular Formula: C3H6O
Molecular Weight: 58.0414

**** SECTION 10 - STABILITY AND REACTIVITY ****

Chemical Stability:

Stable.

Conditions to Avoid:

High temperatures, temperatures above 220°C.

Incompatibilities with Other Materials:

Forms explosive mixtures with hydrogen peroxide, acetic acid, nitric acid, nitric acid+sulfuric acid, chromic anhydride, chromyl chloride, nitrosyl chloride, hexachloromelamine, nitrosyl perchlorate, nitryl perchlorate, permonosulfuric acid, thiodiglycol+hydrogen peroxide.

Hazardous Decomposition Products:

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Carbon monoxide, carbon dioxide.
Hazardous Polymerization: Has not been reported.

**** SECTION 11 - TOXICOLOGICAL INFORMATION ****

RTECS#:

CAS# 67-64-1; AL3150000

LD50/LC50:

CAS# 67-64-1; Inhalation, rat; LC50 = 50100 mg/m³/8H; Oral, mouse:
LD50 = 3 gm/kg; Oral, rabbit; LD50 = 5340 mg/kg; Oral, rat; LD50 =
5800 mg/kg; Skin, rabbit; LD50 = 20 gm/kg.

Carcinogenicity:

2-propanone -

ACGIH: A4 - Not Classifiable as a Human Carcinogen

Epidemiology:

No information available.

Teratogenicity:

No information available.

Reproductive Effects:

Fertility: post-implantation mortality. 1hl, mam: TCL₀=31500
ug/m³/24H (1-130 preg)

Neurotoxicity:

No information available.

Mutagenicity:

Cytogenetic analysis: hamster fibroblast, 40 g/L Sex chromosome
loss/non-disjunction: S.cerevisiae, 47600 ppm

Other Studies:

None.

**** SECTION 12 - ECOLOGICAL INFORMATION ****

Ecotoxicity:

Rainbow trout LC50=5540 mg/L/96H Sunfish (tap water), death at 14250
ppm/24H Mosquito fish (turbid water) TLm=13000 ppm/48H

Environmental Fate:

Volatilizes, leeches, and biodegrades when released to soil.

Physical/Chemical:

No information available.

Other:

None.

**** SECTION 13 - DISPOSAL CONSIDERATIONS ****

Dispose of in a manner consistent with federal, state, and local regulations.

RCRA D-Series Maximum Concentration of Contaminants:

None listed.

RCRA D-Series Chronic Toxicity Reference Levels: None

listed.

RCRA F-Series: None listed.

RCRA P-Series: None listed.

RCRA U-Series: CAS# 67-64-1: waste number U002

(Ignitable waste).

CAS# 67-64-1 is banned from land disposal according to RCRA.

**** SECTION 14 - TRANSPORT INFORMATION ****

US DOT

Shipping Name: ACETONE

Hazard Class: 3

UN Number: UN1090

Packing Group: II

IMO

Shipping Name: ACETONE

Hazard Class: 3.1

UN Number: 1090

Packing Group: 2

IATA

Shipping Name: ACETONE

Hazard Class: 3

UN Number: 1090

Packing Group: 2

RID/ADR

Shipping Name: ACETONE

Dangerous Goods Code: 3(3B)

UN Number: 1090

Canadian TDG

Shipping Name: ACETONE

Hazard Class: 3

UN Number: UN1090

Other Information: FLASHPOINT -20 C

**** SECTION 15 - REGULATORY INFORMATION ****

US FEDERAL
TSCA

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CAS# 67-64-1 is listed on the TSCA Inventory.
Health & Safety Reporting List
None of the chemicals are on the Health & Safety Reporting List.
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.
Section 12b
CAS# 67-64-1: export notification required - Section 4
TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.

SARA

Section 302 (RQ)
final RQ = 5000 pounds (2270 kg)
Section 302 (TPQ)
None of the chemicals in this product have a TPQ.
SARA Codes
CAS # 67-64-1: acute, chronic, flammable, sudden release of pressure.
Section 313
No chemicals are reportable under Section 313.

Clean Air Act:

This material does not contain any hazardous air pollutants.
This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.

Clean Water Act:

None of the chemicals in this product are listed as Hazardous Substances under the CWA.
None of the chemicals in this product are listed as Priority Pollutants under the CWA.
None of the chemicals in this product are listed as Toxic Pollutants under the CWA.

OSHA:

None of the chemicals in this product are considered highly hazardous by OSHA.

STATE

2-propanone can be found on the following state right to know lists:
California, New Jersey, Florida, Pennsylvania, Minnesota, Massachusetts.
California No Significant Risk Level:
None of the chemicals in this product are listed.

European/International Regulations

European Labeling in Accordance with EC Directives
Hazard Symbols: F
Risk Phrases:

R 11 Highly flammable.

Safety Phrases:

- S 16 Keep away from sources of ignition - No smoking.
- S 33 Take precautionary measures against static discharges.
- S 9 Keep container in a well-ventilated place.
- S 23C Do not breathe vapour.

WSK (Water Danger/Protection)

CAS# 67-64-1: 0

Canada

CAS# 67-64-1 is listed on Canada's DSL/NDL List.
This product has a WHMIS classification of B2, D2B.
CAS# 67-64-1 is not listed on Canada's Ingredient Disclosure List.

Exposure Limits

CAS# 67-64-1: OEL-AUSTRALIA: TWA 500 ppm (1185 mg/m³); STEL 1000 ppm.
OEL-AUSTRIA: TWA 750 ppm (1780 mg/m³); OEL-BELGIUM: TWA 750 ppm (1780 mg/m³); STEL 1000 ppm.
OEL-CZECHOSLOVAKIA: TWA 800 mg/m³; STEL 4000 mg/m³.
OEL-DENMARK: TWA 250 ppm (600 mg/m³); OEL-FINLAND: TWA 500 ppm (1200 mg/m³); STEL 625 ppm (1500 mg/m³).
OEL-FRANCE: TWA 750 ppm (1800 mg/m³); OEL-GERMANY: TWA 1000 ppm (2400 mg/m³); OEL-HUNGARY: TWA 600 mg/m³; STEL 1200 mg/m³.
OEL-INDIA: TWA 750 ppm (1780 mg/m³); STEL 1000 ppm (2375 mg/m³).
OEL-JAPAN: TWA 200 ppm (470 mg/m³); OEL-THE NETHERLANDS: TWA 750 ppm (1780 mg/m³); JAN9.
OEL-THE PHILIPPINES: TWA 1000 ppm (2400 mg/m³); OEL-POLAND: TWA 200 mg/m³; OEL-RUSSIA: TWA 200 ppm; STEL 200 mg/m³.
OEL-SWEDEN: TWA 250 ppm (600 mg/m³); STEL 500 ppm (1200 mg/m³); OEL-SWITZERLAND: TWA 750 ppm (1780 mg/m³); OEL-TURKEY: TWA 1000 ppm (2400 mg/m³); OEL-UNITED KINGDOM: TWA 1000 ppm (2400 mg/m³); STEL 1250 ppm.
OEL IN BULGARIA, COLUMBIA, JORDAN, KOREA check ACGIH TLV. OEL IN NEW ZEALAND, SINGAPORE, VIETNAM check ACGI TLV

*** SECTION 16 - ADDITIONAL INFORMATION ***

MSDS Creation Date: 11/30/1994 Revision #40 Date: 12/12/1997

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the possibility of such damages.

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FROM : FISHER SCIENTIFIC

**** MATERIAL SAFETY DATA SHEET ****

Methyl Ethyl Ketone
14460

**** SECTION 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION ****

MSDS Name: Methyl Ethyl Ketone

Catalog Numbers:

AC149670200, AC149670250, S80081, BP209RB-115, BP209RB-19, BP209RB-200,
BP209RB-50, BP209RS-200, BP209RS-50, BPM209RB-115, BPM209RB-19,
BPM209RB-200, BPM209RB-50, BPM209RS-200, BPM209RS-28, BPM209RS-50, DWH2084,
M209RB115, M209RB19, M209RB200, M208 1, M208 20, M208 4, M208-1, M208-20,
M208-4, M2081, M20820, M2084, M209 1, M209 20, M209 4, M209 500, M209-1,
M209-20, M209-200, M209-4, M209-500, M2091, M20920, M209200, M20920LC,
M2094, M209500, M209FB115, M209FB19, M209FB200, M209FB50, M209RB115,
M209RB19, M209RB200, M209RS115, M209RS200, M209RS50, M209S 4, M209S-4,
M209S4, M209SS115, M209SS200, M209SS28, M209SS50

Synonyms:

2-Butanone, ethyl methyl ketone, MEK, methylacetone, 2-propanone.

Company Identification: Fisher Scientific

1 Reagent Lane

Fairlawn, NJ 07410

For information, call: 201-796-7100

Emergency Number: 201-796-7100

For CHEMTREC assistance, call: 800-424-9300

For International CHEMTREC assistance, call: 703-527-3887

**** SECTION 2 - COMPOSITION, INFORMATION ON INGREDIENTS ****

CAS#	Chemical Name	X	EINECS#
78-93-3	Methyl ethyl ketone	99X	201-159-0

Hazard Symbols: Xi F

Risk Phrases: 11 36/37

**** SECTION 3 - HAZARDS IDENTIFICATION ****

EMERGENCY OVERVIEW

Appearance: Not available. Flash Point: -7 deg C.

Danger: Extremely flammable liquid. May cause respiratory tract

irritation. May cause central nervous system effects. May cause severe eye and skin irritation with possible burns. May cause digestive tract irritation with nausea, vomiting, and diarrhea. May cause fetal effects.
Target Organs: Central nervous system.

Potential Health Effects

Eyes:

Causes eye irritation. May result in corneal injury.

Skin:

May be absorbed through the skin in harmful amounts. Prolonged and/or repeated contact may cause irritation and/or dermatitis.

Ingestion:

May cause irritation of the digestive tract. May cause central nervous system depression, characterized by excitement, followed by headache, dizziness, drowsiness, and nausea. Advanced stages may cause collapse, unconsciousness, coma and possible death due to respiratory failure.

Inhalation:

Inhalation of high concentrations may cause central nervous system effects characterized by headache, dizziness, unconsciousness and coma. Causes respiratory tract irritation. Irritation may lead to chemical pneumonitis and pulmonary edema. May cause numbness in the extremities.

Chronic:

Chronic inhalation may cause effects similar to those of acute inhalation. Prolonged or repeated skin contact may cause defatting and dermatitis.

*** SECTION 4 - FIRST AID MEASURES ***

Eyes:

Flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower lids. Get medical aid immediately. Do NOT allow victim to rub or keep eyes closed.

Skin:

Get medical aid. Rinse area with large amounts of water for at least 15 minutes. Remove contaminated clothing and shoes.

Ingestion:

If victim is conscious and alert, give 2-4 cupfuls of milk or water. Get medical aid immediately.

Inhalation:

Get medical aid immediately. Remove from exposure to fresh air.

immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Notes to Physician:

Treat symptomatically and supportively.

**** SECTION 5 - FIRE FIGHTING MEASURES ****

General Information:

As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Vapors can travel to a source of ignition and flash back. Flammable Liquid. Can release vapors that form explosive mixtures at temperatures above the flashpoint. Water may be ineffective. Material is lighter than water and a fire may be spread by the use of water.

Extinguishing Media:

For small fires, use dry chemical, carbon dioxide, water spray or alcohol-resistant foam. For large fires, use water spray, fog, or alcohol-resistant foam.

Autoignition Temperature: 404 deg C (759.20 deg F)

Flash Point: -7 deg C (19.40 deg F)

NFPA Ratings: health-1; flammability-3; reactivity-0

Explosion Limits, Lower: 1.80 vol %

Upper: 11.50 vol %

**** SECTION 6 - ACCIDENTAL RELEASE MEASURES ****

General Information: Use proper personal protective equipment as indicated in Section 8.

Spills/Leaks:

Absorb spill with inert material, (e.g., dry sand or earth), then place into a chemical waste container. Clean up spills immediately, observing precautions in the Protective Equipment section. Use a spark-proof tool.

**** SECTION 7 - HANDLING and STORAGE ****

Handling:

Use only in a well ventilated area. Ground and bond containers when transferring material. Avoid contact with eyes, skin, and clothing. Empty containers retain product residue, (liquid and/or vapor), and can be dangerous. Keep container tightly closed. Avoid contact with heat, sparks and flame. Avoid ingestion and inhalation. Do not

pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat, sparks or open flames.

Storage:

Store in a cool, dry, well-ventilated area away from incompatible substances. Flammables-area.

***** SECTION B - EXPOSURE CONTROLS, PERSONAL PROTECTION *******Engineering Controls:**

Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits.

Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Methyl ethyl ketone	200 ppm ; 590 mg/m3; 300 ppm STEL; 885 mg/m3 STEL	200 ppm TWA; 590 mg/m3 TWA 3000 ppm IDLH	200 ppm TWA; 590 mg/m3 TWA

OSHA Vacated PELs:

Methyl ethyl ketone:

200 ppm TWA; 590 mg/m3 TWA

Personal Protective Equipment**Eyes:**

Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133.

Skin:

Wear appropriate protective gloves to prevent skin exposure.

Clothing:

Wear appropriate protective clothing to prevent skin exposure.

Respirators:

Follow the OSHA respirator regulations found in 29CFR 1910.134. Always use a NIOSH-approved respirator when necessary.

**** SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES ****

Physical State: Liquid
Appearance: Not available.
Odor: sweetish odor - alcohol-like
pH: Not available.
Vapor Pressure: 71.2 mm Hg
Vapor Density: 2.5 (Air=1)
Evaporation Rate: 2.7 (Ether=1)
Viscosity: 0.42 mPas 15 de
Boiling Point: 80 deg C @ 760.00mm Hg
Freezing/Melting Point: -87 deg C
Decomposition Temperature: Not available.
Solubility: miscible with oils
Specific Gravity/Density: .8050g/cm3
Molecular Formula: C4H8O
Molecular Weight: 72.11

**** SECTION 10 - STABILITY AND REACTIVITY ****

Chemical Stability:
Stable at room temperature in closed containers under normal storage and handling conditions.
Conditions to Avoid:
Incompatible materials, ignition sources, excess heat.
Incompatibilities with Other Materials:
Amines, ammonia, caustics, chloroform + alkali, chlorosulfonic acid, copper, hydrogen peroxide + nitric acid, inorganic acids, isocyanates, potassium-t-butoxide, 2-propanol, pyridines, strong oxidizers, and fuming sulfuric acid.
Hazardous Decomposition Products:
Carbon monoxide, carbon dioxide.
Hazardous Polymerization: Has not been reported.

**** SECTION 11 - TOXICOLOGICAL INFORMATION ****

RTECS:
CAS# 78-93-3: EL6475000
LD50/LC50:
CAS# 78-93-3: Inhalation, mouse: LC50 = 40 gm/m3/2H; Inhalation, rat: LC50 = 23500 mg/m3/8H; Oral, mouse: LD50 = 4050 mg/kg; Oral, rat: LD50 = 2737 mg/kg; Skin, rabbit: LD50 = 6480 mg/kg.
Carcinogenicity:

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Methyl Ethyl ketone -

Not listed by ACGIH, IARC, NIOSH, NTP, or OSHA.

Epidemiology:

No information available.

Teratogenicity:

Embryo or Fetus: fetotoxicity, ihl-rat TCL₀=1000 ppm, Specific Developmental Abnormalities: craniofacial and urogenital, ihl-rat TCL₀=3000 ppm/7H; musculoskeletal, ihl-rat TCL₀=1000 ppm.

Reproductive Effects:

No information available.

Neurotoxicity:

No information available.

Mutagenicity:

Sex chromosome loss/non-disjunction: *S. cerevisiae* 33800 ppm.

Other Studies:

None.

**** SECTION 12 - ECOLOGICAL INFORMATION ****

Ecotoxicity:

Fathead minnow LC50=3220 mg/L/96H Bluegill TLm=5640 to 1690 mg/L/24 to 96H

Environmental Fate:

Substance evaporates in water with 11/2 = 30 (rivers) to 120 (lakes). Substance is not expected to bioconcentrate in aquatic organisms.

Physical/Chemical:

Substance photodegrades in air with 11/2 = 2-3 days.

Other:

None.

**** SECTION 13 - DISPOSAL CONSIDERATIONS ****

Dispose of in a manner consistent with federal, state, and local regulations.

RCRA D-Series Maximum Concentration of Contaminants:

CAS# 78-93-3: waste number D035; regulatory level = 200.0 mg/L.

RCRA D-Series Chronic Toxicity Reference Levels: CAS#

78-93-3: chronic toxicity reference level = 2 mg/L.

RCRA F-Series: None listed.

RCRA P-Series: None listed.

RCRA U-Series: CAS# 78-93-3: waste number U159

(Ignitable waste; Toxic waste).

CAS# 78-93-3 is banned from land disposal according

to: ACORN

**** SECTION 14 - TRANSPORT INFORMATION ****

US DOT

Shipping Name: ETHYL METHYL KETONE
Hazard Class: 3
UN Number: 1193
Packing Group: II

IMO

Shipping Name: ETHYL METHYL KETONE
Hazard Class: 3.2
UN Number: 1193
Packing Group: II

IATA

Shipping Name: ETHYL METHYL KETONE
Hazard Class: 3
UN Number: 1193
Packing Group: II

RIO/ADR

Shipping Name: ETHYL METHYL KETONE
Dangerous Goods Code: 3(38)
UN Number: 1193

Canadian TDG

Shipping Name: METHYL ETHYL KETONE
Hazard Class: 3
UN Number: UN1193

Other Information: FLASHPOINT -9C

**** SECTION 15 - REGULATORY INFORMATION ****

US FEDERAL

TSCA

CAS# 78-93-3 is listed on the TSCA inventory.
Health & Safety Reporting List
CAS# 78-93-3; Effective Date: October 4, 1982; Sunset Date: October 4,
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.
Section 12b
None of the chemicals are listed under TSCA Section 12b.
TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.

SARA

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Section 302 (RQ)

final RQ = 5000 pounds (2270 kg)

Section 302 (TPQ)

None of the chemicals in this product have a TPQ.

SARA Codes

CAS # 78-93-3: acute, flammable.

Section 313

This material contains Methyl ethyl ketone (CAS# 78-93-3, 99X), which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.

Clean Air Act:

CAS# 78-93-3 is listed as a hazardous air pollutant (HAP).

This material does not contain any Class 1 Ozone depleters.

This material does not contain any Class 2 Ozone depleters.

Clean Water Act:

None of the chemicals in this product are listed as Hazardous Substances under the CWA.

None of the chemicals in this product are listed as Priority Pollutants under the CWA.

None of the chemicals in this product are listed as Toxic Pollutants under the CWA.

OSHA:

None of the chemicals in this product are considered highly hazardous by OSHA.

STATE

Methyl ethyl ketone can be found on the following state right to know lists: California, New Jersey, Florida, Pennsylvania, Minnesota, Massachusetts.

California No Significant Risk Level:

None of the chemicals in this product are listed.

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols: XI F

Risk Phrases:

R 11 Highly flammable.

R 36/37 Irritating to eyes and respiratory system.

Safety Phrases:

S 16 Keep away from sources of ignition - No smoking.

S 25 Avoid contact with eyes.

S 33 Take precautionary measures against static discharges.

S 9 Keep container in a well-ventilated place.

MSR (Water Damage/Protection)

CAS# 78-93-3; 1

Canada

CAS# 78-93-3 is listed on Canada's DSL/NDL List.

This product has a WHMIS classification of B2, D2B.

CAS# 78-93-3 is not listed on Canada's Ingredient Disclosure List.

Exposure Limits

CAS# 78-93-3: OEL-AUSTRALIA: TWA 150 ppm (445 mg/m³); STEL 300 ppm (890 mg/m³). OEL-AUSTRIA: TWA 200 ppm (590 mg/m³). OEL-BELGIUM: TWA 200 ppm (590 mg/m³); STEL 300 ppm (885 mg/m³). OEL-DENMARK: TWA 100 ppm (290 mg/m³); Skin. OEL-FINLAND: TWA 150 ppm (440 mg/m³); STEL 190 ppm; Skin. OEL-FRANCE: TWA 200 ppm (600 mg/m³); Skin. OEL-GERMANY: TWA 200 ppm (590 mg/m³). OEL-HUNGARY: TWA 200 mg/m³; STEL 600 mg/m³. OEL-INDIA: TWA 200 ppm (590 mg/m³); STEL 300 ppm (885 mg/m³). OEL-JAPAN: TWA 200 ppm (590 mg/m³)? OEL-THE NETHERLANDS: TWA 200 ppm (590 mg/m³). OEL-THE PHILIPPINES: TWA 200 ppm (590 mg/m³). OEL-POLAND: TWA 200 mg/m³. OEL-RUSSIA: TWA 200 ppm; STEL 200 mg/m³. OEL-SWEDEN: TWA 50 ppm (150 mg/m³); STEL 100 ppm (300 mg/m³). OEL-SWITZERLAND: TWA 200 ppm (590 mg/m³); STEL 400 ppm. OEL-TURKEY: TWA 200 ppm (590 mg/m³). OEL-UNITED KINGDOM: TWA 200 ppm (590 mg/m³); STEL 300 ppm. OEL IN BULGARIA, COLOMBIA, JORDAN, KOREA check ACGIH TLV? OEL IN NEW ZEALAND, SINGAPORE, VIETNAM check ACGIH TLV

**** SECTION 16 - ADDITIONAL INFORMATION ****

MSDS Creation Date: 12/28/1994 Revision #5 Date: 12/12/1997

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Tetrachloroethylene

**** MATERIAL SAFETY DATA SHEET ****

Tetrachloroethylene 22900

**** SECTION 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION ****

MSDS Name: Tetrachloroethylene

Catalog Numbers:

C182 20, C182 4, C182-20, C182-4, C18220, C1824, O4586 4, O4586-4, O45864

Synonyms:

Ethylene tetrachloride; Tetrachlorethylene; Perchloroethylene;
Perchlorethylene

Company Identification: Fisher Scientific
1 Reagent Lane
Fairlawn, NJ 07410

For information, call: 201-796-7100

Emergency Number: 201-796-7100

For CHEMTREC assistance, call: 800-424-9300

For International CHEMTREC assistance, call: 703-527-3887

**** SECTION 2 - COMPOSITION, INFORMATION ON INGREDIENTS ****

CAS#	Chemical Name	%	EINECS#
127-18-4	Tetrachloroethylene	99+	204-825-9

Hazard Symbols: XN N

Risk Phrases: 40 51/53

**** SECTION 3 - HAZARDS IDENTIFICATION ****

EMERGENCY OVERVIEW

Appearance: clear, colorless.

Caution! Irritant. May cause central nervous system depression. May cause respiratory and digestive tract irritation. May cause liver and kidney damage. May cause severe eye and skin irritation with possible burns. May cause reproductive and fetal effects. May cause cancer based on animal studies.

Target Organs: Kidneys, central nervous system, liver.

Potential Health Effects

Eye:

Contact with eyes may cause severe irritation, and possible eye burns.

Skin:

May cause severe irritation and possible burns.

Ingestion:

May cause central nervous system depression, kidney damage, and liver damage. Symptoms may include: headache, excitement, fatigue, nausea, vomiting, stupor, and coma. May cause gastrointestinal irritation with nausea, vomiting and diarrhea.

Inhalation:

Inhalation of vapor may cause respiratory tract irritation. May cause central nervous system effects including vertigo, anxiety, depression, muscle incoordination, and emotional instability.

Chronic:

Possible cancer hazard based on tests with laboratory animals. Prolonged or repeated skin contact may cause defatting and dermatitis. May cause respiratory tract cancer. May cause adverse nervous system effects including muscle tremors and incoordination. May cause liver and kidney damage. May cause reproductive and fetal effects.

**** SECTION 4 - FIRST AID MEASURES ****

Eyes:

Flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower lids. Get medical aid.

Skin:

Get medical aid if irritation develops or persists. Wash clothing before reuse. Flush skin with plenty of soap and water.

Ingestion:

If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid.

Inhalation:

Remove from exposure to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.

Notes to Physician:

Treat symptomatically and supportively.

**** SECTION 5 - FIRE FIGHTING MEASURES ****

General Information:

As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Containers may explode in the heat of a fire. Vapors may be heavier than air. They can spread along the ground and collect in low or confined areas.

Extinguishing Media:

Substance is noncombustible; use agent most appropriate to extinguish surrounding fire. For small fires, use dry chemical, carbon dioxide, or water spray. For large fires, use dry chemical, carbon dioxide, alcohol-resistant foam, or water spray. Cool containers with flooding quantities of water until well after fire is out.

Autoignition Temperature: Not applicable.

Flash Point: Not applicable.

NFPA Rating: health-2; flammability-0; reactivity-0

Explosion Limits, Lower: Not available.

Upper: Not available.

**** SECTION 6 - ACCIDENTAL RELEASE MEASURES ****

**** SECTION 6 - ACCIDENTAL RELEASE MEASURES ****

General Information: Use proper personal protective equipment as indicated in Section 8.

Spills/Leaks:

Absorb spill with inert material, (e.g., dry sand or earth), then place into a chemical waste container. Avoid runoff into storm sewers and ditches which lead to waterways. Clean up spills immediately, observing precautions in the Protective Equipment section. Flush down the spill with a large amount of water. Remove all sources of ignition. Use a spark-proof tool. Provide ventilation.

**** SECTION 7 - HANDLING and STORAGE ****

Handling:

Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Use with adequate ventilation. Do not reuse this container. Avoid breathing vapors from heated material. Avoid contact with skin and eyes. Keep container tightly closed. Keep away from flames and other sources of high temperatures that may cause material to form vapors or mists.

Storage:

Keep away from heat and flame. Store in a cool, dry place. Keep containers tightly closed.

**** SECTION 8 - EXPOSURE CONTROLS, PERSONAL PROTECTION ****

Engineering Controls:

Use process enclosure, local exhaust ventilation, or other engineering controls to control airborne levels below recommended exposure limits.

Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Tetrachloroethylene	25 ppm ; 170 mg/m3; 100 ppm STEL; 685 mg/m3 STEL	NIOSH Potential Occupational Carcinogen - see Appendix A; minimize workplace odor exposure concentrations limit number of workers exposed 150 ppm IDLH (not considering carcinogenic effects)	100 ppm TWA; C 200 ppm; C 200 ppm

OSHA Vacated PELs:

Tetrachloroethylene:
25 ppm TWA; 170 mg/m3 TWA

Personal Protective Equipment

Eyes:

Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133.

Skin:

Wear appropriate protective gloves to prevent skin

exposure.

Clothing:

Wear appropriate protective clothing to prevent skin exposure.

Respirators:

A respiratory protection program that meets OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements must be followed whenever workplace conditions warrant a respirator's use.

**** SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES ****

Physical State:	Liquid
Appearance:	clear, colorless
Odor:	sweetish odor
pH:	Not available.
Vapor Pressure:	15.8 mm Hg
Vapor Density:	5.2
Evaporation Rate:	9 (ether=100)
Viscosity:	0.89 mPa s 20 d
Boiling Point:	121 deg C
Freezing/Melting Point:	-22.3 deg C
Decomposition Temperature:	150 deg C
Solubility:	Nearly insoluble in water.
Specific Gravity/Density:	1.623
Molecular Formula:	C2Cl4
Molecular Weight:	165.812

**** SECTION 10 - STABILITY AND REACTIVITY ****

Chemical Stability:

Stable under normal temperatures and pressures.

Conditions to Avoid:

Incompatible materials, excess heat.

Incompatibilities with Other Materials:

Strong bases, metals, liquid oxygen, dinitrogen tetroxide.

Hazardous Decomposition Products:

Hydrogen chloride, phosgene, carbon monoxide, carbon dioxide.

Hazardous Polymerization: Will not occur.

**** SECTION 11 - TOXICOLOGICAL INFORMATION ****

RTECS#:

CAS# 127-18-4: KX3850000

LD50/LC50:

CAS# 127-18-4: Inhalation, mouse: LC50 = 5200 ppm/4H; Inhalation, rat: LC50 = 34200 mg/m³/8H; Oral, mouse: LD50 = 8100 mg/kg; Oral, rat: LD50 = 2629 mg/kg.

Carcinogenicity:

Tetrachloroethylene -

ACGIH: A3-animal carcinogen

California: carcinogen - initial date 4/1/88

NIOSH: occupational carcinogen

NTP: Suspect carcinogen

OSHA: Possible Select carcinogen

IARC: Group 2A carcinogen

Epidemiology:

Epidemiologic studies have given inconsistent results. Studies have shown that tetrachloroethylene has not caused cancer in exposed workers. The studies have serious weaknesses such as mixed exposures. In tests with rats and mice, it appeared that tissue destruction or peroxisome proliferation rather than genetic mechanisms were the cause of

the observed increases in normally occurring cancers. The oral mouse TDLo that was tumorigenic was 195 gm/kg/50W-I.

Teratogenicity:

Has caused musculoskeletal abnormalities. Has caused morphological transformation at a dose of 97mg/L in a study using rat embryos.

Reproductive Effects:

Has caused behavioral, biochemical, and metabolic effects on newborn rats when the mother was exposed to the TCLo of 900 ppm/7H at 7-13 days after conception. A dose of 300 ppm/7H 6-15 days after conception caused post-implantation mortality.

Neurotoxicity:

No information available.

Mutagenicity:

Not mutagenic in Escherichia coli. No mutagenic effects were seen in rat liver after exposure at 200 ppm for 10 weeks. No chromosome changes were seen in the bone marrow cells of exposed mice.

Other Studies:

A case of 'obstructive jaundice' in a 6-week old infant has been attributed to tetrachloroethylene in breast milk.

**** SECTION 12 - ECOLOGICAL INFORMATION ****

Ecotoxicity:

Not available.

Environmental Fate:

In soil, substance will rapidly evaporate. In water, it will evaporate. In air, it can be expected to exist in the vapor phase.

Physical/Chemical:

Not available.

Other:

Not available.

**** SECTION 13 - DISPOSAL CONSIDERATIONS ****

Dispose of in a manner consistent with federal, state, and local regulations.

RCRA D-Series Maximum Concentration of Contaminants:

CAS# 127-18-4: waste number D039; regulatory level = 0.7 mg/L.

RCRA D-Series Chronic Toxicity Reference Levels: CAS#

127-18-4: chronic toxicity reference level = 0.007 mg/L.

RCRA F-Series: None listed.

RCRA P-Series: None listed.

RCRA U-Series: CAS# 127-18-4: waste number U210.

CAS# 127-18-4 is banned from land disposal according to RCRA.

**** SECTION 14 - TRANSPORT INFORMATION ****

US DOT

Shipping Name: TETRACHLOROETHYLENE

Hazard Class: 6.1

UN Number: UN1897

Packing Group: III

IMO

No information available.

IATA

No information available.

RID/ADR

No information available.

Canadian TDG

Shipping Name: TETRACHLOROETHYLENE

Hazard Class: 6.1

UN Number: UN1897

**** SECTION 15 - REGULATORY INFORMATION ****

US FEDERAL

TSCA

CAS# 127-18-4 is listed on the TSCA inventory.
Health & Safety Reporting List
CAS# 127-18-4: Effective Date: June 1, 1987; Sunset Date: June 1, 1997
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.
Section 12b
None of the chemicals are listed under TSCA Section 12b.
TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.

SARA

Section 302 (RQ)
final RQ = 100 pounds (45.4 kg)
Section 302 (TPQ)
None of the chemicals in this product have a TPQ.
SARA Codes
CAS # 127-18-4: acute.
Section 313
This material contains Tetrachloroethylene (CAS# 127-18-4, 99+%), which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.

Clean Air Act:

CAS# 127-18-4 is listed as a hazardous air pollutant (HAP).
This material does not contain any Class 1 Ozone depleters.
This material does not contain any Class 2 Ozone depleters.

Clean Water Act:

None of the chemicals in this product are listed as Hazardous Substances under the CWA.
CAS# 127-18-4 is listed as a Priority Pollutant under the Clean Water Act.
CAS# 127-18-4 is listed as a Toxic Pollutant under the Clean Water Act.

OSHA:

None of the chemicals in this product are considered highly hazardous by OSHA.

STATE

Tetrachloroethylene can be found on the following state right to know lists: California, New Jersey, Florida, Pennsylvania, Minnesota, Massachusetts.

The following statement(s) is(are) made in order to comply with the California Safe Drinking Water Act:

WARNING: This product contains Tetrachloroethylene, a chemical known to the state of California to cause cancer.

California No Significant Risk Level:

CAS# 127-18-4: no significant risk level = 14 ug/day

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols: XN N

Risk Phrases:

R 40 Possible risks of irreversible effects.
R 51/53 Toxic to aquatic organisms; may cause long-term adverse effects in the aquatic environment.

Safety Phrases:

S 23 Do not inhale gas/fumes/vapour/spray.
S 36/37 Wear suitable protective clothing and gloves.
S 61 Avoid release to the environment. Refer to special instructions/Safety data sheets.

WGK (Water Danger/Protection)

CAS# 127-18-4: 3

Canada

CAS# 127-18-4 is listed on Canada's DSL/NDSL List.

This product has a WHMIS classification of D1B, D2A.

CAS# 127-18-4 is not listed on Canada's Ingredient Disclosure List.

Exposure Limits

CAS# 127-18-4: OEL-ARAB Republic of Egypt:TWA 5 ppm (35 mg/m3);Skin

A 50 ppm (339 mg/m3);STEL 200 ppm (1368 mg/m3). OEL-CZECHOSLOVAKIA:TWA 250 mg/m3;STEL 1250 mg/m3. OEL-DENMARK:TWA 30 ppm (200 mg/m3);Skin. OEL-FINLAND:TWA 50 ppm (335 mg/m3);STEL 75 ppm (520 mg/m3);Skin. OEL-FRANCE:TWA 50 ppm (335 mg/m3). OEL-GERMANY:TWA 50 ppm (345 mg/m3);Carcinogen. OEL-HUNGARY:STEL 50 mg/m3;Skin;Carcinogen. OEL-JAPAN:TWA 50 ppm (340 mg/m3). OEL-THE NETHERLANDS:TWA 35 ppm (240 mg/m3);Skin. OEL-THE PHILIPPINES:TWA 100 ppm (670 mg/m3). OEL-POLAND:TWA 60 mg/m3. OEL-RUSSIA:TWA 50 ppm;STEL 10 mg/m3. OEL-SWEDEN:TWA 10 ppm (70 mg/m3);STEL 25 ppm (170 mg/m3). OEL-SWITZERLAND:TWA 50 ppm (345 mg/m3);STEL 100 ppm;Skin. OEL-THAILAND:TWA 100 ppm;STEL 200 ppm. OEL-UNITED KINGDOM:TWA 50 ppm (335 mg/m3);STEL 15 ppm. OEL IN BULGARIA, COLOMBIA, JORDAN, KOREA check ACGIH TLV. OEL IN NEW ZEALAND, SINGAPORE, VIETNAM check ACGI TLV

**** SECTION 16 - ADDITIONAL INFORMATION ****

MSDS Creation Date: 4/07/1995 Revision #11 Date: 12/12/1997

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no way shall Fisher be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if Fisher has been advised of the possibility of such damages.

05-27-1998 16:19

P.01

MATERIAL SAFETY DATA SHEET

ULTRA Scientific
J01) 294-9400230 South Street
North Kingstown, RI 02852

DATE: 05/27/1998

LAST UPDATED: 09/18/1997

CATALOG NUMBER: PP-340

PAGE 1 1

SECTION I PRODUCT IDENTIFICATION

Catalog Number: PP-340 Name: Aroclor 1248 Solution
Solvent: methanol (ethyl alcohol)

SECTION II HAZARDOUS INGREDIENTS

Component	CAS #	WT% L850	RTECS #	OSHA PEL	ACGIH TLV	Codes
methanol (methanol)	00067-56-1	99.9874	12,700 mg/kg oral rat	PC1400000	200 ppm	200 ppm G
Aroclor 1248 (PCB 1248)	12672-29-6	0.0126	11000 mg/kg oral rat	N/A	N/A	N/A

Codes: A - OSHA regulated carcinogen; B - IARC Group 1 carcinogen; C - IARC Group 2A carcinogen; D - IARC Group 2B carcinogen;
E - NTP Group 1 carcinogen; F - NTP Group 2 carcinogen; G - SARA Title III compound; H - California Prop. 65 compound

SECTION III PHYSICAL DATA FOR SOLVENT

Melting Point: -98°C Boiling Point: 64.8°C Density: 0.7910
Vapor Pressure: 100 mmHg @ 21.2°C Vapor Density: 1.1 Water Solubility: soluble
Appearance: colorless liquid Odor: N/A

SECTION IV FIRE AND EXPLOSION HAZARD DATA FOR SOLVENT

Flash Point: 52°F Auto-Ignition Temp: 723°F LEL: 6.7 UEL: 36.0 Fire Hazard: combustible

Extinguishing Media: Carbon Dioxide, dry chemical powder, or water spray.

SECTION V HEALTH HAZARD DATA FOR PRODUCT

Contains carcinogen(s) or cancer suspect agent(s)
Toxic; irritant

All chemicals should be considered hazardous - direct physical contact should be avoided.

FIRST AID: In case of eye or skin contact, flush with copious amounts of water. If inhaled, remove to fresh air - give oxygen, if necessary. Contact physician.

SECTION VI REACTIVITY DATA FOR SOLVENT

Stability: stable
Incompatibilities: strong oxidizers
Hazardous Decomposition Products: N/A
Hazardous Polymerization Products: no

Post-It® Fax Note	7871	Date	5-27	# of pages	4
To	Mike Burkhardt	From	LOAN		
Co./Dept	Fisher	Co.	Ultra Scientific		
Phone #	412-490-8095	Phone #	401-294-9400		
Fax #	490-8098	Fax #			

MATERIAL SAFETY DATA SHEET

ULTRA Scientific
(401) 294-9400

250 Smith Street
North Kingstown, RI 02881

DATE: 05/27/1998

LAST UPDATED: 08/18/1997

CATALOG NUMBER: PP-340

PAGE: 2

SECTION VII SPILL OR LEAK PROCEDURES

Spills or leaks: Due to the small quantity involved, spills or leaks should not pose a significant problem. A leaking ampule or bottle may be placed in a plastic bag and normal disposal procedures followed. Liquid samples may be absorbed on vermiculite or sand.

Waste disposal: Burn in a chemical incinerator equipped with an afterburner and scrubber. Observe all federal, state and local laws concerning disposal.

SECTION VIII PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE

Use appropriate OSHA/MSHA approved safety equipment. Wear chemical goggles, face shield, gloves and chemical resistant clothing such as a laboratory coat and/or a rubber apron to prevent contact with eyes, skin, and clothing. Keep tightly closed and store in a cool dry place.

SECTION IX SPECIAL PRECAUTIONS AND COMMENTS

This material should only be used by those persons trained in the safe handling of hazardous chemicals.

The above information is believed to be correct, but does not purport to be all inclusive. This data should be used only as a guide in handling the material. ULTRA SCIENTIFIC, INC. shall not be held liable for any damage resulting from handling or from contact with the above product.

MATERIAL SAFETY DATA SHEET

TRA Scientific
(401) 294-9400250 Smith Street
North Kingstown, RI 02882

DATE: 05/27/1998

LAST UPDATED: 09/18/1997

CATALOG NUMBER: PP-350

PAGE: 1

SECTION I PRODUCT IDENTIFICATION

Catalog Number: PP-350 Name: Aroclor 1234 Solution
Solvent: methanol (methyl alcohol)

SECTION II HAZARDOUS INGREDIENTS

Component	CAS #	WTX	LD50	RTECS #	OSHA PEL	ACGIH TLV	Codes
methyl alcohol (methanol)	00067-56-1	99.9874	12,900 mg/kg oral rat	PC1400000	200 ppm	200 ppm	G
Aroclor 1234 (PCB 1234)	11097-69-1	0.0126	1295 mg/kg oral rat	N/A	0.5 mg/m3	0.5 mg/m3	C,F

Codes: A - OSHA regulated carcinogen; B - IARC Group 1 carcinogen; C - IARC Group 2A carcinogen; D - IARC Group 2B carcinogen;
E - NTP Group 1 carcinogen; F - NTP Group 2 carcinogen; G - SARA Title III compound; H - California Prop. 65 compound.

SECTION III PHYSICAL DATA FOR SOLVENT

Melting Point: -98°C Boiling Point: 64.8°C Density: 0.7910
Vapor Pressure: 100 mmHg @ 21.2°C Vapor Density: 1.1 Water Solubility: soluble
Appearance: colorless liquid Odor: N/A

SECTION IV FIRE AND EXPLOSION HAZARD DATA FOR SOLVENT

Flash Point: 52°F Auto-ignition Temp: 725°F LEL: 6.7 UEL: 36.0 Fire Hazard: combustible

Extinguishing Media: Carbon Dioxide, dry chemical powder, or water spray.

SECTION V HEALTH HAZARD DATA FOR PRODUCT

Contains carcinogen(s) or cancer suspect agent(s)
Toxic; Irritant

All chemicals should be considered hazardous - direct physical contact should be avoided.

FIRST AID: In case of eye or skin contact, flush with copious amounts of water. If inhaled, remove to fresh air - give oxygen, if necessary. Contact physician.

SECTION VI REACTIVITY DATA FOR SOLVENT

Stability: stable
Incompatibilities: strong oxidizers
Hazardous Decomposition Products: N/A
Hazardous Polymerization Products: no

MATERIAL SAFETY DATA SHEET

ULTRA Scientific
(401) 294-9400

250 Smith Street
North Kingstown, RI 02881

DATE: 05/27/1998

LAST UPDATED: 09/18/1997

CATALOG NUMBER: PP-350

PAGE: 2

SECTION VII SPILL OR LEAK PROCEDURES

Spills or leaks: Due to the small quantity involved, spills or leaks should not pose a significant problem. A leaking can or bottle may be placed in a plastic bag and normal disposal procedures followed. Liquid samples may be absorbed on vermiculite or sand.

Waste disposal: Burn in a chemical incinerator equipped with an afterburner and scrubber. Observe all federal, state and local laws concerning disposal.

SECTION VIII PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE

Use appropriate OSHA/MSHA approved safety equipment. Wear chemical goggles, face shield, gloves and chemical resistant clothing such as a laboratory coat and/or a rubber apron to prevent contact with eyes, skin, and clothing. Keep tightly closed and store in a cool dry place.

SECTION IX SPECIAL PRECAUTIONS AND COMMENTS

This material should only be used by those persons trained in the safe handling of hazardous chemicals.

The above information is believed to be correct, but does not purport to be all inclusive. This data should be used only as a guide in handling the material. ULTRA SCIENTIFIC, INC. shall not be held liable for any damage resulting from handling or from contact with the above product.

J T BAKER -- M-CRESOL, F842
MATERIAL SAFETY DATA SHEET
NSN: 681000N041610
Manufacturer's CAGE: 70829
Part No. Indicator: A
Part Number/Trade Name: M-CRESOL, F842

=====

General Information

=====

Company's Name: J T BAKER INC
Company's Street: 222 RED SCHOOL LANE
Company's City: PHILLIPSBURG
Company's State: NJ
Company's Country: US
Company's Zip Code: 08865-2219
Company's Emerg Ph #: 908-859-2151; 800-424-9300 (CHEMTREC)
Company's Info Ph #: 800-582-2537
Record No. For Safety Entry: 001
Tot Safety Entries This Stk#: 001
Status: SMJ
Date MSDS Prepared: 01MAY89
Safety Data Review Date: 28JUL93
MSDS Serial Number: BRLPK
Hazard Characteristic Code: NK

=====

Ingredients/Identity Information

=====

Proprietary: NO
Ingredient: M-CRESOL (SARA III)
Ingredient Sequence Number: 01
Percent: 90-100
NIOSH (RTECS) Number: GO6125000
CAS Number: 108-39-4
OSHA PEL: 5 PPM, S
ACGIH TLV: N/K (FP N)

=====

Physical/Chemical Characteristics

=====

Appearance And Odor: COLORLESS TO YELLOW LIQUID. PHENOLIC ODOR.
Boiling Point: 395F, 202C
Melting Point: 53.0F, 11.7C
Vapor Pressure (MM Hg/70 F): 0.1 (20C)
Vapor Density (Air=1): 3.7
Specific Gravity: 1.03 (H*20=1)
Evaporation Rate And Ref: N/A
Solubility In Water: MODERATE (1-10%)
Percent Volatiles By Volume: N/A
pH: N/A

=====

Fire and Explosion Hazard Data

=====

Flash Point: 187F, 86C
Flash Point Method: CC
Lower Explosive Limit: 1.1%
Upper Explosive Limit: 1.4%
Extinguishing Media: USE WATER SPRAY, CARBON DIOXIDE, DRY CHEMICAL OR ORDINARY FOAM.
Special Fire Fighting Proc: USE NIOSH/MSHA APPRVD SCBA AND FULL PROTECTIVE EQUIP (FP N). MOVE CONTRS FROM FIRE AREA IF IT CAN BE DONE W/OUT RISK. USE WATER TO KEEP FIRE-EXPOS CNTRS COOL.
Unusual Fire And Expl Hazrds: VAPS MAY FLOW ALONG SURFACES TO DISTANT IGNITION SOURCES & FLASH BACK. CLOSED CONTRS EXPOSED TO HEAT MAY EXPLODE. CONTACT W/STRONG OXIDIZERS MAY CAUSE FIRE.

Reactivity Data

Stability: YES
 Cond To Avoid (Stability): HEAT, FLAME, OTHER SOURCES OF IGNITION, LIGHT.
 Materials To Avoid: STRONG OXIDIZING AGENTS.
 Hazardous Decomp Products: CARBON MONOXIDE AND CARBON DIOXIDE
 Hazardous Poly Occur: NO
 Conditions To Avoid (Poly): NOT RELEVANT.

Health Hazard Data

LD50-LC50 Mixture: LD50: (ORAL, RAT): 242 MG/KG
 Route Of Entry - Inhalation: YES
 Route Of Entry - Skin: YES
 Route Of Entry - Ingestion: NO
 Health Haz Acute And Chronic: TARGET ORGANS: NASAL SEPTUM, RESP SYS, LIVER, KIDNEYS, EYES, SKIN. ACUTE: INHAL: HDCH, NAUS, VOMIT, DIZZ, DROW, IRRIT OF SEV IRRIT/BURNS. SKIN ABSORPTION: DERM. INGEST: HARMFUL & MAY BE FATAL, NAUS, VOMIT, GI IRRIT, BURNS TO MOUTH (EFTS OF OVEREXP)
 Carcinogenicity - NTP: NO
 Carcinogenicity - IARC: NO
 Carcinogenicity - OSHA: NO
 Explanation Carcinogenicity: NOT RELEVANT.
 Signs/Symptoms Of Overexp: HLTH HAZ: THROAT. CHRONIC EFTS: DAMAGE TO LIVER, KIDNEYS, LUNGS, BLOOD, CENTRAL NERVOUS SYSTEM.
 Med Cond Aggravated By Exp: NONE IDENTIFIED.
 Emergency/First Aid Proc: INGEST: CALL MD. IF SWALLOWED, DO NOT INDUCE VOMIT. IF CONSCIOUS GIVE WATER, MILK/MILK OF MAGNESIA. INHAL: REMOVE TO IN CASE OF CNTCT, IMMEDIATELY FLUSH SKIN W/PLENTHY OF WATER (DELUGE SHOWER) FOR @ LEAST 15 MINS WHILE REMOVING CONTAMD CLTHNG & SHOES. WASH CLTHNG BEFORE RE-USE. EYES: IMMEDIATELY FLUSH W/PLENTHY OF WATER FOR @ LEAST 15 MINS.

Precautions for Safe Handling and Use

Steps If Matl Released/Spill: WEAR NIOSH/MSHA APPRVD SCBA & FULL PROT CLTHNG. SHUT OFF IGNIT SOURCES; NO FLARES, SMKG/FLAMES IN AREA. STOP LEAK IF CAN DO W/OUT RISK. USE WATER SPRAY TO REDUCE VAPS. TAKE UP W/SAND/OTHER NON-COMBUST ABSORB MATL & PLACE INTO CONTR FOR LATER (SUPDAT)
 Neutralizing Agent: J T BAKER SOLUSORB(R) SOLVENT ABSORBENT RECOMMENDED FOR SPILLS OF THIS PRODUCT.
 Waste Disposal Method: DISPOSE IN ACCORDANCE WITH ALL APPLICABLE FEDERAL, STATE, AND LOCAL ENVIRONMENTAL REGULATIONS.
 Precautions-Handling/Storing: KEEP CONTR TIGHTLY CLOSED. STORE IN COOL, DRY, WELL-VENTILATED, FLAMMABLE LIQUID STORAGE AREA/CABINET. STORE IN LIGHT-RESISTANT CONTAINERS.
 Other Precautions: PRODUCT MAY SOLIDIFY AT ROOM TEMPERATURE. KEEP AWAY FROM HEAT, SPARKS, FLAME. HARMFUL IF SWALLOWED, INHALED OR ABSORBED THROUGH SKIN.

Control Measures

Respiratory Protection: NIOSH/MSHA APPRVD RESP PROT REQ IF AIRBORNE CONC EXCEEDS TLV. AT CONCS UP TO 250 PPM, CHEM CARTRIDGE RESP W/ ORGANIC VAP CARTRIDGE & DUST/MIST FILTER IS RECOMMENDED. ABOVE THIS LEVEL, A NIOSH/MSHA APPRVD SCBA IS RECOMMENDED.
 Ventilation: USE GENERAL OR LOCAL EXHAUST VENTILATION TO MEET TLV REQUIREMENTS.
 Protective Gloves: RUBBER GLOVES.
 Eye Protection: CHEM WORK GOGG W/FULL LGTH FSHLD (FP N)
 Other Protective Equipment: EMER EYE BATH & DELUGE SHOWER (FP N). UNIFORM, PROTECTIVE SUIT RECOMMENDED.
 Work Hygienic Practices: WASH THOROUGHLY AFTER HANDLING.

Suppl. Safety & Health Data: SPILL PROC: DISP. FLUSH AREA W/WATER.

=====
Transportation Data
=====

=====
Disposal Data
=====

=====
Label Data
=====

Label Required: YES

Technical Review Date: 28JUL93

Label Date: 19APR93

Label Status: G

Common Name: M-CRESOL, F842

Chronic Hazard: YES

Signal Word: DANGER!

Acute Health Hazard-Severe: X

Contact Hazard-Severe: X

Fire Hazard-Moderate: X

Reactivity Hazard-Slight: X

Special Hazard Precautions: CORROSIVE! COMBUSTIBLE! KEEP AWAY FROM HEAT, SPARKS & FLAME. TARGET ORGANS: NASAL SEPTUM, RESP SYS, LIVER, KIDNEYS, EYES, SKIN. ACUTE: INHAL: HDCH, NAUS, VOMIT, DIZZ, DROW, IRRIT OF UPPER RESP TRACT, UNCON, MAY CAUSE PULM EDEMA. SKIN: SEV IRRIT/BURNS. EYES: SEV IRRIT/BURNS. SKIN ABSORPTION: DERMAT. INGEST: HARMFUL & MAY BE FATAL, NAUS, VOMIT, GI IRRIT, BURNS TO MOUTH & THROAT. CHRONIC: DMG TO LIVER, KIDNEYS, LUNGS, BLOOD & CNS.

Protect Eye: Y

Protect Skin: Y

Protect Respiratory: Y

Label Name: J T BAKER INC

Label Street: 222 RED SCHOOL LANE

Label City: PHILLIPSBURG

Label State: NJ

Label Zip Code: 08865-2219

Label Country: US

Label Emergency Number: 201-859-2151; 800-424-9300 (CHEMTREC)

**** MATERIAL SAFETY DATA SHEET ****

Lead
12510

**** SECTION 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION ****

MSDS Name: Lead
Catalog Numbers:
671957, 671957-1, 875257, 880049, L18 500, L18-500, L18500, L246 500,
L246-500, L246500, L27 1LB, L27-1LB, L271LB, 8719571
Synonyms:
Lead metal
Company Identification: Fisher Scientific
1 Reagent Lane
Fairlawn, NJ 07410
For information, call: 201-796-7100
Emergency Number: 201-796-7100
For CHEMTREC assistance, call: 800-424-9300
For International CHEMTREC assistance, call: 703-527-3887

**** SECTION 2 - COMPOSITION, INFORMATION ON INGREDIENTS ****

CAS#	Chemical Name	%	EINECS#
7439-92-1	LEAD	99.8	231-100-4

**** SECTION 3 - HAZARDS IDENTIFICATION ****

EMERGENCY OVERVIEW

Appearance: bluish white, silvery gray.
Caution! May cause central nervous system depression. May be absorbed through the skin. May cause kidney damage. May cause respiratory and digestive tract irritation. Can cause reproductive effects. Causes eye and skin irritation. May cause fetal effects.
Target Organs: Kidneys, central nervous system, blood forming organs.

Potential Health Effects

Eyes:
Causes eye irritation.
Skin:

Causes skin irritation.

Ingestion:

Causes gastrointestinal irritation with nausea, vomiting and diarrhea. Many lead compounds can cause toxic effects in the blood-forming organs, kidneys, and central nervous system. May cause metal taste, muscle pain/weakness, and convulsions.

Inhalation:

May cause respiratory tract irritation. Inhalation of fumes may cause metal fume fever, which is characterized by flu-like symptoms with metallic taste, fever, chills, cough, weakness, chest pain, muscle pain and increased white blood cell count. May cause effects similar to those described for ingestion.

Chronic:

Chronic exposure to lead may result in plumbism which is characterized by lead line in gum, headache, muscle weakness, mental changes,

**** SECTION 4 - FIRST AID MEASURES ****

Eyes:

Flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower lids. Get medical aid.

Skin:

Get medical aid. Immediately flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes. Discard contaminated clothing in a manner which limits further exposure.

Ingestion:

If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid immediately. Do NOT induce vomiting. Allow the victim to rinse his mouth and then to drink 2-4 cupfuls of water, and seek medical advice.

Inhalation:

Remove from exposure to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.

Notes to Physician:

Treat symptomatically and supportively.

Antidote:

The use of Dimercaprol or BAL (British Anti-Lewisite) as a chelating

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agent should be determined by qualified medical personnel. The use of d-Penicillamine as a chelating agent should be determined by qualified medical personnel. The use of Calcium disodium EDTA as a chelating agent should be determined by qualified medical personnel.

**** SECTION 5 - FIRE FIGHTING MEASURES ****

General Information:

As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Dust can be an explosion hazard when exposed to heat or flame.

Extinguishing Media:

For small fires, use water spray, dry chemical, carbon dioxide or chemical foam.

Autoignition Temperature: Not available.

Flash Point: Not available.

NFPA Rating: Not published.

Explosion Limits, Lower: Not available.
Upper: Not available.

**** SECTION 6 - ACCIDENTAL RELEASE MEASURES ****

General Information: Use proper personal protective equipment as indicated in Section 8.

Spills/Leaks:

Vacuum or sweep up material and place into a suitable disposal container. Sweep up, then place into a suitable container for disposal. Avoid generating dusty conditions.

**** SECTION 7 - HANDLING and STORAGE ****

Handling:

Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Use with adequate ventilation. Avoid contact with eyes, skin, and clothing. Avoid ingestion and inhalation.

Storage:

Store in a cool, dry place. Keep from contact with oxidizing materials.

**** SECTION 8 - EXPOSURE CONTROLS, PERSONAL PROTECTION ****

Engineering Controls:

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Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits.

Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
LEAD	0.05 mg/m3	as Pb: 0.100 mg/m3 TWA; see Appendix C for supplementary exposure limits as Pb: 100 mg/m3 IDLH	as Pb: 50 ug/m3 TWA PEL; 30 ug/m 3 action level; Poison (see 29 CFR 1910.102 5)

OSHA Vacated PELs:

LEAD:

No OSHA Vacated PELs are listed for this chemical.

Personal Protective Equipment

Eyes:

Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133.

Skin:

Wear appropriate protective gloves and clothing to prevent skin exposure.

Clothing:

Wear appropriate protective clothing to prevent skin exposure.

Respirators:

Follow the OSHA respirator regulations found in 29CFR 1910.134. Always use a NIOSH-approved respirator when necessary.

*** SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES ***

Physical States:

Solid

Appearance:

bluish white, silvery gray

Odor:

None reported

pH:

Not applicable.

Vapor Pressure: 11.3 mm Hg @ 77°C
Vapor Density: Not available.
Evaporation Rate: Not applicable.
Viscosity: Not applicable.
Boiling Point: 1740 deg C
Freezing/Melting Point: 327.4 deg C
Decomposition Temperature: Not available.
Solubility: Insoluble in water.
Specific Gravity/Density: 11.3
Molecular Formula: Pb
Molecular Weight: 207.2

**** SECTION 10 - STABILITY AND REACTIVITY ****

Chemical Stability:

Stable under normal temperatures and pressures.

Conditions to Avoid:

Strong oxidants.

Incompatibilities with Other Materials:

Strong oxidizing agents.

Hazardous Decomposition Products:

Lead/lead oxides.

Hazardous Polymerization: Has not been reported.

**** SECTION 11 - TOXICOLOGICAL INFORMATION ****

RTECS#:

CAS# 7439-92-1: OF7525000

LD50/LC50:

Not available.

Carcinogenicity:

LEAD --

ACGIH: elemental, as Pb; A3 - animal carcinogen

California: carcinogen - initial date 10/1/92

OSHA: Possible Select carcinogen

IARC: Group 2B carcinogen

Epidemiology:

There are several reports that certain lead compounds administered to animals in high doses are carcinogenic, primarily producing renal tumors. Salts demonstrating carcinogenicity in animals are usually soluble salts. Epidemiological studies have not shown a relationship between lead exposure and the incidence of cancer in lead workers. However,

the study of lead-exposed workers demonstrated a statistically significant elevation in the standardized mortality ratio for gastric and lung cancer in battery plant workers only.

Teratogenicity:

Lead penetrates the placental barrier and has caused fetal abnormalities in animals. Excessive exposure to lead during pregnancy has caused neurological disorders in infants.

Reproductive Effects:

Reproductive effects from lead have been documented in animals and human beings of both sexes. In battery workmen with a mean exposure of 8.5 years to lead, there was an increased frequency of sperm abnormalities as compared with a control group.

Neurotoxicity:

Subtle neurologic effects have been demonstrated with relatively low blood levels of lead. The performance of lead workers on various neurophysiological tests was mildly reduced when compared with a control group. Anxiety, depression, poor concentration, forgetfulness, mild reductions in motor and sensory nerve conduction velocities have been documented in lead-exposed workers.

Mutagenicity:

No data available.

Other Studies:

No data available.

****** SECTION 12 - ECOLOGICAL INFORMATION ********Ecotoxicity:**

Not available.

Environmental Fate:

Not available.

Physical/Chemical:

Not available.

Other:

Not available.

****** SECTION 13 - DISPOSAL CONSIDERATIONS ******

Dispose of in a manner consistent with federal, state, and local regulations.

RCRA D-Series Maximum Concentration of Contaminants:

CAS# 7439-92-1; waste number D008; regulatory level =

5.0 mg/L.

RCRA U-Series Chronic Toxicity Reference Levels: CRS
7439-92-1: chronic toxicity reference level = 0.05
mg/L.
RCRA F-Series: None listed.
RCRA P-Series: None listed.
RCRA U-Series: None listed.
CAS# 7439-92-1 is banned from land disposal according
to RCRA.

**** SECTION 14 - TRANSPORT INFORMATION ****

US DOT

Shipping Name: RQ, ENVIRONMENTALLY HAZARDOUS SUBSTANCE,
SOLID, N.O.S. (CONTAINS LEAD SHOT)

Hazard Class: 9

UN Number: UN3077

Packing Group: III

IMO

No information available.

IATA

No information available.

RID/AOR

No information available.

Canadian TDG

No information available.

**** SECTION 15 - REGULATORY INFORMATION ****

US FEDERAL

TSCA

CAS# 7439-92-1 is listed on the TSCA inventory.

Health & Safety Reporting List

None of the chemicals are on the Health & Safety Reporting List.

Chemical Test Rules

None of the chemicals in this product are under a Chemical Test Rule.

Section 12b

None of the chemicals are listed under TSCA Section 12b.

TSCA Significant New Use Rule

None of the chemicals in this material have a SNUR under TSCA.

SARA

Section 302 (RQ)

Final RQ = 10 pounds (4.54 kg)

Section 302 (TPQ)

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None of the chemicals in this product have a TQ.

SARA Code:

CAS# 7439-92-1: acute, chronic.

Section 313

This material contains LEAD (CAS# 7439-92-1, 99.8%) which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.

Clean Air Act:

CAS# 7439-92-1 listed as LEAD COMPOUNDS is listed as a hazardous air pollutant (HAP).

This material does not contain any Class 1 Ozone depleters.

This material does not contain any Class 2 Ozone depleters.

Clean Water Act:

None of the chemicals in this product are listed as Hazardous Substances under the CWA.

CAS# 7439-92-1 is listed as a Priority Pollutant under the Clean Water Act.

CAS# 7439-92-1 is listed as a Toxic Pollutant under the Clean Water Act.

OSHA:

None of the chemicals in this product are considered highly hazardous by OSHA.

STATE

LEAD can be found on the following state right to know lists:
California, New Jersey, Florida, Pennsylvania, Minnesota,
Massachusetts.

The following statement(s) is/are made in order to comply with the California Safe Drinking Water Act:

WARNING: This product contains LEAD, a chemical known to the state of California to cause cancer.

WARNING: This product contains LEAD, a chemical known to the state of California to cause birth defects or other reproductive harm.

California No Significant Risk Level:

CAS# 7439-92-1: NOEL = 0.5 ug/day

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols: Not available.

Risk Phrases:

Safety Phrases:

WGK (Water Danger/Protection)

CAS# 7439-92-1:

Canada

CAS# 7439-92-1 is listed on Canada's DSL/NDL List.

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THIS PRODUCT HAS A WHMIS CLASSIFICATION OF D2A.
CAS# 7439-92-1 is not listed on Canada's Ingredient Disclosure List.

Exposure Limits

CAS# 7439-92-1: OEL-FRANCE:TWA 150 mg/m3. OEL-GERMANY:TWA 0.1 mg/m3?
?OEL-POLAND:TWA 0.05 mg/m3

*** SECTION 16 - ADDITIONAL INFORMATION ***

MSDS Creation Date: 9/28/1995 Revision #16 Date: 12/12/1997

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no way shall Fisher be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if Fisher has been advised of the possibility of such damages.

APPENDIX C

GUIDANCE ON HEAT STRESS CONTROL

C&S ENGINEERS, INC.
HEALTH & SAFETY GUIDELINE #15
HEAT STRESS CONTROL

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C&S ENGINEERS, INC.

HEAT STRESS CONTROL

1.0 PURPOSE

To establish procedures for the implementation and operation of a heat stress prevention, evaluation, and response program.

2.0 SCOPE

Applies to all activity where employees may be exposed to environments exceeding 71 degrees Fahrenheit (WBGT) performing Levels C and B work, and environments exceeding 77 degrees Fahrenheit (WBGT) for Level D work.

3.0 DEFINITIONS

Acclimatization — Acclimatization is the process of the body becoming accustomed to extremes in temperature.

ACGIH TLV 1997 — Heat Stress Threshold Limit Values (TLVs) are intended to protect workers from the severest effects of heat stress and heat injury and to describe exposures to hot working conditions under which it is believed that nearly all workers can be repeatedly exposed without adverse health effects. The TLV objective is to prevent the deep body core temperature from exceeding 38°C (100.4°F).

Wet-Bulb Globe Temperature (WBGT) — This is the simplest and most suitable technique to measure the environmental factors associated with heat stress. The value is calculated by using the equations shown in Appendix A.

Work/Rest Regimen — This is a ratio of time spent working versus time spent resting. The ratio applies to one (1) hour periods. For example, a work/rest regimen of 75% work, 25% rest corresponds to 45 minutes work, 15 minutes rest each hour.

4.0 RESPONSIBILITIES

Employees — All employees must be alert to signs of development of symptoms of heat stress in themselves and in those working with them. They must also be aware of emergency corrective action.

Health and Safety Coordinator (HSC) — The HSC is responsible for establishing and enforcing the work/rest regimen to control heat stress.

5.0 GUIDELINES

Acclimatization to heat involves a series of physiological and psychological adjustments that occur in an individual during his/her first week of exposure to hot environmental conditions. The work-rest regimen in this procedure is valid for acclimated workers who are physically fit.

5.1 Effects of Heat Stress

Hot weather can cause physical discomfort, loss of efficiency, and personal injury. Wearing personal protective equipment puts a worker at considerable risk of developing heat stress because protective clothing decreases natural body ventilation. Heat stress is probably one of the most common (and potentially serious) illnesses at hazardous waste sites. Regular monitoring and preventive measures are essential to the health and safety of personnel conducting field work.

Early symptoms of heat stress may include fatigue, irritability, anxiety, and decreased concentration, dexterity, or movement. If not recognized or treated, heat stress may be serious, even fatal.

Heat-related problems include:

1. **Heat Rash** — caused by continuous exposure to hot and humid air and aggravation of the skin by chafing clothes. As well as being a nuisance, this decreases the ability to tolerate heat.
2. **Heat Cramps** — caused by profuse perspiration with inadequate fluid intake and chemical replacement (especially salts). Signs: muscle spasm and pain in the extremities and abdomen.
3. **Heat Exhaustion** — caused by increased stress on various organs to meet increased demands for body cooling. Signs: shallow breathing; pale, cool, moist skin; profuse sweating; dizziness; fatigue.
4. **Heat Stroke** — the most severe form of heat stress. Heat stroke is considered an Immediately Dangerous to Life or Health (IDLH) condition and as such must be treated as an emergency. Any person suffering from heat stroke must be cooled down immediately and brought to a hospital. Decontamination procedures should not be implemented. Signs and symptoms are: red, hot, dry skin; no perspiration; nausea; dizziness and confusion; strong, rapid pulse; coma.

It is important to note that individuals vary in their susceptibility and their reactions to heat-related conditions. Factors that may predispose someone to a heat condition include:

- | | |
|----------------------------|------------------------|
| • Lack of physical fitness | • Alcohol and drug use |
| • Lack of acclimatization | • Infection |
| • Age | • Sunburn |
| • Dehydration | • Diarrhea |
| • Obesity | • Chronic disease |

5.2 First Aid/Medical Treatment

The following first aid and medical treatments are recommended. First aid training is recommended.

1. **Heat Rash** — Apply mild drying lotions and use cool, dry sleeping quarters to allow skin to dry between heat exposures.
2. **Heat Cramps** — Administer commercially-available electrolyte-balanced liquids. Seek medical attention if serious.
3. **Heat Exhaustion** — Remove to cooler environment; rest in reclining position. Drink plenty of fluids.
4. **Heat Stroke** — Immediate and rapid cooling by immersion in chilled water with massage, or wrapping in wet sheet and fanning. These steps are to be taken while waiting for emergency response to arrive, or while transporting the victim to an emergency medical facility. This is a **life-threatening** situation.

5.3 Heat Stress Prevention

One or more of the following will help prevent or reduce heat stress:

1. Drinking water shall be available to employees to encourage frequent small drinks (i.e., one cup every 15-20 minutes {about 150 ml or 1/4 pint}). The water shall be kept reasonably cool (55-60°F) and shall be placed outside the contaminated areas. Employees shall be encouraged to salt their foods and maintain well-balanced diets. If employees are unacclimatized, a commercially available product such as Gatorade or Exceed may be used for electrolyte replacement.
2. Cooling devices may be used to aid natural body ventilation. These devices, however, add weight, and their use should be balanced against worker efficiency.
3. Long cotton underwear should be worn. It acts as a wick to help absorb moisture and protect the skin from direct contact with heat-absorbing protective clothing.
4. Provide air-conditioned shelter or shaded areas to protect employees during rest periods.
5. Install mobile showers and/or hose-down facilities to reduce body temperature and cool protective clothing.
6. Conduct operations in the early morning or evening.
7. Rotate shifts of workers.
8. Add additional employees to work teams.
9. Mandate work slowdowns.
10. Good hygienic standards must be maintained by frequent change of clothing and daily showering. Clothing should be permitted to dry during rest periods.

11. Employees shall be instructed in hot weather procedures. The training program shall include, as a minimum, instruction in:
 - a. Proper cooling procedures and appropriate first aid treatment.
 - b. Proper clothing practices.
 - c. Proper eating and drinking habits.
 - d. Recognition of impending heat exhaustion.
 - e. Recognition of signs and symptoms of impending heat stroke.
 - f. Safe work practices.

5.4 Heat Stress Monitoring

Specific procedures will be established by the HSC and/or in the site specific HASP. Appendices A and B discuss the use of WBGT values.

5.5 Work-Rest Regimen

A work-rest regimen will be established for field work where personnel may be exposed to environments exceeding 77 degrees Fahrenheit (WBGT) for Level D work and environments exceeding 71 degrees Fahrenheit (WBGT) for Levels C and B work. The American Conference of Governmental Industrial Hygienists' TLV Heat Stress Threshold Limit Values will be used as a guideline.

If any heat stress symptoms are identified by the employee or buddy, the HSC should be notified immediately and all work activity should cease until the situation is corrected.

5.6 Biological Monitoring

Always monitor signs and symptoms of heat-stressed employees. When WBGT-TLV criteria are exceeded or water vapor impermeable clothing is worn, discontinue any environmentally-induced or activity-induced heat stress for a person when:

- Sustained heart rate is greater than 160 beats per minute for those under age 35; 140 beats for 35 years of age and older.
- Deep body temperature is more than 100°F.
- Blood pressure falls more than 40 torr in about 3.5 minutes.
- There are complaints of sudden and severe fatigue, nausea, dizziness, lightheadedness, or fainting.
- There are periods of inexplicable irritability, malaise, or flu-like symptoms.
- Sweating stops and the skin becomes hot and dry.
- Daily urinary sodium ion excretion is less than 50 mmoles.

6.0 REFERENCES

ACGIH TLV Booklet, 1997

7.0 ATTACHMENTS

TABLE 1 — Permissible Heat Exposure Threshold Limit Values

APPENDIX A — Wet-Bulb Globe Temperature Index

APPENDIX B — Manual Measurement of WBGT Factors

TABLE 1
PERMISSIBLE HEAT EXPOSURE THRESHOLD LIMIT VALUES
INTENDED CHANGES LISTED
(values are given in °F WBGT)

Work-Rest Regimen	WORK LOAD		
	Light	Moderate	Heavy
Continuous Work	86	80	77
75% Work 25% Rest, Each Hour	87	82.5	79
50% Work 50% Rest, Each Hour	89	85	82.5
25% Work 75% Rest, Each Hour	89.5	88	86

Water vapor impermeable or thermally insulating clothing, encapsulating suits, and similar convective and evaporative barriers can severely restrict heat loss and produce life-threatening heat strain, even when the ambient air temperature, radiant heat, and humidity are low. Whenever employees wear such restrictive clothing, it is essential that extra caution be exercised. Project managers and supervisors must evaluate heat stress conditions at each job site, taking into account specific job activities, protective clothing being used, and WBGT readings.

APPENDIX A

WET-BULB GLOBE TEMPERATURE INDEX

A baseline work-rest regimen is selected using the WBGT procedure. The WBGT in conjunction with the work load required to perform each task is used to determine work-rest regimen. **Light** work examples include such tasks as sitting or standing to control machines or performing light hand or arm work. **Moderate** work includes walking about in coated coveralls and respirators doing moderate lifting and pushing. **Heavy** work corresponds to pick and shovel-type work or the use of full body protective clothing. *It must be assumed that any activity involving this type of clothing will be considered heavy work.*

In order to determine the WBGT the following equations are used:

- Outdoors with solar load:
$$\text{WBGT} = 0.7 \text{ NWB} + 0.2 \text{ GT} + 0.1 \text{ DB}$$
 - Indoors or outdoors with no solar load:
$$\text{WBGT} = 0.7 \text{ NWB} + 0.3 \text{ GT}$$
- NWB = Natural Wet-Bulb Temperature
DB = Dry-Bulb Temperature
GT = Globe Thermometer Temperature

The factors involved in the above equations can be measured using a direct reading instrument or manually measuring each factor.

- An example of a direct-reading heat stress monitor is the Reuter-Stokes Wibget No. RSS-214 heat stress monitor.
- Measurement of the individual factors requires the following equipment:
 - ~ Dry-bulb thermometer
 - ~ Natural wet-bulb thermometer
 - ~ Globe thermometer
 - ~ Stand

APPENDIX B

MANUAL MEASUREMENT OF WBGT FACTORS

The range of the dry and the natural wet-bulb thermometers shall be -5°C to 50°C with an accuracy of 0.5°C . The dry-bulb thermometer must be shielded from the sun and the other radiant surfaces of the environment without restricting the airflow around the bulb. The wick of the natural wet-bulb thermometer shall be kept wet with distilled water for at least 1/2 hour before the temperature reading is made. It is not enough to immerse the other end of the wick into a reservoir of distilled water and wait until the whole wick becomes wet by capillary action. The wick shall be wetted by direct application of water from a syringe 1/2 hour before each reading. The wick shall extend over the bulb of the thermometer, covering the stem about one additional bulb length. The wick should always be clean and new wicks shall be washed before using.

A globe thermometer, consisting of a 15 cm (6-inch) diameter hollow copper sphere painted on the outside with a matted black finish or equivalent, shall be used. The bulb or sensor of a thermometer (range -5°C to 100°C with an accuracy of 0.5°C) must be fixed in the center of the sphere. The globe thermometer shall be exposed at least 25 minutes before it is read.

A stand shall be used to suspend the three thermometers so that they do not restrict free airflow around the bulbs.

It is permissible to use any other type of temperature sensor that gives a reading identical to that of a mercury thermometer under the same conditions.

The thermometers must be placed so that the readings are representative of the condition where the employees work or rest, respectively. All readings shall be recorded on the site log.

In many cases WBGT is the simplest and most suitable technique to measure heat. However, this system is only valid for light summer clothing. When special personal protective clothing is required for performing a particular job, the worker's heat tolerance is reduced and the permissible heat exposure limits are not applicable because this clothing is heavier, impedes sweat evaporation, and/or has higher insulation value.

APPENDIX D

GUIDANCE ON SITE COMMUNICATIONS

C&S ENGINEERS, INC.
HEALTH & SAFETY GUIDELINE #13
SITE COMMUNICATIONS

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C&S ENGINEERS, INC.
SITE COMMUNICATIONS

1.0 PURPOSE

This guideline contains information and requirements necessary to make sure field activities are conducted with adequate provision for communications among field personnel and to emergency agencies.

2.0 SCOPE

The guideline applies to all field activities conducted by C&S. Additional provisions for communications will be addressed in each Site-Specific Health and Safety Plan (HASP), as needed. Field communications must be provided not only to make sure field personnel can communicate with one another, but also to contact off-site technical and emergency assistance.

3.0 DEFINITIONS

None

4.0 RESPONSIBILITIES

Employees — All employees are responsible for knowing and using the specified communications to make sure field work is safely completed and/or to respond to emergencies.

Health and Safety Coordinator (HSC) — The HSC is responsible for determining the proper methods of communication required at a particular site; for training site personnel in the use of these communications; and for providing and maintaining the communications as specified.

5.0 GUIDELINES

5.1 On-Site Communications

Each person shall be able to communicate with other personnel at all times. This communication may be via sound (air horn), electronic (two-way radio, bullhorn, etc.), or visual means.

A set of hand signals shall be designated and agreed upon by all personnel at each site activity, for use in case electronic communications fail. The site-specific training shall include explanation of the following standard hand signals:

Signal	Meaning
Hand gripping throat	Out of air; can't breath
Grip partner's wrist or place both hands around waist	Leave area immediately
Hands on top of head	Need assistance
Thumbs up	OK; I'm all right; I understand
Thumbs down	No; negative

Whichever communication system is selected as a primary system, a backup system must be provided. For example, hand signals may be used as a backup if radio communications fail. All internal systems should be:

- Clearly understood by all personnel
- Checked and practiced daily
- Intrinsically safe (spark-free)

A special set of emergency signals should be set up. These should be:

- Different from ordinary signals
- Brief and exact
- Limited in number so that they are easily remembered

When designing and practicing communication systems, remember that:

- Background noise on site will interfere with talking and listening
- Wearing personal protective equipment will impede hearing and limit vision (i.e., the ability to recognize hand and body signals)
- Inexperienced radio users may need practice in speaking clearly

5.2 Off-Site Communications

Every field task shall provide for off-site communications to be able to contact local emergency agencies. Acceptable methods include mobile telephone, radio (CB, other) on a frequency monitored by emergency agencies; on-site telephone (portable or land-line); or a phone (booth or private home) within one-mile of the site. Where a private home phone is to be used, personnel shall make sure access to the home is guaranteed by the owner. Explicit directions and a map shall be prominently displayed. Adequate change shall be conveniently provided where a phone booth is specified for off-site communications.

6.0 REFERENCES

None

7.0 ATTACHMENTS

None

APPENDIX E

GUIDANCE ON EXCAVATION/TRENCHING OPERATIONS

C&S ENGINEERS, INC.
HEALTH & SAFETY GUIDELINE NO. 14
EXCAVATION/TRENCHING OPERATIONS

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C&S ENGINEERS, INC.
EXCAVATION/TRENCHING OPERATIONS

1.0 PURPOSE

To establish safe operating procedures for excavation/trenching operations at C&S work sites.

2.0 SCOPE

Applies to all C&S activity where excavation or trenching operations take place.

3.0 DEFINITIONS

Excavation — Any manmade cavity or depression in the earth's surface, including its sides, walls, or faces, formed by earth removal and producing unsupported earth conditions by reasons of the excavation.

Trench — A narrow excavation made below the surface of the ground. In general, the depth is greater than the width, but the width of a trench is not greater than 15 feet.

4.0 RESPONSIBILITY

Employees — All employees must understand and follow the procedures outlined in this guideline during all excavation and trenching operations.

Health and Safety Coordinator (HSC) — The HSC is responsible for ensuring that these procedures are implemented at each work site.

5.0 GUIDELINES

5.1 Hazards Associated With Excavation/Trenching

The principal hazards associated with excavation/trenching are:

- Suffocation, crushing, or other injury from falling material.
- Damage/failure of installed underground services and consequent hazards.
- Tripping, slipping, or falling.
- Possibility of explosive, flammable, toxic, or oxygen-deficient atmosphere in excavation.

5.2 Procedures Prior to Excavation

1. **Underground utilities**

- Determine the presence and location of any underground chemical or utility pipes, electrical, telephone, or instrument wire or cables.
- Identify the location of underground services by stakes or markers.

- De-energize or isolate underground services during excavation. If not possible, or if location is not definite, method of excavation shall be established to minimize hazards by such means as:
 - 1) Use of hand tools in area of underground services.
 - 2) Insulating personnel and equipment from possible electrical contact.
 - 3) Use of tools or equipment that will reduce possibility of damage to underground services and hazard to worker.
- 2. Identify Excavation Area
 - Areas to be excavated shall be identified and segregated by means of barricades, ropes, and/or signs to prevent access of unauthorized personnel and equipment. Suitable means shall be provided to make barriers visible at all times.
- 3. Surface Water
 - Provide means of diverting surface water from excavation.
- 4. Shoring/ Bracing
 - Shoring or bracing that may be required for installed equipment adjacent to the excavation shall be designed by a competent person.
- 5. Structural Ramps
 - Structural ramps that are used solely by employees as a means of access to or egress from the excavation shall be designed by a competent person.

5.3 Procedures For Doing The Excavation

1. **Determine the need for shoring/sloping** — the type of soil will establish the need for shoring, slope of the excavation, support systems, and equipment to be used. The soil condition may change as the excavation proceeds. Appendices A, B, C, D, E, and F of the OSHA Excavation Regulation, 29 CFR 1926 Subpart P (Attachment 1), are to be used in defining shoring and sloping requirements.
2. **Mobile equipment** — For safe use of mobile industrial equipment in or near the excavation, the load carrying capacity of soil shall be established and suitable protection against collapse of soil provided by the use of mats, barricades, restricting the location of equipment, or shoring.
3. Excavated material (spoil) shall be stored at least two (2) feet from the edge of the excavation.
4. All trench (vertical sides) excavations greater than five (5) feet deep shall be shored.

5. Ladders or other means of access to or egress from excavations shall be provided at a maximum spacing of:
 - 1) 100 feet on the perimeter of open excavations, and
 - 2) 25 feet for trench excavations greater than four (4) feet in depth.
6. The excavation shall be inspected daily for changes in conditions, including the presence of ground water, change in soil condition, or effects of weather such as rain or freeze. A safe means of continuing the work shall be established based on changes in condition.
7. Appropriate monitoring for gas, toxic, or flammable materials will be conducted to establish the need for respiratory equipment, ventilation, or other measures required to continue the excavation safely.
8. Adequate means of dewatering the excavation shall be provided as required.
9. A signal person shall be provided to direct powered equipment if working in the excavation with other personnel.
10. A signal person shall be provided when backfilling excavations to direct powered equipment working in the excavation with other personnel.
11. Warning vests will be worn when employees are exposed to public vehicular traffic.
12. Employees shall stand away from vehicles being loaded or unloaded, and shall not be permitted underneath loads handled by lifting or dragging equipment.
13. Emergency rescue equipment, such as breathing apparatus, a safety harness and line, or a basket stretcher, shall be readily available if hazardous atmospheric conditions exist or may be expected to develop. The specifics will be determined by the HSC/HSM.
14. Walkways or bridges with standard guardrail shall be provided where employees or equipment are required or permitted to cross over excavations.

5.4 Entering the Excavation

No C&S Engineers employee shall enter an excavation which fails to meet the requirements of Section 5.3 of this guideline.

6.0 REFERENCES

29 CFR 1926, Subpart P - Excavations

7.0 ATTACHMENTS

29 CFR 1926, Subpart P, Appendices A, B, C, D, E, and F

APPENDIX F

GUIDANCE ON INCIDENT INVESTIGATION AND REPORTING

C&S ENGINEERS, INC.
HEALTH & SAFETY GUIDELINE #2
INCIDENT INVESTIGATION & REPORTING

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C&S ENGINEERS, INC.
INCIDENT INVESTIGATION AND REPORTING

1.0 PURPOSE

To prevent the occurrence or reoccurrence of accidents on C&S Engineers work sites and to establish a procedure for investigation and reporting of incidents occurring in, or related to C&S Engineers' work activities.

2.0 SCOPE

Applies to all incidents related to C&S Engineers' work activities.

3.0 DEFINITIONS

Accident - An undesired event resulting in personal injury and/or property damage, and/or equipment failure.

Fatality - An injury resulting in death of the individual.

Incident - Any occurrence which results in, or could potentially result in, the need for medical care or property damage. Such incidents shall include lost time accidents or illness, medical treatment cases, unplanned exposure to toxic materials or any other significant occurrence resulting in property damage or in "near misses."

Incidence Rate - the number of injuries, illnesses, or lost workdays related to a common exposure base of 100 full-time workers. The rate is calculated as:

$$N/EH \times 200,000$$

N = number of injuries and illnesses or lost workday cases; EH = total hours worked by all associates during calendar year. 200,000 = base for 100 full-time equivalent workers (working 40 hours per week, 50 weeks per year).

Injury - An injury such as a cut, fracture, sprain, amputation, etc. which results from a work accident or from a single instantaneous event in the work environment.

Lost Workday Case - A lost workday case occurs when an injured or ill employee experiences days away from work beginning with the next scheduled work day. Lost workday cases do not occur unless the employee is effected beyond the day of injury or onset of illness.

Recordable Illness - An illness that results from the course of employment and must be entered on the OSHA 200 Log and Summary of Occupational Injuries and Illnesses. These illnesses require medical treatment and evaluation of work related injury. For example, dermatitis, bronchitis, irritation of eyes, nose, and throat can result from work and non-work related incidents.

Recordable Injury - An injury that results from the course of employment must be entered on the OSHA 200 Log and Summary of Occupational Injuries and Illnesses (the "OSHA 200 Log"). These injuries require medical treatment; may involve loss of consciousness; may result in restriction of work or motion or transfer to another job; or result in a fatality.

Near Miss - An incident which, if occurring at a different time or in a different personnel or equipment configuration, would have resulted in an incident.

4.0 RESPONSIBILITIES

Employees - It shall be the responsibility of all C&S Engineers employees to report all incidents as soon as possible to the HSC, regardless of the severity.

Human Resources - Has overall responsibility for maintaining accident/incident reporting and investigations according to current regulations and recording injuries/ illness on the OSHA 200 Log and Summary of Occupational Injuries and Illnesses and posting the OSHA 200 Log.

Health and Safety Coordinator (HSC) - It is the responsibility of the HSC to investigate and prepare an appropriate report of all accidents, illnesses, and incidents occurring on or related to C&S work.. The HSC shall complete Attachment A within 24 hours of the incident occurrence.

Health and Safety Manager (HSM) - It is the responsibility of the HSM to investigate and prepare an appropriate report of all lost time injuries and illnesses and significant incidents occurring on C&S's property or related to C&S. The HSM shall maintain the OSHA 200 Log.

Project Managers (PM) - It shall be the PM's responsibility to promptly correct any deficiencies in personnel, training, actions, or any site or equipment deficiencies that were determined to cause or contribute to the incident investigated.

5.0 GUIDELINES

5.1 Incident Investigation

The HSC will immediately investigate the circumstances surrounding the incident and will make recommendations to prevent reoccurrence. The HSM shall be immediately notified by telephone if a serious accident/incident occurs. The incident shall be evaluated to determine whether it is OSHA recordable. If the incident is determined to be OSHA 200 recordable, it shall be entered on the OSHA 200 Log.

The following minimum information should be gathered in an accident investigation.

- Where and when the accident occurred
- Who and what were involved, operating personnel and witnesses
- How the accident or illness exposure occurred
- List of objects or substances involved
- The nature of the injury or illness and the part(s) of the body affected
- Discussion of the causes, and recommendations for prevention of recurrence.

5.2 Incident Report

The completed incident report must be completed by the HSC within 24 hours of the incident and distributed to the PM, HSM, and Human Resources. This form shall be maintained by Human Resources for at least five years for all OSHA recordable cases. This form serves as an equivalent to the OSHA 101 Supplementary Record of Occupational Injuries and Illnesses.

5.3 Incident Follow-up Report

The Incident Follow-up Report (Attachment B) shall be distributed with the Incident Report within one week of the incident. Delay in filing this report shall be explained in a brief memorandum.

5.4 Reporting of Fatalities or Multiple Hospitalization Accidents

Fatalities or accidents resulting in the hospitalization of five or more employees must be reported to OSHA verbally or in writing within 48 hours. The report must contain: 1) circumstances surrounding the accident(s); 2) the number of fatalities; and 3) the extent of any injuries.

5.5 OSHA 200 Summary Form

Recordable cases must be entered on the log within six workdays of receipt of the information that a recordable case has occurred. The OSHA log must be kept updated to within 45 calendar days.

OSHA 200 forms must be updated during the 5 year retention period, if there is a change in the extent or outcome of an injury or illness which affects an entry on a log. If a change is necessary, the original entry should be lined out and a corrected entry made on that log. New entries should be made for previously unrecorded cases that are discovered or for cases that initially weren't recorded but were found to be recordable after the end of the year. Log totals should also be modified to reflect these changes.

5.5.1 Posting

The log must be summarized at the end of the calendar year and the summary must be posted from February 1 through March 1.

5.6 OSHA 200S

Facilities selected by the Bureau of Labor Statistics (BLS) to participate in surveys of occupational injuries and illnesses will receive the OSHA 200S. The data from the annual summary on the OSHA 200 Log should be transferred to the OSHA 200S, other requested information provided and the form returned as instructed by the BLS.

5.7 Access to OSHA Records

All OSHA records (accident reporting forms and OSHA 200) shall be available for inspection and copying by authorized federal and state government officials.

Employees, former employees, and their representatives must be given access for inspection and copying to only the log, OSHA 200 Log, for the establishment in which the employee currently works or formerly worked.

6.0 REFERENCES

29 CFR Part 1904

7.0 ATTACHMENTS

Attachment A - Incident Investigation Form

Attachment B - Incident Follow-up Report

Attachment C - Establishing Recordability

ATTACHMENT A
INCIDENT INVESTIGATION FORM

Accident investigation should include:

Location

Time of Day

Accident Type

Victim

Nature of Injury

Released Injury

Hazardous Material

Unsafe Acts

Unsafe Conditions

Policies, Decisions

Personal Factors

Environmental Factors

ATTACHMENT B
INCIDENT FOLLOW-UP REPORT

Date _____

Date of Incident: _____

Site: _____

Brief description of incident: _____

Outcome of incident: _____

Physician's recommendations: _____

Date the injured employee returned to work: _____

ATTACH ANY ADDITIONAL INFORMATION TO THIS FORM

ATTACHMENT C

ESTABLISHING RECORDABILITY

1. Deciding whether to record a case and how to classify the case.

Determine whether a fatality, injury, or illness is recordable.

A fatality is recordable if it:

- results from employment

An injury is recordable if it:

- results from employment and
- requires medical treatment beyond first aid, or
- results in restricted work activity, or
- results in a lost workday

An illness is recordable if it:

- results from employment

2. Definition of “Resulting from Employment”

For recordability purposes, “resulting from employment” means the injury or illness results from an event or exposure in the work environment. The work environment is primarily composed of the employer’s premises and other locations where employees are engaged in work-related activities or are present as a condition of their employment.

The employer’s premises include company rest rooms, hallways, and cafeterias. Injuries occurring in these places are generally considered work-related.

The employer’s premises **EXCLUDE** employer-controlled ball fields, tennis courts, golf courses, parks, swimming pools, gyms, and other similar recreational facilities used by employees on a voluntary basis for their own benefit, primarily during off-work hours.

Company parking facilities are generally not considered part of the employer’s premises for OSHA recordkeeping purposes. Therefore, injuries to employee’s occurring on these parking lots are not presumed to be work-related, and are not recordable unless the employee was engaged in some work-related activity when he/she was injured.

Employees who travel on company business are considered to be engaged in work-related activities all the time they spend in the interest of the company. This includes travel to and from customer contacts, and entertaining or being entertained for purposes of promoting or discussing business. Incidents occurring during normal living activities (eating, sleeping, recreation) or if the employee deviates from a reasonably direct route of travel are not considered OSHA recordable.

3. Distinction between Medical Treatment and First Aid.

"First aid" means any one-time treatment, and any follow-up visit for the purpose of observation, of minor scratches, cuts, burns, splinters, etc., which do not ordinarily require medical care. Such one time treatment and follow-up visit for the purpose of observation are considered first aid even though provided by a physician or other licensed professional medical care provider.

Injuries are not minor if:

- a) They must be treated only by a physician or other licensed medical personnel;
- b) They impair bodily function (i.e., normal use of senses, limbs, etc.);
- c) They result in damage to physical structure of a nonsuperficial nature (e.g., fractures); or
- d) They involve complications requiring follow-up medical treatment.