

MATERIAL SAFETY DATA SHEET

Prepared to U.S. OSHA, CMA, ANSI and Canadian WHMIS Standards

PART I *What is the material and what do I need to know in an emergency?*

1. PRODUCT IDENTIFICATION

CHEMICAL NAME; CLASS:

ETHYL CHLORIDE - C₂H₅Cl

Document Number: P-0023

PRODUCT USE:

For general analytical/synthetic chemical uses.

SUPPLIER/MANUFACTURER'S NAME:

MESA Specialty Gases & Equipment

ADDRESS:

3619 Pendleton Avenue, Suite C
Santa Ana, CA 92704

BUSINESS PHONE:

1-714-434-7102

EMERGENCY PHONE:

INFOTRAC: 1-800-535-5053

DATE OF PREPARATION:

May 20, 1996

SECOND REVISION:

January 23, 1998

2. COMPOSITION and INFORMATION ON INGREDIENTS

| CHEMICAL NAME | CAS # | mole % | EXPOSURE LIMITS IN AIR | | | | | |
|--------------------|---------|--------|--|-------------|------------|-------------|---------------------------|--|
| | | | ACGIH | | OSHA | | OTHER | |
| | | | TLV ppm | STEL ppm | PEL ppm | STEL ppm | | IDLH ppm |
| Ethyl Chloride | 75-00-3 | > 99.7 | 100, Skin A3 (Animal Carcinogen) | NE | 1000 | NE | 3800 (Based on LEL) | NIOSH REL (Ethyl Chloride): Handle with caution. Carcinogen: IARC-3 MAK-B |
| Maximum Impurities | | < 0.3 | None of the trace impurities in this mixture contribute significantly to the hazards associated with the product. All hazard information pertinent to this product has been provided in this Material Safety Data Sheet, per the requirements of the OSHA Hazard Communication Standard (29 CFR 1910.1200) and State equivalent standards. | | | | | |

NE = Not Established

C = Ceiling Limit

See Section 16 for Definitions of Terms Used

NOTE: All WHMIS required information is included. It is located in appropriate sections based on the ANSI Z400.1-1993 format.

3. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW: Ethyl Chloride is a colorless, liquefied, flammable gas. Ethyl Chloride has a pungent, ether-like odor and is mildly toxic by inhalation, with a narcotic effect. Inhalation of the gas can cause central nervous system depression. Symptoms of such overexposure can include headache, nausea, dizziness, drowsiness. Inhalation of high concentrations can be fatal. Exposure to the gas may also be irritating to the skin, eyes and mucus membrane irritant. Both the liquid and gas pose a serious fire hazard when accidentally released. The gas is heavier than air, and may spread long distances. Distant ignition and flashback are possible. Ethyl Chloride reacts with water or steam to produce hydrochloric acid, which is toxic and corrosive. Rapid evaporation of liquid from cylinder may cause frostbite. Flame or high temperature impinging on a localized area of the cylinder of Ethyl Chloride can cause the cylinder to rupture without activating the cylinder's relief devices. Provide adequate fire protection during emergency response situations.

SYMPTOMS OF OVEREXPOSURE BY ROUTE OF EXPOSURE:

The most significant routes of overexposure for Ethyl Chloride are by inhalation or skin and eye contact. The symptoms of overexposure to Ethyl Chloride by route of exposure are as follows:

INHALATION: The main effect of inhalation of Ethyl Chloride is central nervous system depression. Symptoms of such overexposure can include drowsiness, headache, dizziness, and loss of coordination. Exposures to large concentrations can lead to unconsciousness and death. The gas can be irritating to the mucous membranes. Specific exposure symptoms, as related to dose of exposure, are as follows:

| Concentrations (ppm) | Effects |
|----------------------|---|
| 13000 | Slight symptoms (e.g., dizziness, headaches). |
| 19000 | Slight loss of feeling in hands, fingers and other appendages. |
| 20000 | Dizziness, slight abdominal cramps after brief exposure. |
| 25000 | Rapid loss of coordination and balance. |
| > 25000 | Brief exposure can lead to serious effects (e.g., painful stomach cramps, headaches, unconsciousness, death). |

Long-term exposure to high levels of Ethyl Chloride may produce the following symptoms: loss of muscle coordination, involuntary eye movements, tremors, speech disturbance, sluggish reflexes and hallucinations. These symptoms are alleviated when the overexposure to this gas is ended.



CONTACT WITH SKIN and EYES: The gas is mildly irritating to the skin and eyes. There is one report of an allergic reaction experienced by an individual after a skin exposure to liquid Ethyl Chloride. Contact with liquid or rapidly expanding gases (which are released under high pressure) may cause frostbite. Symptoms of frostbite include change in skin color to white or grayish-yellow. The pain after such contact can quickly subside.

HEALTH EFFECTS OR RISKS FROM EXPOSURE: An Explanation in **Lay Terms**. Overexposure to Ethyl Chloride may cause the following health effects:

ACUTE: The most significant hazard associated with Ethyl Chloride is inhalation of vapors, which can be mildly toxic, and cause the appearance of drunkenness, staggering, dizziness, nausea and possible hiccups. Contact with liquid or rapidly expanding gases may cause frostbite.

CHRONIC: Long-term exposure to high levels of Ethyl Chloride may produce the following symptoms: loss of muscle coordination, involuntary eye movements, tremors, speech disturbance, sluggish reflexes and hallucinations. These symptoms are alleviated when the overexposure to this gas is ended. IARC classifies Ethyl Chloride as a Group 3 compound (Not Classifiable as to Carcinogenicity in Humans). Refer to Section 11 of this MSDS (Toxicological Information) for further information.

TARGET ORGANS: Central nervous system, respiratory system, skin, eyes, liver and kidneys.

| HAZARDOUS MATERIAL INFORMATION SYSTEM | | | |
|--|---------------|---|---------------|
| HEALTH | | (BLUE) | 2 |
| FLAMMABILITY | | (RED) | 4 |
| REACTIVITY | | (YELLOW) | 0 |
| PROTECTIVE EQUIPMENT | | | C |
| EYES | RESPIRATORY | HANDS | BODY |
|  | See Section 8 |  | See Section 8 |
| For routine industrial applications | | | |

See Section 16 for Definition of Ratings

PART II *What should I do if a hazardous situation occurs?*

4. FIRST-AID MEASURES

RESCUERS SHOULD NOT ATTEMPT TO RETRIEVE VICTIMS OF EXPOSURE TO ETHYL CHLORIDE WITHOUT ADEQUATE PERSONAL PROTECTIVE EQUIPMENT. At a minimum, Self-Contained Breathing Apparatus and Fire-Retardant Personal Protective equipment should be worn. Adequate fire protection must be provided during rescue situations.

Remove victim(s) to fresh air, as quickly as possible. Trained personnel should administer supplemental oxygen and/or cardio-pulmonary resuscitation, if necessary. Only trained personnel should administer supplemental oxygen.

In case of frostbite, place the frostbitten part in warm water. **DO NOT USE HOT WATER.** If warm water is not available, or is impractical to use, wrap the affected parts gently in blankets. Alternatively, if the fingers or hands are frostbitten, place the affected area in the armpit. Encourage victim to gently exercise the affected part while being warmed. Seek immediate medical attention.

SKIN EXPOSURE: If liquid is spilled on skin, or if irritation of the skin develops after exposure to liquid or gas, immediately begin decontamination with running water. Minimum flushing is for 15 minutes. Remove exposed or contaminated clothing, taking care not to contaminate eyes. Victim must seek immediate medical attention.

EYE EXPOSURE: If liquid is splashed into eyes, or if irritation of the eye develops after exposure to liquid or gas, open victim's eyes while under gentle running water. Use sufficient force to open eyelids. Have victim "roll" eyes. Minimum flushing is for 15 minutes.

Victim(s) must be taken for medical attention. Rescuers should be taken for medical attention, if necessary. Take copy of label and MSDS to physician or other health professional with victim(s).

5. FIRE-FIGHTING MEASURES

FLASH POINT (method): -50°C (-58°F)

AUTOIGNITION TEMPERATURE: 519°C (966°F)

FLAMMABLE LIMITS (in air by volume, %):

Lower (LEL): 3.8%

Upper (UEL): 15.4%

FIRE EXTINGUISHING MATERIALS: Extinguish Ethyl Chloride fires by shutting-off the source of the gas. Use water spray to cool fire-exposed containers, structures, and equipment. Use water spray, carbon dioxide or dry chemicals as extinguishing media.

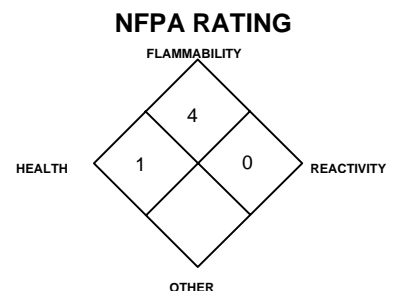
UNUSUAL FIRE AND EXPLOSION HAZARDS: Flammable gas. Very dangerous fire hazard when exposed to heat, flame or powerful oxidizers. Both the liquid and gas pose a serious fire hazard when accidentally released. Ethyl Chloride liquid is lighter than water and the gas is heavier than air, either may hug the ground and travel a considerable distance to a source if ignition and flash back to a leak or open container. Distant ignition and flashback are possible. Explosion hazard in confined spaces. During a fire, toxic gases (e.g., hydrogen chloride, chlorine, and phosgene) may be produced. Water spray should be used with care. Ethyl Chloride can be hydrolyzed, and will form hydrochloric acid.

DANGER! Fires impinging (direct flame) on the outside surface of unprotected pressure storage vessels of Ethyl Chloride can be very dangerous. Direct flame exposure on the cylinder wall can cause an explosion either by BLEVE (Boiling Liquid Expanding Vapor Explosion), or by exothermic decomposition. This is a catastrophic failure of the vessel releasing the contents into a massive fireball and explosion. The resulting fire and explosion can result in severe equipment damage and personnel injury or death over a large area around the vessel. For massive fires in large areas, use unmanned hose holder or monitor nozzles; if this is not possible, withdraw from area and allow fire to burn.

Explosion Sensitivity to Mechanical Impact: Not sensitive.

Explosion Sensitivity to Static Discharge: Static discharge may cause Ethyl Chloride to ignite explosively.

SPECIAL FIRE-FIGHTING PROCEDURES: Structural firefighters must wear Self-Contained Breathing Apparatus and full protective equipment. The best fire-fighting technique may be simply to let the burning gas escape from the pressurized cylinder, tank car, or pipeline. Stop the leak before extinguishing fire. If the fire is extinguished before the leak is sealed, the still-leaking gas could explosively re-ignite without warning and cause extensive damage, injury, or fatality. In this case, increase ventilation (in enclosed areas) to prevent flammable or explosive mixture formation.



See Section 16 for Definition of Ratings

5. FIRE-FIGHTING MEASURES (Continued)

SPECIAL FIRE-FIGHTING PROCEDURES (continued): Because of the potential for a BLEVE, evacuation of non-emergency personnel is essential. If water is not available for cooling or protection of vessel exposures, evacuate the area. Ethyl Chloride reacts with water to form Hydrochloric Acid.

6. ACCIDENTAL RELEASE MEASURES

SPILL AND LEAK RESPONSE: Uncontrolled releases should be responded to by trained personnel using pre-planned procedures. Proper protective equipment should be used. In case of a release, clear the affected area, protect people, and respond with trained personnel. Adequate fire protection must be provided.

Minimum Personal Protective Equipment should be **Level B: fire-retardant protective clothing, mechanically-resistant gloves and Self-Contained Breathing Apparatus**. Use only non-sparking tools and equipment. Locate and seal the source of the leaking gas. Protect personnel attempting the shut-off with water-spray. Allow the gas to dissipate. Monitor the surrounding area for combustible gas levels and oxygen. Combustible gas concentration must be below 10% of the LEL (LEL = 3.8%) prior to entry. A colorimetric tube is also available for Ethyl Chloride. If a colorimetric tube is used to indicate the concentration of Ethyl Chloride, the reading obtained should be lower than the limits indicated in Section 2 (Composition and Information on Ingredients) before non-emergency personnel are allowed to enter area. The atmosphere must have at least 19.5 percent oxygen before personnel can be allowed in the area without Self-Contained Breathing Apparatus.

Attempt to close the main source valve prior to entering the area. If this does not stop the release (or if it is not possible to reach the valve), allow the gas to release in-place or remove it to a safe area and allow the gas to be released there.

THIS IS AN EXTREMELY FLAMMABLE GAS. Protection of all personnel and the area must be maintained.

PART III *How can I prevent hazardous situations from occurring?*

7. HANDLING and STORAGE

WORK PRACTICES AND HYGIENE PRACTICES: As with all chemicals, avoid getting Ethyl Chloride IN YOU. Do not eat or drink while handling chemicals. Be aware of any signs of effects of Ethyl Chloride exposure indicated in Section 3 (Hazard Identification); exposures to fatal concentrations of Ethyl Chloride could occur rapidly.

STORAGE AND HANDLING PRACTICES: Protect against physical damage. Outside or detached storage is preferable. Cylinders should be stored in dry, well-ventilated areas away from sources of heat. Compressed gases can present significant safety hazards. Store containers away from heavily trafficked areas and emergency exits. Store away from oxidizers, corrosives and other incompatibles such as chemically active metals (e.g., sodium, potassium, calcium, powdered aluminum, zinc), water or steam. Post "No Smoking or Open Flames" signs in storage or use areas.

SPECIAL PRECAUTIONS FOR HANDLING GAS CYLINDERS: Protect cylinders against physical damage. Store in cool, dry, well-ventilated area, away from sources of heat, ignition and direct sunlight. Do not allow area where cylinders are stored to exceed 52°C (125°F). Use a check valve or trap in the discharge line to prevent hazardous backflow. Cylinders should be stored upright and be firmly secured to prevent falling or being knocked over. Cylinders can be stored in the open, but in such cases, should be protected against extremes of weather and from the dampness of the ground to prevent rusting. Never tamper with pressure relief devices in valves and cylinders. Electrical equipment should be non-sparking or explosion proof. The following rules are applicable to work situations in which cylinders are being used.

Before Use: Move cylinders with a suitable hand-truck. Do not drag, slide or roll cylinders. Do not drop cylinders or permit them to strike each other. Secure cylinders firmly. Leave the valve protection cap in-place (where provided) until cylinder is ready for use.

During Use: Use designated CGA fittings and other support equipment. Do not use adapters. Do not heat cylinder by any means to increase the discharge rate of the product from the cylinder. Use check valve or trap in discharge line to prevent hazardous backflow into the cylinder. Do not use oils or grease on gas-handling fittings or equipment.

After Use: Close main cylinder valve. Replace valve protection cap (where provided). Mark empty cylinders "EMPTY".

NOTE: Use only DOT or ASME code containers. Earth-ground and bond all lines and equipment associated with Ethyl Chloride. Close valve after each use and when empty. Cylinders must not be recharged except by or with the consent of owner. For additional information refer to the Compressed Gas Association Pamphlet P-1, *Safe Handling of Compressed Gases in Containers*. Additionally, refer to CGA Bulletin SB-2 "Oxygen Deficient Atmospheres".

PROTECTIVE PRACTICES DURING MAINTENANCE OF CONTAMINATED EQUIPMENT: Follow practices indicated in Section 6 (Accidental Release Measures). Make certain application equipment is locked and tagged-out safely. Purge gas handling equipment with inert gas (e.g., nitrogen) before attempting repairs. Always use product in areas where adequate ventilation is provided.

8. EXPOSURE CONTROLS - PERSONAL PROTECTION

VENTILATION AND ENGINEERING CONTROLS: Use with adequate ventilation. Local exhaust ventilation is preferred, because it prevents Ethyl Chloride dispersion into the work place by eliminating it at its source. If appropriate, install automatic monitoring equipment to detect the presence of potentially explosive air-gas mixtures and the level of oxygen.

RESPIRATORY PROTECTION: Maintain oxygen levels above 19.5% in the workplace. Use supplied air respiratory protection if oxygen levels are below 19.5% or during emergency response to a release of Ethyl Chloride. If respiratory protection is required, follow the requirements of the Federal OSHA Respiratory Protection Standard (29 CFR 1910.134), or equivalent State standards. The following NIOSH respiratory protection recommendations are for Ethyl Chloride.

CONCENTRATION

Up to 3,800 ppm:

Supplied Air Respirator (SAR) or Self-Contained Breathing Apparatus (SCBA).

Emergency or Planned Entry into Unknown Concentration or IDLH Conditions: a SCBA or positive pressure, full-faced SAR with an auxiliary SCBA.

Escape:

Gas mask with organic vapor canister; or escape-type SCBA.

The IDLH concentration for Ethyl Chloride is 3800 ppm (10% of the LEL).

EYE PROTECTION: Splash goggles or safety glasses, for protection from rapidly expanding gases and contact with liquid.

HAND PROTECTION: Wear mechanically-resistant, chemically compatible gloves when handling cylinders of Ethyl Chloride. Viton or neoprene gloves are recommended for operations in which exposure to liquid may occur.

BODY PROTECTION: Use body protection appropriate for task. An apron or coveralls may be necessary if splashes of liquid may be anticipated. Transfer of large quantities under pressure may require protective equipment appropriate to protect employees from gas spraying, as well as fire-retardant items.

9. PHYSICAL and CHEMICAL PROPERTIES

VAPOR DENSITY: 2.642 kg/m³ (0.1649 lb/ft³)

pH: Not applicable.

SPECIFIC GRAVITY (air = 1): 2.23

FREEZING POINT: -136.3°C (-213.5°F)

SOLUBILITY IN WATER: (slightly) 0.06%

BOILING POINT @ 1 atm: 12.3°C (54.1°F)

EVAPORATION RATE (nBuAc = 1): Not applicable.

EXPANSION RATIO: Not applicable

ODOR THRESHOLD: 4.2 ppm

VAPOR PRESSURE (psia): 20.0

COEFFICIENT WATER/OIL DISTRIBUTION: Log K_{ow} = 1.43

SPECIFIC VOLUME (ft³/lb): 6.0

APPEARANCE AND COLOR: Colorless gas at room temperature, or colorless liquid under pressure. Ethyl Chloride has an ethereal odor.

HOW TO DETECT THIS SUBSTANCE (warning properties): The Odor Threshold for Ethyl Chloride is 10 times below the Threshold Limit Value; therefore, the odor can be a good warning indication that a release of Ethyl Chloride is occurring. In terms of leak detection, fittings and joints can be painted with a soap solution to detect leaks, which will be indicated by a bubble formation.

10. STABILITY and REACTIVITY

STABILITY: Normally stable in air. In the presence of moisture, it hydrolyzes slowly forming hydrochloric acid

DECOMPOSITION PRODUCTS: Carbon monoxide, carbon dioxide, hydrogen chloride gas and phosgene gas.

MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: Ethyl Chloride reacts violently with alkali metals (e.g., potassium, sodium), and powdered metals (e.g., aluminum, zinc, magnesium). Ethyl Chloride also poses an explosion or fire risk in the presence of strong oxidizers.

HAZARDOUS POLYMERIZATION: Not expected to occur.

CONDITIONS TO AVOID: Contact with incompatible materials and exposure to heat, sparks and other sources of ignition. Cylinders exposed to high temperatures or direct flame can rupture or burst.

PART IV *Is there any other useful information about this material?*

11. TOXICOLOGICAL INFORMATION

TOXICITY DATA: The information on the following page is for Ethyl Chloride:

11. TOXICOLOGICAL INFORMATION (Continued)

TOXICITY DATA (continued):

LC₅₀ (inhalation, rat) = 160g/m³/2 hours
LC₅₀ (inhalation, mouse) = 146g/m³/6 hours
LCLo (inhalation, dog) = 14661 ppm/6 hours

LCLo (inhalation, guinea pig) = 40,000 ppm/45M
TCLo (inhalation, rat) = 15,000 ppm/6 hours/2 years-intermittent, equivocal tumorigenic agent

TCLo (inhalation, mouse) = 15,000 ppm/6 hours/2 years-intermittent, carcinogenic effect

EYE IRRITATION: Rabbits exposed to liquid Ethyl Chloride exhibited damage due to chemical or solvent action and not to temperature lowering.

ACUTE INHALATION EFFECTS: In short-term animal studies, Ethyl Chloride produced central nervous system effects (drowsiness, narcosis, coma) at high concentrations. Exposure of guinea pigs to 10000 ppm (1%) for 810 minutes caused no obvious effects. Exposure to 20000 ppm (2%) caused slight to moderate unsteadiness after 25 minutes and slight sluggishness after exposure for 540 minutes. Guinea pigs exposed to concentrations of approximately 40000-50000 ppm (4-5%) became dizzy within 3 minutes, and were unable to stand after exposure for 40 minutes; some of the guinea pigs died after 540 minutes at 40000 ppm. Concentrations exceeding 100000 ppm produced loss of balance in a minute, unconsciousness in 5 minutes, and death in less than one hour. Recovery appeared to be rapid and complete in animals which survived the exposures. Animals which died showed lung, liver, kidney and intestinal injury. Similar effects have been reported in other studies.

CHRONIC INHALATION EFFECTS: Rats exposed to 14 mg/L for 2 hours a day for 60 days showed changes in body weight, minor changes in blood cells, and functional changes in nervous system and liver. The effects were reversible. In another study, rats were exposed to .57 mg/L for 4 hours a day 6 days a week, for 6 months. In general the animals appeared healthy but exposed animals did not gain weight normally and functional changes in the nervous system and liver were detected.

SUSPECTED CANCER AGENT: Ethyl Chloride is not found on the following lists: FEDERAL OSHA Z LIST, NTP, CAL/OSHA and therefore is not considered to be, nor suspected to be a cancer-causing agent by these agencies. Other agencies list this compound as follows:

Ethyl Chloride: IARC Group 3 Compound (Not Classifiable as to Human Carcinogenicity). Additional information obtained during clinical studies involving test animals exposed to Ethyl Chloride. A carcinogenic effect has been seen in rats and mice exposed by inhalation for 2 years to 15000 ppm. An increase in skin tumors was seen in exposed male rats and an unusual type of brain tumor in exposed female rats. In female mice there was a significant increase in uterine tumors, and there was also an increase in liver tumors.

IRRITANCY OF PRODUCT: Ethyl Chloride is mildly irritating; also, contact with rapidly expanding gases can cause frostbite to exposed tissue.

SENSITIZATION TO THE PRODUCT: Ethyl Chloride may cause allergic reactions after skin contact with the liquid.

REPRODUCTIVE TOXICITY INFORMATION: Listed below is information concerning the effects of Ethyl Chloride on the human reproductive system.

Mutagenicity: No human mutagenicity effects have been described for Ethyl Chloride. In terms of Ethyl Chloride exposures during clinical studies involving test animals, the following results were observed: Negative results in a micro nucleus test with mice exposed by inhalation to 15000 ppm; negative results in a cell transformation test; positive results in a bacterial test.

Embryotoxicity: No human embryotoxic effects have been described for Ethyl Chloride. Refer to following paragraph for additional information.

Teratogenicity: No human teratogenicity effects have been described for Ethyl Chloride. In terms of Ethyl Chloride exposures during clinical studies involving test animals, the following results were observed: No significant effects seen when pregnant mice were exposed to 5000 ppm for 6 hr./day, during days 6-15 of pregnancy.

Reproductive Toxicity: No human reproductive toxicity effects have been described for Ethyl Chloride. In terms of Ethyl Chloride exposures during clinical studies involving test animals, the following results were observed: Sperm motility was impaired in rats exposed by inhalation to 23 or 216 ppm. Motility returned to normal once exposure stopped.

*A **mutagen** is a chemical which causes permanent changes to genetic material (DNA) such that the changes will propagate through generation lines. An **embryotoxin** is a chemical which causes damage to a developing embryo (i.e. within the first eight weeks of pregnancy in humans), but the damage does not propagate across generational lines. A **teratogen** is a chemical which causes damage to a developing fetus, but the damage does not propagate across generational lines. A **reproductive toxin** is any substance which interferes in any way with the reproductive process.*

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Conditions relating to the target organs may be aggravated by overexposures to Ethyl Chloride. See Section 3 (Hazard Identification) for information on these conditions.

RECOMMENDATIONS TO PHYSICIANS: Administer oxygen, if necessary. Treat symptoms and eliminate exposure.

BIOLOGICAL EXPOSURE INDICES (BEIs): Currently, Biological Exposure Indices (BEIs) are not applicable for Ethyl Chloride.

12. ECOLOGICAL INFORMATION

ENVIRONMENTAL STABILITY: This gas will be dissipated rapidly in well-ventilated areas. Additional environmental data are available for Ethyl Chloride, as follows:

ETHYL CHLORIDE: Log K_{ow} = 1.43. Water Solubility = 0.574g/100 ml water ppm at 20°C. Biodegradation: May be potentially biodegradable (53-91% degradation in 28 days of incubation). Bioconcentration: none. The experimental half-life of volatilization of chloroethane from water at 1 mg/mL = 21 minutes at 25°C. Estimated hydrolysis half-life = 40 days (pH 7, 25°C).

EFFECT OF MATERIAL ON PLANTS or ANIMALS: Ethyl Chloride has suspected toxic effects with long term exposure to: central nervous system depression, liver and kidney. No information currently available concerning adverse effects expected to occur to plant life, except for frost produced in the presence of rapidly expanding gases.

EFFECT OF CHEMICAL ON AQUATIC LIFE: No evidence is currently available on the effects of Ethyl Chloride on aquatic life.

13. DISPOSAL CONSIDERATIONS

PREPARING WASTES FOR DISPOSAL: Waste disposal must be in accordance with appropriate Federal, State, and local regulations. Return cylinders with any residual product to MESA Specialty Gases & Equipment. Do not dispose of locally.

14. TRANSPORTATION INFORMATION

THIS MATERIAL IS HAZARDOUS AS DEFINED BY 49 CFR 172.101 BY THE U.S. DEPARTMENT OF TRANSPORTATION.

PROPER SHIPPING NAME: Ethyl chloride
HAZARD CLASS NUMBER and DESCRIPTION: 2.1 (Flammable Gas)
UN IDENTIFICATION NUMBER: UN 1037
PACKING GROUP: Not Applicable
DOT LABEL(S) REQUIRED: FLAMMABLE GAS

NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (1996): 115

MARINE POLLUTANT: Ethyl Chloride is not classified by the DOT as a Marine Pollutant (as defined by 49 CFR 172.101, Appendix B).

TRANSPORT CANADA TRANSPORTATION OF DANGEROUS GOODS REGULATIONS: THIS MATERIAL IS CONSIDERED AS DANGEROUS GOODS. Use the above information for the preparation of Canadian Shipments.

15. REGULATORY INFORMATION

U.S. SARA REPORTING REQUIREMENTS: Ethyl Chloride is subject to the reporting requirements of Sections 302, 304, and 313 of Title III of the Superfund Amendments and Reauthorization Act, as follows:

| COMPONENT | SARA 302 (40 CFR 355, Appendix A) | SARA 304 (40 CFR Table 302.4) | SARA 313 (40 CFR 372.65) |
|----------------|--------------------------------------|----------------------------------|-----------------------------|
| Ethyl Chloride | NO | YES | YES |

U.S. SARA THRESHOLD PLANNING QUANTITY: Not applicable.

U.S. CERCLA REPORTABLE QUANTITY (RQ): Ethyl Chloride = 100 lbs.

CANADIAN DSL/NDSL INVENTORY STATUS: Ethyl Chloride is on the DSL Inventory.

U.S. TSCA INVENTORY STATUS: Ethyl Chloride is listed on the TSCA Inventory.

OTHER U.S. FEDERAL REGULATIONS: Ethyl Chloride is subject to the reporting requirements of Section 112(r) of the Clean Air Act. The Threshold Quantity for this gas is 10,000 lb. Compliance with the OSHA Process Safety Standard (29 CFR 1910.119) may be applicable to operations involving the use of Ethyl Chloride. Under this regulation Ethyl Chloride is not listed in Appendix A; however, any process that involves a flammable gas on-site, in one location, in quantities of 10,000 lb (4,553 kg) or greater is covered under this regulation unless it is used as a fuel.

15. REGULATORY INFORMATION (Continued)

U.S. STATE REGULATORY INFORMATION: Ethyl Chloride is covered under specific State regulations, as denoted below:

Alaska - Designated Toxic and Hazardous Substances: Ethyl Chloride.

California - Permissible Exposure Limits for Chemical Contaminants: Ethyl Chloride.

Florida - Substance List: Ethyl Chloride.

Illinois - Toxic Substance List: Ethyl Chloride.

Kansas - Section 302/313 List: No.

Massachusetts - Substance List: Ethyl Chloride.

Michigan Critical Materials Register: Ethyl Chloride.

Minnesota - List of Hazardous Substances: Ethyl Chloride.

Missouri - Employer Information/Toxic Substance List: Ethyl Chloride.

New Jersey - Right to Know Hazardous Substance List: Ethyl Chloride.

North Dakota - List of Hazardous Chemicals, Reportable Quantities: No.

Pennsylvania - Hazardous Substance List: No.

Rhode Island - Hazardous Substance List: Ethyl Chloride.

Texas - Hazardous Substance List: Ethyl Chloride.

West Virginia - Hazardous Substance List: Ethyl Chloride.

Wisconsin - Toxic and Hazardous Substances: Ethyl Chloride.

CALIFORNIA SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT (PROPOSITION 65): Ethyl Chloride is on the California Proposition 65 lists. **WARNING:** This product contains a chemical known to the State of California to cause cancer.

LABELING:

DANGER:

FLAMMABLE LIQUID AND GAS UNDER PRESSURE.
CAN FORM EXPLOSIVE MIXTURES WITH AIR.
MAY CAUSE ANESTHETIC EFFECTS.
MAY CAUSE IRRITATION TO SKIN, EYES, AND MUCOUS MEMBRANES.
MAY CAUSE LIVER AND KIDNEY DAMAGE.

Avoid breathing gas.

Keep away from heat, flames, and sparks.

Store and use with adequate ventilation.

Avoid contact with eyes.

Cylinder temperature should not exceed 52°C (125°F).

Close valve after each use and when empty.

Use in accordance with the Material Safety Data Sheet.

NOTE:

Suck-back into cylinder may cause rupture.

Always use a back flow preventative device in piping.

FIRST-AID:

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

IN CASE OF CONTACT WITH EYES, immediately flush eyes with plenty of water for at least 15 minutes. Call a physician.

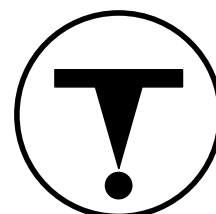
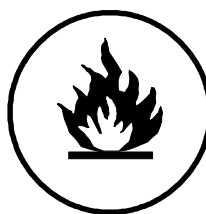
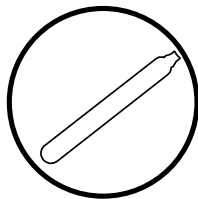
DO NOT REMOVE THIS PRODUCT LABEL

CANADIAN WHMIS SYMBOLS:

Class A: Compressed Gas

Class B1: Flammable Gas

Class D2B: Other Toxic Effects



16. OTHER INFORMATION

The information contained herein is based on data considered accurate. However, no warranty is expressed or implied regarding the accuracy of these data or the results to be obtained from the use thereof. MESA Specialty Gases & Equipment. assumes no responsibility for injury to the vendee or third persons proximately caused by the material if reasonable safety procedures are not adhered to as stipulated in the data sheet. Additionally, MESA Specialty Gases & Equipment .assumes no responsibility for injury to vendee or third persons proximately caused by abnormal use of the material even if reasonable safety procedures are followed. Furthermore, vendee assumes the risk in his use of the material.

DEFINITIONS OF TERMS

A large number of abbreviations and acronyms appear on a MSDS. Some of these which are commonly used include the following:

CAS #: This is the Chemical Abstract Service Number which uniquely identifies each constituent. It is used for computer-related searching.

EXPOSURE LIMITS IN AIR:

ACGIH - American Conference of Governmental Industrial Hygienists, a professional association which establishes exposure limits. **TLV** - Threshold Limit Value - an airborne concentration of a substance which represents conditions under which it is generally believed that nearly all workers may be repeatedly exposed without adverse effect. The duration must be considered, including the 8-hour Time Weighted Average (**TWA**), the 15-minute Short Term Exposure Limit, and the instantaneous Ceiling level (**C**). Skin absorption effects must also be considered.

OSHA - U.S. Occupational Safety and Health Administration. **PEL** - Permissible Exposure Limit - This exposure value means exactly the same as a TLV, except that it is enforceable by OSHA. The OSHA Permissible Exposure Limits are based in the 1989 PELs and the June, 1993 Air Contaminants Rule (Federal Register: 58: 35338-35351 and 58: 40191). Both the current PELs and the vacated PELs are indicated. The phrase, "Vacated 1989 PEL," is placed next to the PEL which was vacated by Court Order.

IDLH - Immediately Dangerous to Life and Health - This level represents a concentration from which one can escape within 30-minutes without suffering escape-preventing or permanent injury. **The DFG - MAK** is the Republic of Germany's Maximum Exposure Level, similar to the U.S. PEL. **NIOSH** is the National Institute of Occupational Safety and Health, which is the research arm of the U.S. Occupational Safety and Health Administration (**OSHA**). NIOSH issues exposure guidelines called Recommended Exposure Levels (**RELs**). When no exposure guidelines are established, an entry of **NE** is made for reference.

HAZARD RATINGS:

HAZARDOUS MATERIALS IDENTIFICATION SYSTEM: Health Hazard: **0** (minimal acute or chronic exposure hazard); **1** (slight acute or chronic exposure hazard); **2** (moderate acute or significant chronic exposure hazard); **3** (severe acute exposure hazard; onetime overexposure can result in permanent injury and may be fatal); **4** (extreme acute exposure hazard; onetime overexposure can be fatal). Flammability Hazard: **0** (minimal hazard); **1** (materials that require substantial pre-heating before burning); **2** (combustible liquid or solids; liquids with a flash point of 38-93°C [100-200°F]); **3** (Class IB and IC flammable liquids with flash points below 38°C [100°F]); **4** (Class IA flammable liquids with flash points below 23°C [73°F] and boiling points below 38°C [100°F]). Reactivity Hazard: **0** (normally stable); **1** (material that can become unstable at elevated temperatures or which can react slightly with water); **2** (materials that are unstable but do not detonate or which can react violently with water); **3** (materials that can detonate when initiated or which can react explosively with water); **4** (materials that can detonate at normal temperatures or pressures).

NATIONAL FIRE PROTECTION ASSOCIATION: Health Hazard: **0** (material that on exposure under fire conditions would offer no hazard beyond that of ordinary combustible materials); **1** (materials that on exposure under fire conditions could cause irritation or minor residual injury); **2** (materials that on intense or continued exposure under fire conditions could cause temporary incapacitation or possible residual injury); **3** (materials that can on short exposure could cause serious temporary or residual injury); **4** (materials that under very short exposure causes death or major residual injury). Flammability Hazard and Reactivity Hazard: Refer to definitions for "Hazardous Materials Identification System".

FLAMMABILITY LIMITS IN AIR:

Much of the information related to fire and explosion is derived from the National Fire Protection Association (**NFPA**). Flash Point - Minimum temperature at which a liquid gives off sufficient vapors to form an ignitable mixture with air. Autoignition Temperature: The minimum temperature required to initiate combustion in air with no other source of ignition. **LEL** - the lowest percent of vapor in air, by volume, that will explode or ignite in the presence of an ignition source. **UEL** - the highest percent of vapor in air, by volume, that will explode or ignite in the presence of an ignition source.

TOXICOLOGICAL INFORMATION:

Possible health hazards as derived from human data, animal studies, or from the results of studies with similar compounds are presented. Definitions of some terms used in this section are: **LD₅₀** - Lethal Dose (solids & liquids) which kills 50% of the exposed animals; **LC₅₀** - Lethal Concentration (gases) which kills 50% of the exposed animals; **ppm** concentration expressed in parts of material per million parts of air or water; **mg/m³** concentration expressed in weight of substance per volume of air; **mg/kg** quantity of material, by weight, administered to a test subject, based on their body weight in kg. Data from several sources are used to evaluate the cancer-causing potential of the material. The sources are: **IARC** - the International Agency for Research on Cancer; **NTP** - the National Toxicology Program, **RTECS** - the Registry of Toxic Effects of Chemical Substances, **OSHA** and **CAL/OSHA**. IARC and NTP rate chemicals on a scale of decreasing potential to cause human cancer with rankings from 1 to 4. Subrankings (2A, 2B, etc.) are also used. Other measures of toxicity include **TDLo**, the lowest dose to cause a symptom and **TCLo** the lowest concentration to cause a symptom; **TD₀₁**, **LDLo**, and **LD₀₁**, or **TC**, **TC₀₁**, **LCLo**, and **LCo**, the lowest dose (or concentration) to cause lethal or toxic effects. **BEI** - Biological Exposure Indices, represent the levels of determinants which are most likely to be observed in specimens collected from a healthy worker who has been exposed to chemicals to the same extent as a worker with inhalation exposure to the TLV. Ecological Information: EC is the effect concentration in water.

REGULATORY INFORMATION:

This section explains the impact of various laws and regulations on the material. **EPA** is the U.S. Environmental Protection Agency. **WHMIS** is the Canadian Workplace Hazardous Materials Information System. **DOT** and **TC** are the U.S. Department of Transportation and the Transport Canada, respectively. Superfund Amendments and Reauthorization Act (**SARA**); the Canadian Domestic/Non-Domestic Substances List (**DSL/NDL**); the U.S. Toxic Substance Control Act (**TSCA**); Marine Pollutant status according to the **DOT**; the Comprehensive Environmental Response, Compensation, and Liability Act (**CERCLA** or **Superfund**); and various state regulations.