# Praxair Material Safety Data Sheet

## 1. Chemical Product and Company Identification

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|---|---|
| **Product Name:** Ethylene oxide and carbon dioxide mixtures *with more than 9% but not more than 87% ethylene oxide* (MSDS No. P-4705-J) | **Trade Name:** 10% Ethylene Oxide and Carbon Dioxide Sterilizing Gas |
| **Chemical Name:** Mixture of ethylene oxide and carbon dioxide | **Synonyms:** Fumigant-sterilant mixture |
| **Formula:** Mixture of $CH_2CH_2O$ and $CO_2$ | **Chemical Family:** Not applicable |

**Telephone:** **Emergencies:** 1-800-645-4633*
**CHEMTREC:** 1-800-424-9300*
**Routine:** 1-800-PRAXAIR

**Company Name:** Praxair, Inc.
39 Old Ridgebury Road
Danbury, CT 06810-5113

** Call emergency numbers 24 hours a day only for spills, leaks, fire, exposure, or accidents involving this product. For routine information, contact your supplier, Praxair sales representative, or call 1-800-PRAXAIR (1-800-772-9247).*

## 2. Composition/Information on Ingredients

**See section 16 for important information about mixtures.**

| INGREDIENT | CAS NUMBER | CONCENTRATION | OSHA PEL | ACGIH TLV-TWA (2004) |
|---|---|---|---|---|
| Ethylene Oxide | 75-21-8 | 10% | 1 ppm* | 1 ppm |
| Carbon Dioxide | 124-38-9 | 90% | 5,000 ppm | 5,000 ppm* |

** See section 3.*

## 3. Hazards Identification

**EMERGENCY OVERVIEW**

**DANGER! Cancer hazard and reproductive hazard.**
**Flammable liquid and gas under pressure.**
**May form explosive mixtures with air.**
**Harmful or fatal if inhaled.**
**Can cause rapid suffocation.**
**Can cause eye, skin, and respiratory system damage. May cause frostbite.**
**Can increase respiration and heart rate.**
**May cause nervous system damage.**
**May cause dizziness and drowsiness.**
**Self-contained breathing apparatus must be worn by rescue workers.**
**Odor: Nonresidual, ether-like in high concentrations.**

**THRESHOLD LIMIT VALUE:** TLV-TWA, ethylene oxide, 1 ppm (ACGIH, 2004); 0.5 ppm OSHA Action Level; 5 ppm, 15 min, OSHA Excursion Limit. TLV-TWA, carbon dioxide, 5,000 ppm (ACGIH, 2004); Short Term Exposure Limit (STEL), 15 min, 30,000 ppm. TLV-TWAs should be used as a guide in the control of health hazards and not as fine lines between safe and dangerous concentrations.





*Revised*

**EFFECTS OF A SINGLE (ACUTE) OVEREXPOSURE:**

**INHALATION**–Asphyxiant, with effects due to lack of oxygen. Moderate concentrations may cause headache, drowsiness, dizziness, stinging of the nose and throat, excitation, rapid breathing and heart rate, excess salivation, vomiting, and unconsciousness. Lack of oxygen can kill. Carbon dioxide is also physiologically active, affecting circulation and breathing.

Ethylene oxide irritates the respiratory tract. Depending on the degree of exposure, there may be coughing, chest tightness, nausea, diarrhea, light headed feeling, weakness, cyanosis, loss of coordination, convulsions, and coma. May cause lung injury and the delayed onset of pulmonary edema. May be fatal if inhaled in high concentrations.

**SKIN CONTACT**–Contact with the liquid or with water solutions may produce a local erythema, edema, and formation of vesicles. These signs may not appear for several hours. Liquid may cause frostbite, a freezing injury resembling a burn.

**SWALLOWING**–A highly unlikely route of exposure. Will cause severe irritation and ulceration of the mouth and throat, abdominal pain, nausea, vomiting, collapse, and coma. Frostbite of the lips and mouth may result from contact with the liquid.

**EYE CONTACT**–Liquid may cause frostbite and severe irritation with corneal injury. High concentrations of vapor may cause moderate irritation.

**EFFECTS OF REPEATED (CHRONIC) OVEREXPOSURE:**

**DANGER: Failure to follow the precautionary measures recommended in sections 5, 6, 8, and 16 may result in overexposure.** ***Ethylene Oxide.*** Allergic contact dermatitis may occur in a small proportion of exposed workers. In various reports involving recurrent exposures to high vapor concentrations, peripheral neurotoxic effects, and, in some cases, indications of Central Nervous System (CNS) toxicity, were described. In most cases, there was marked improvement on removal from further exposure. A few cases of cataract formation have also been linked to such exposures. Although one epidemiological study has suggested that women exposed to ethylene oxide may have an increased incidence of abortions, the laboratory findings indicate that if adverse reproductive effects are produced, these occur only at high exposure concentrations. OSHA considers that, at excessive levels, ethylene oxide may present reproductive, mutagenic, genotoxic, neurologic, and sensitization hazards. ***Carbon Dioxide.*** No harm expected.

**OTHER EFFECTS OF OVEREXPOSURE:** ***Carbon Dioxide.*** Damage to retinal or ganglion cells and CNS may occur.

**MEDICAL CONDITIONS AGGRAVATED BY OVEREXPOSURE:** The toxicology and the physical and chemical properties of the components suggest that overexposure is unlikely to aggravate existing medical conditions.

**SIGNIFICANT LABORATORY DATA WITH POSSIBLE RELEVANCE TO HUMAN HEALTH HAZARD EVALUATION:** ***Ethylene Oxide.*** This component has been shown to produce mutagenic and cytogenetic effects in a variety of test systems. Based on experimental and observational data, ethylene oxide is a cancer hazard and should be treated as causing cancer in humans.

***Carbon Dioxide.*** A single study has shown an increase in heart defects in rats exposed to 6% carbon dioxide in air for 24 hours at different times during gestation. There is no evidence that carbon dioxide is teratogenic in humans.

See section 11, Toxicological Information, for further information.

**CARCINOGENICITY:** OSHA considers ethylene oxide to pose a human cancer hazard and a human reproductive hazard. The IARC assigns it to Group 1, "Carcinogenic to humans." The NTP classifies it as "known to be a human carcinogen." Refer to OSHA 29 CFR 1910.1047 for additional information.

## 4. First Aid Measures

***IMPORTANT:*** *In all cases of exposure, get or summon medical treatment immediately. Take the victim to a doctor or medical facility at once.*

**INHALATION:** Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, qualified personnel may give oxygen. Call a physician.

**SKIN CONTACT:** Immediately flush skin with plenty of water while removing contaminated clothing and shoes. Wash skin with soap and water. For exposure to cold vapor or liquid, immediately warm frostbite area with warm water not to exceed 105°F (41°C). In case of massive exposure, remove clothing while showering with warm water. Call a physician. Aerate, wash, or clean contaminated clothing. Discard leather goods and shoes.

**SWALLOWING:** A highly unlikely route of exposure. If patient is conscious, give at least two glasses of water. Do not induce vomiting. Never give anything to an unconscious person by mouth. Call a physician.

**EYE CONTACT:** Immediately flush eyes thoroughly with water for at least 15 minutes. Hold the eyelids open and away from the eyeballs to ensure that all surfaces are flushed thoroughly. Seek the advice of a physician, preferably an ophthalmologist, urgently.

***NOTES TO PHYSICIAN:*** *(1) Persons exposed to ethylene oxide may develop severe and intractable vomiting, requiring the use of antiemetics given intravenously. (2) Prolonged or high vapor concentration exposure may result in the development of pulmonary edema after a latent phase of several hours. Also, respiratory tract injury caused by ethylene oxide may predispose to the development of a secondary respiratory infection. Individuals exposed to moderately high vapor concentrations of ethylene oxide should be retained for observation. (3) Following skin contacts, primary irritation and blister formation may be delayed in onset. (4) When introduced directly into the blood stream, ethylene oxide may act as hapten and lead to the development of anaphylactoid reactions of varying severity. This has been noted in a few haemodialysis and plasmapheresis patients due to desorption of ethylene oxide from the sterilized equipment. There appears to be a close association to the presence of IgE antibodies to albumin/ethylene oxide conjugates.*

## 5. Fire Fighting Measures

| | | |
|---|---|---|
| **FLASH POINT** (test method)**:** | Not available | |
| **AUTOIGNITION TEMPERATURE:** | Not available | |
| **FLAMMABLE LIMITS IN AIR,** % by volume**:** | **LOWER:** Not available | **UPPER:** Not available |

**EXTINGUISHING MEDIA:** $CO_2$, dry chemical, water spray, or fog

**SPECIAL FIRE FIGHTING PROCEDURES: DANGER! Cancer hazard and reproductive hazard. Flammable liquid and gas under pressure.** Evacuate all personnel from danger area. Immediately spray cylinders with water from maximum distance until cool; then move them away from fire area if without risk. Use self-contained breathing apparatus operated in the pressure demand mode

and appropriate protective clothing. Stop flow of gas if without risk. On-site fire brigades must comply with OSHA 29 CFR 1910.156.

**UNUSUAL FIRE AND EXPLOSION HAZARDS:** May form explosive mixtures with air and oxidizing agents. Heat of fire can build pressure in cylinder and cause it to rupture. Cylinders are equipped with a pressure relief device. (Exceptions may exist where authorized by DOT.) No part of cylinder should be subjected to a temperature higher than 125°F (52°C). If venting or leaking product catches fire, do not extinguish the flames. Flammable vapors may spread from spill. Explosive atmospheres may linger. Vapor in air has a very low ignition energy and is prone to static or other low-energy ignition sources. Before entering area, especially a confined area, check atmosphere with an appropriate device.

**HAZARDOUS COMBUSTION PRODUCTS:** Carbon monoxide, carbon dioxide

## 6. Accidental Release Measures

**STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED: DANGER! Cancer hazard and reproductive hazard. Flammable liquid and gas under pressure.** May form explosive mixtures with air. (See section 5.) Immediately evacuate all personnel from danger area. Use self-contained breathing apparatus operated in the pressure demand mode and appropriate protective clothing. Shut off leak if you can do so without risk. Vapors can be reduced with fog or fine water spray. Ventilate area of leak or move leaking assembly to a well-ventilated area. Test for sufficient oxygen, especially in confined spaces, before allowing reentry. Do not allow solutions of ethylene oxide and water to discharge into streams or sewers. Contingency planning is recommended for handling releases, spills, and emergencies.

**WASTE DISPOSAL METHOD:** Prevent waste from contaminating the surrounding environment. Keep personnel away. Discard any product, residue, disposable container, or liner in an environmentally acceptable manner, in full compliance with federal, state, and local regulations. If necessary, call your local supplier for assistance.

Ethylene oxide reacts slowly with water to form ethylene glycol, a process that takes days to complete.

## 7. Handling and Storage

**PRECAUTIONS TO BE TAKEN IN STORAGE:** Store and use with adequate ventilation. Separate cylinders from oxygen, chlorine, and other oxidizers by at least 20 ft (6.1 m) or use a barricade of noncombustible material. This barricade should be at least 5 ft (1.53 m) high and have a fire resistance rating of at least ½ hr. Firmly secure cylinders upright to keep them from falling or being knocked over. Screw valve protection cap firmly in place by hand. Post “No Smoking or Open Flames” signs in storage and use areas. There must be no sources of ignition. All electrical equipment in storage areas must be explosion-proof. Storage areas must meet national electric codes for Class 1 hazardous areas. Store only where temperature will not exceed 125°F (52°C). Store full and empty cylinders separately. Use a first-in, first-out inventory system to prevent storing full cylinders for long periods.

**PRECAUTIONS TO BE TAKEN IN HANDLING:** Protect cylinders from damage. Use a suitable hand truck to move cylinders; do not drag, roll, slide, or drop. All piped systems and associated equipment must be grounded. Electrical equipment must be non-sparking or explosion-proof. Leak check system with soapy water; never use a flame. Never attempt to lift a cylinder by its cap; the cap is intended solely to protect the valve. Never insert an object (e.g., wrench, screwdriver, pry bar) into cap openings; doing so may damage the valve and cause a leak. Use an adjustable strap wrench to remove over-tight or rusted caps. Open valve slowly. If valve is hard to open, discontinue use and contact your supplier. For other precautions in using this product, see section 16.

For further information on storage, handling, and use of this product, see *NFPA 55: Standard for the Storage, Use, and Handling of Compressed and Liquefied Gases in Portable Cylinders*, published by the National Fire Protection Association.

## 8. Exposure Controls/Personal Protection

**VENTILATION/ENGINEERING CONTROLS:**

**LOCAL EXHAUST**–Use an explosion-proof local exhaust system with sufficient air flow velocity to maintain the concentration of ethylene oxide below the Action Level (0.5 ppm) in the worker's breathing zone.

**MECHANICAL (general)**–Not recommended as a primary ventilation system to control worker exposure. Should be used in conjunction with local exhaust ventilation.

**SPECIAL**–Use in a closed system. Ventilation should be designed so that no person is exposed to ethylene oxide concentrations exceeding the OSHA PEL of 1 ppm or excursion limit of 5 ppm.

**OTHER**–See SPECIAL.

**RESPIRATORY PROTECTION:** Respiratory protection must conform to OSHA rules as specified in 29 CFR 1910.134. Refer to OSHA 1910.1047 for specific respirator selection criteria.

**SKIN PROTECTION:** Butyl rubber (49 FR 25782, June 22, 1984). See section IX. Gloves have a lifetime of approximately one-half to one hour after contact with liquid ethylene oxide.

**EYE PROTECTION:** Full face shield and safety glasses or goggles. Select in accordance with OSHA 29 CFR 1910.133. Contact lenses should not be worn.

**OTHER PROTECTIVE EQUIPMENT:** Metatarsal shoes for cylinder handling. Rubber shoes and apron where risk of liquid spill exists. Select in accordance with OSHA 29 CFR 1910.132 and 1910.133. Exposure must be held to the PEL/TLV standard by appropriate engineering and procedural safeguards. Do not allow protective equipment to become contaminated with this product. Regardless of protective equipment, never touch live electrical parts.

## 9. Physical and Chemical Properties

| | |
|---|---|
| **SPECIFIC GRAVITY** (Air = 1) at 70°F (21.1°C) and 1 atm**:** | approx. 1.52 |
| **GAS DENSITY** at 70°F (21.1°C) and 1 atm**:** | approx. 0.1139 lb/ft3 (1.824 kg/$m^3$) |
| **VAPOR PRESSURE** at 70°F (21.1°C)**:** | 750 psig (5171 kPa) |
| **SOLUBILITY IN WATER:** | Appreciable |
| **PERCENT VOLATILES BY VOLUME:** | 100 |
| **EVAPORATION RATE** (Butyl Acetate = 1)**:** | High |

**APPEARANCE, ODOR, AND STATE:** Colorless gas at normal temperature and pressure; nonresidual, ether-like odor in high concentrations. Odor not detectable until well above the permissible exposure level.

## 10. Stability and Reactivity

**STABILITY:** ☐ **Unstable** ☒ **Stable**

**INCOMPATIBILITY (materials to avoid):** Because of the highly reactive nature of ethylene oxide, dangerous runaway reactions can result from contamination with alkalies, amines, acids, water, metal chlorides, metal oxides, or a wide variety of other organic and inorganic materials. These contaminants can catalyze highly exothermic ethylene oxide reactions. Oxidizers, mercaptans, alkali metals, alkaline earth metals, alcohols, metal acetylides, chromium, titanium above 1022°F (550°C), uranium above 1382°F (750°C).

**HAZARDOUS DECOMPOSITION PRODUCTS:** Thermal decomposition may produce carbon monoxide and/or carbon dioxide.

**HAZARDOUS POLYMERIZATION:** ☒ **May Occur** ☐ **Will Not Occur**

**CONDITIONS TO AVOID:** In the absence of other materials or contaminants, this mixture is stable at ordinary temperatures and pressures in ordinary use, handling, and storage. Prevent heat build-up by avoiding flame or heat impingement on vessels and piping and preventing contamination of this mixture with trace amounts of other materials.

Trace polymers may be present under ordinary conditions of temperature, pressure, etc. However, ethylene oxide will polymerize violently if contaminated with aqueous alkalies, amines, mineral acids, metal chlorides, or metal oxides. Avoid exposing stored cylinders to heat or sources of ignition.

## 11. Toxicological Information

***Ethylene Oxide.*** Animals exposed to ethylene oxide vapor for up to two years have shown an increase in the incidence of certain malignant tumors in comparison to nonexposed controls. In humans, an increased occurrence of leukemia and stomach cancer has been reported by one group of investigators who pooled results from three Swedish facilities producing or using ethylene oxide, among other materials.

A NIOSH study of sterilant workers completed in 1987 found elevated rates of non-Hodgkin's lymphoma in men and decreased rates in women. The reported excesses of stomach cancer, leukemia, and non-Hodgkin's lymphoma have not been seen in other studies of workers potentially exposed to ethylene oxide in chemical manufacturing or sterilizing operations.

A recently completed follow-up of the 1987 NIOSH study found an elevated risk of blood cancers among men and breast cancers among women. The elevated risk occurred only at high exposures as defined by a combination of exposure level and years worked. The study showed no elevated cancer or disease risk for sterilant workers overall as compared to the general U.S. population.

Laboratory studies with mice have shown that acute exposure to ethylene oxide vapor at concentrations of 30 ppm and above cause testicular injury as evidenced by concentration-related increased embryonic deaths following the mating of exposed males to nonexposed females (Dominant Lethal Test).

In a developmental toxicity study with rats exposed to 225, 125, or 50 ppm of ethylene oxide vapor, there was maternal toxicity at 225 ppm and at 125 ppm. Fetotoxicity was present as reduced fetal body weight at all concentrations and as increased incidence of skeletal variants at 225 ppm and to a lesser extent at 125 ppm. There were no indications of embryotoxicity or malformations. In a two-generation oxide vapor for 6 hr/day, 5.day/week, there was parental toxicity at 33 and 100 ppm. Post-implant losses with reduction in litter size and offspring body weight were present at 33 and 100 ppm. The no-observed-effects concentrations for adult toxicity, offspring effects, and reproductive effects was 10 ppm.

***Carbon Dioxide.*** Carbon dioxide is an asphyxiant. It initially stimulates respiration and then causes respiratory depression. High concentrations result in narcosis. Symptoms in humans are as follows:

| EFFECT | CONCENTRATION |
|---|---|
| Breathing rate increases slightly. | 1% |
| Breathing rate increases to 50% above normal level. Prolonged exposure can cause headache, tiredness. | 2% |
| Breathing increases to twice normal rate and becomes labored. Weak narcotic effect. Impaired hearing, headache, increased blood pressure and pulse rate. | 3% |
| Breathing increases to approximately four times normal rate, symptoms of intoxication become evident, and slight choking may be felt. | 4-5% |
| Characteristic sharp odor noticeable. Very labored breathing, headache, visual impairment, and ringing in the ears. Judgment may be impaired, followed within minutes by loss of consciousness. | 5-10% |
| Unconsciousness occurs more rapidly above 10% level. Prolonged exposure to high concentrations may eventually result in death from asphyxiation. | 10-100% |

## 12. Ecological Information

No adverse ecological effects expected. This mixture does not contain any Class I or Class II ozone-depleting chemicals. Ethylene oxide and carbon dioxide are not listed as marine pollutants by DOT.

## 13. Disposal Considerations

**WASTE DISPOSAL METHOD:** Do not attempt to dispose of residual or unused quantities. Return cylinder to supplier.

## 14. Transport Information

**DOT/IMO SHIPPING NAME:** Ethylene oxide and carbon dioxide mixtures *with more than 9% but not more than 87% ethylene oxide*

| | | |
|---|---|---|
| **HAZARD CLASS:** 2.1 | **IDENTIFICATION NUMBER:** UN 1041 | **PRODUCT RQ:** 10 lb (4.54 kg, ethylene oxide) |

**SHIPPING LABEL(s):** FLAMMABLE GAS

**PLACARD (when required):** FLAMMABLE GAS

**SPECIAL SHIPPING INFORMATION:** Cylinders should be transported in a secure position, in a well-ventilated vehicle. Cylinders transported in an enclosed, nonventilated compartment of a vehicle can present serious safety hazards.

Shipment of compressed gas cylinders that have been filled without the owner's consent is a violation of federal law [49 CFR 173.301(b)].

## 15. Regulatory Information

The following selected regulatory requirements may apply to this product. Not all such requirements are identified. Users of this product are solely responsible for compliance with all applicable federal, state, and local regulations.

**U.S. FEDERAL REGULATIONS:**

**EPA (ENVIRONMENTAL PROTECTION AGENCY)**

**CERCLA:** COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND LIABILITY ACT OF 1980 (40 CFR Parts 117 and 302):

**Reportable Quantity (RQ):** 10 lb (4.54 kg, ethylene oxide)

**SARA:** SUPERFUND AMENDMENT AND REAUTHORIZATION ACT:

**SECTIONS 302/304:** Require emergency planning based on Threshold Planning Quantity (TPQ) and release reporting based on Reportable Quantities (RQ) of Extremely Hazardous Substances (EHS) (40 CFR Part 355):

**TPQ:** 1000 lb (454 kg, ethylene oxide)
**EHS RQ:** 10 lb (4.54 kg, ethylene oxide)

**SECTIONS 311/312:** Require submission of MSDSs and reporting of chemical inventories with identification of EPA hazard categories. The hazard categories for this product are as follows:

**IMMEDIATE:** Yes
**DELAYED:** Yes
**PRESSURE:** Yes
**REACTIVITY:** Yes
**FIRE:** Yes

**SECTION 313:** Requires submission of annual reports of release of toxic chemicals that appear in 40 CFR Part 372.

The ethylene oxide component is subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA) and 40CFR Part 372.

**40 CFR 68:** RISK MANAGEMENT PROGRAM FOR CHEMICAL ACCIDENTAL RELEASE PREVENTION: Requires development and implementation of risk management programs at facilities that manufacture, use, store, or otherwise handle regulated substances in quantities that exceed specified thresholds.

The ethylene oxide component is listed as a regulated substance in quantities of 10,000 lb (4536 kg) or greater.

**TSCA:** TOXIC SUBSTANCES CONTROL ACT: The components of this product are listed on the TSCA inventory.

**OSHA:** OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION**:**

**29 CFR 1910.119:** PROCESS SAFETY MANAGEMENT OF HIGHLY HAZARDOUS CHEMICALS: Requires facilities to develop a process safety management program based on Threshold Quantities (TQ) of highly hazardous chemicals.

The ethylene oxide component is listed in Appendix A as a highly hazardous chemical with a Threshold Quantity of 5,000 lb (2270 kg).

**STATE REGULATIONS:**

**CALIFORNIA:** The ethylene oxide component is listed by California under the SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT OF 1986 (Proposition 65).

**WARNING:** Ethylene oxide is a chemical known to the State of California to cause cancer and birth defects or other reproductive harm.
*(California Health and Safety Code §25249.5 et seq.)*

**PENNSYLVANIA:** This product is subject to the PENNSYLVANIA WORKER AND COMMUNITY RIGHT-TO-KNOW ACT (35 P.S. Sections 7301-7320).

## 16. Other Information

Be sure to read and understand all labels and instructions supplied with all containers of this product.

**OTHER PRECAUTIONS FOR HANDLING, STORAGE, AND USE:** Do not incinerate ethylene oxide cartridges, tanks, or other containers. OSHA regulations are in force that limit exposure to ethylene oxide (29 CFR 1910.134 and 1910.1047). These must be strictly adhered to. Users must provide for safe discharge of vented material and for destruction of liquid wastes. Discharge of aqueous (water) solutions of ethylene oxide must be regarded as constituting both personnel and flammability hazards. Because of the potential for violent decomposition, containers of ethylene oxide must be properly blanketed with an inert gas and given extraordinary protection against fire exposure. Take extreme care to avoid contamination of ethylene oxide. Contamination could lead to runaway reactions. Contingency planning is necessary for potential emergencies from spills, fire exposure, or contamination.

**WARNING:** Sudden release of hot organic chemical vapors or mists from process equipment operating at elevated temperatures and pressures, or sudden entry of air into vacuum equipment, may result in ignition without obvious ignition sources. Published autoignition or ignition temperature values cannot be treated as safe operating temperatures in chemical processes without analysis of the actual process conditions. Any use of this product in elevated temperature processes should be thoroughly evaluated to establish and maintain safe operating conditions.

**OTHER HAZARDOUS CONDITIONS OF HANDLING, STORAGE, AND USE:** ***Cancer hazard and reproductive hazard. Flammable liquid and gas under pressure.*** May form explosive mixtures with air. Keep away from heat, sparks, and open flame. ***Noxious, irritating gas; can cause rapid suffocation due to oxygen deficiency***. Use only in a closed system. Use piping and equipment adequately designed to withstand pressures to be encountered. Close cylinder valve after each use; keep closed even when empty. ***Avoid contact with eyes, skin, or clothing***. Have safety showers and eyewash fountains immediately available. Allow any contaminated rubber gloves and rubber clothing to air out for several days before cleaning and reuse. ***Prevent reverse flow***. Reverse flow into cylinder may cause rupture. Use a check valve or other protective device in any line or piping from the cylinder***. Never work on a pressurized system***. If there is a leak, close the cylinder valve. Blow the system down in a safe and environmentally sound manner in compliance with all federal, state and local laws; then repair the leak. If venting to atmosphere is necessary, gas must be filtered through an emission control system that complies with all federal, state, and local regulations. ***Never place a compressed gas cylinder where it may become part of an electrical circuit.***

**MIXTURES:** When you mix two or more gases or liquefied gases, you can create additional, unexpected hazards. Obtain and evaluate the safety information for each component before you produce the mixture. Consult an industrial hygienist or other trained person when you evaluate the end product. Remember, gases and liquids have properties that can cause serious injury or death.

**HAZARD RATING SYSTEMS:**

| **NFPA RATINGS:** | | **HMIS RATINGS:** | |
|---|---|---|---|
| HEALTH | = 3 | HEALTH | = 1* |
| FLAMMABILITY | = 4 | FLAMMABILITY | = 4 |
| INSTABILITY | = 3 | PHYSICAL HAZARD | = 3 |
| SPECIAL | = None | | |

**A component of this mixture presents a carcinogenic or reproductive hazard.*

**STANDARD VALVE CONNECTIONS FOR U.S. AND CANADA:**

| | |
|---|---|
| **THREADED:** | CGA-350 |
| **PIN-INDEXED YOKE:** | Not applicable |
| **ULTRA-HIGH-INTEGRITY CONNECTION:** | Not applicable |

Use the proper CGA connections. **DO NOT USE ADAPTERS.**

Ask your supplier about free Praxair safety literature as referred to in this MSDS and on the label for this product. Further information about this product can be found in the following pamphlets published by the Compressed Gas Association, Inc. (CGA), 4221 Walney Road, 5th Floor, Chantilly, VA 20151-2923, Telephone (703) 788-2700, http://www.cganet.com/Publication.asp.

| | |
|---|---|
| AV-1 | *Safe Handling and Storage of Compressed Gases* |
| G-6 | *Carbon Dioxide* |
| G-6.1 | *Standard for Low Pressure Carbon Dioxide Systems at Customer Sites* |
| G-6.2 | *Commodity Specification for Carbon Dioxide* |
| P-1 | *Safe Handling of Compressed Gases in Containers* |
| SB-2 | *Oxygen-Deficient Atmospheres* |
| V-1 | *Compressed Gas Cylinder Valve Inlet and Outlet Connections* |
| V-7 | *Standard Method of Determining Cylinder Valve Outlet Connections for Industrial Gas Mixtures* |
| — | *Handbook of Compressed Gases, Fourth Edition* |

Praxair asks users of this product to study this MSDS and become aware of product hazards and safety information. To promote safe use of this product, a user should (1) notify employees, agents, and contractors of the information in this MSDS and of any other known product hazards and safety information, (2) furnish this information to each purchaser of the product, and (3) ask each purchaser to notify its employees and customers of the product hazards and safety information.

The opinions expressed herein are those of qualified experts within Praxair, Inc. We believe that the information contained herein is current as of the date of this Material Safety Data Sheet. Since the use of this information and the conditions of use of the product are not within the control of Praxair, Inc., it is the user's obligation to determine the conditions of safe use of the product.

Praxair MSDSs are furnished on sale or delivery by Praxair or the independent distributors and suppliers who package and sell our products. To obtain current Praxair MSDSs for these products, contact your Praxair sales representative or local distributor or supplier, or download from www.praxair.com. If you have questions regarding Praxair MSDSs, would like the form number and date of the latest MSDS, or would like the names of the Praxair suppliers in your area, phone or write the Praxair Call Center (**Phone:** 1-800-PRAXAIR; **Address:** Praxair Call Center, Praxair, Inc., PO Box 44, Tonawanda, NY 14151-0044).



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