



Emergency Contact: Chemtrec (800) 424-9300  
Or Norco (208) 336-1643

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## Ethylene Oxide in Nitrogen 0.0001% to 3.6%

### MATERIAL SAFETY DATA SHEET

#### Identification

Product Name: Ethylene Oxide in Nitrogen 0.0001% to 3.6%  
Chemical Name: Ethylene Oxide in Nitrogen  
Chemical Family: Gas Mixture  
CAS Number: N/A  
Common Names/Synonyms: N/A  
MSDS Identification Code/Number: 2530  
TDG (Canada) Classification: 2.2  
WHMIS Classification: A, D2A, D2B  
Prepared By: Quality Dept.

Revision Date: 06/15/05  
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#### Composition, Information on Ingredients, Exposure Limits

##### Exposure Limits<sup>1</sup>:

Ingredient	% Volume	PEL-OSHA <sup>2</sup>	TLV-ACGIH <sup>3</sup>	LD <sub>50</sub> or LC <sub>50</sub> Route/Species
Ethylene Oxide Formula: C <sub>2</sub> H <sub>4</sub> O CAS: 75-21-8 RTECS#: KX2450000	0.0001 to 3.6%	1 PPM TWA 5 PPM 15 min. Excursion	1 PPM TWA	LC <sub>50</sub> 2920 PPM Inhalation / Rat (1 Hr.)
Nitrogen Formula: N <sub>2</sub> CAS: 7727-37-9 RTECS#: QW9700000	96.4 to 99.9999%	None Established	Simple Asphyxiant	Not Available

<sup>1</sup> Refer to individual state or provincial regulations, as applicable, for limits which may be more stringent than those listed here.

<sup>2</sup> As stated in 29 CFR 1910.1047 Ethylene Oxide

<sup>3</sup> As stated in the ACGIH 2007 Threshold Limit Values for Chemical Substances and Physical Agents

OSHA Regulatory Status: This material is classified as hazardous under OSHA regulations.

#### Hazards Identification

##### Emergency Overview:

Non-flammable colorless gas with slight sweet odor. Simple Asphyxiant – This product does not contain oxygen and may cause asphyxia if released in a confined area. Maintain oxygen levels above 19.5%. This product contains ethylene oxide, a substance that can cause cancer and has been associated with adverse fetal and reproductive effects in animals. Inhalation of ethylene oxide can cause irritation and affect the lungs and nervous system. Ethylene oxide may undergo hazardous polymerization and explosive decomposition. Contents under pressure. Use and store below 125<sup>o</sup>F (52<sup>o</sup> C).

##### Route of Entry:

Skin Contact Yes	Skin Absorption No	Eye Contact Yes	Inhalation Yes	Ingestion No
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**Hazards Identification Continued**

**Health Effects:**

Exposure Limits Yes	Irritant Yes	Sensitization No
Teratogen Yes	Reproductive Hazard Yes	Mutagen Yes
Synergistic Effects None reported		

Carcinogenicity: NTP: Yes IARC: Yes OSHA: Yes

**Eye Effects:**

May cause irritation and conjunctivitis. Contact with rapidly expanding gas near the point of release may cause frostbite.

**Skin Effects:**

Ethylene oxide may cause irritation at low concentrations or characteristic burns at higher concentrations. Redness, dermatitis, blisters, edema, burns, and tissue damage may develop. May be absorbed through the skin. Contact with rapidly expanding gas near the point of release may cause frostbite with redness, skin color change to gray or white, and blistering.

**Ingestion Effects:**

None known. Ingestion is unlikely as product is a gas at room temperature.

**Inhalation Effects:**

May irritate the eyes, nose, throat, and lungs. Low concentrations may cause delayed nausea and vomiting. High concentrations can have a narcotic and possibly neurotoxic effect that can be followed by coughing and vomiting. Irritation of the respiratory passages may lead to pneumonitis and retention of body fluid and swelling in the lungs (edema). Emphysema and bronchitis may occur. Overexposure to ethylene oxide may adversely affect the lungs, liver, kidneys, endocrine system, central nervous system, and blood forming elements. Chronic intoxication has been reported in humans.

Ethylene oxide is a human carcinogen. Exposure may cause toxicity to the human reproductive system including spontaneous abortions. Chromosomal aberrations have been detected in ethylene oxide expose workers.

The nitrogen balance gas in this product is a non-toxic simple asphyxiant. High concentrations may exclude an adequate supply of oxygen to the lungs. Effects of oxygen deficiency resulting from simple asphyxiants may include: rapid breathing, diminished mental alertness, impaired muscular coordination, faulty judgment, depression of all sensations, emotional instability, and fatigue. As asphyxiation progresses, nausea, vomiting, prostration, and loss of consciousness may result, eventually leading to convulsions, coma, and death.

Oxygen deficiency during pregnancy has produced developmental abnormalities in humans and experimental animals.

**Medical Conditions Aggravated by Exposure:**

Irritant effects may aggravate pre-existing eye, skin, and upper respiratory disorders.

**Potential Environmental Effects:**

The LC<sub>50</sub> for ethylene oxide in the goldfish is 90 mg/L/24 H (modified ASTM D 1345).

**NFPA Hazard Codes**

Health: 1  
Flammability: 0  
Instability: 0

**HMIS Hazard Codes**

Health: 1\*  
Flammability: 0  
Physical Hazard: 3

**Ratings System**

- 0: No Hazard
- 1: Slight Hazard
- 2: Moderate Hazard
- 3: Serious Hazard
- 4: Severe Hazard

\*Carcinogen

Ratings were assigned in accordance with Compressed Gas Association (CGA) guidelines as published in CGA Pamphlet P-19-2009, *CGA Recommended Hazard Ratings for Compressed gases, 3<sup>rd</sup> Edition*.

**First Aid Measures**

**Eyes:**  
 PERSONS WITH POTENTIAL EXPOSURE SHOULD NOT WEAR CONTACT LENSES. Flush contaminated eye(s) with copious quantities of water. Part eyelids to assure complete flushing. Continue for a minimum of 15 minutes. Seek immediate medical attention.

**Skin:**  
 Remove contaminated clothing and flush affected areas with large amounts of lukewarm water. Delayed burns or frostbite may result, seek immediate medical attention.

**Ingestion:**  
 Not anticipated, product is a gas at room temperature.

**Inhalation:**  
 PROMPT MEDICAL ATTENTION IS MANDATORY IN ALL CASES OF OVEREXPOSURE. RESCUE PERSONNEL SHOULD BE EQUIPPED WITH SELF-CONTAINED BREATHING APPARATUS. Victims should be assisted to an uncontaminated area and inhale fresh air. Quick removal from the contaminated area is most important. Unconscious persons should be moved to an uncontaminated area and, if breathing has stopped, administer artificial resuscitation and supplemental oxygen. Get immediate medical assistance. Further treatment should be symptomatic and supportive.

**Fighting Measures**

Conditions of Flammability: Nonflammable		
Flash Point: None	Method: Not Applicable	Autoignition Temperature: None
LEL % None	UEL % None	
Hazardous Combustion Products: None		
Sensitivity to mechanical shock: None		
Sensitivity to static discharge: None		

**Fire and Explosion Hazards:**  
 Nonflammable. Cylinder may rupture violently from pressure when involved in a fire situation.

**Extinguishing Media:**  
 None required. Use as appropriate for surrounding materials

**Fire Fighting Instructions:**  
 Use water spray to cool fire exposed cylinders and areas. Fire fighters should wear a full-facepiece NIOSH/MSHA approved self-contained breathing apparatus (SCBA) operated in positive pressure mode and full turnout gear.

**Accidental Release Measures**

Evacuate all personnel from affected area. Deny entry to unauthorized and unprotected personnel. Use appropriate protective equipment. If it can be done without risk, stop the flow of gas or remove cylinder to outside. Ventilate enclosed areas to prevent build up. If leak is in user's equipment, be certain to purge piping with inert gas prior to attempting repairs. If leak is in container or valve, contact the appropriate emergency telephone number listed in section 1 or call your closest Norco/NorLab location.

**Handling and Storage**

**Electrical Classification:**  
 Non-hazardous.

Metal acting as catalysts for decomposition of ethylene oxide include copper, silver, mercury, magnesium, and their alloys. No acetylide-forming metals should be in contact with ethylene oxide. Potassium, tin, zinc, aluminum, and iron oxides tend to accelerate the polymerization of ETO. Earth-ground or bond all lines and equipment associated with the ETO system.

## Handling and Storage Continued

Unless specifically labeled this material is NOT to be used as a pesticide.

Use only in well-ventilated areas. Valve protection caps must remain in place unless the cylinder is secured with valve outlet piped to use point. Do not drag, slide or roll cylinders. Use a suitable hand truck for cylinder movement. Use a pressure regulator when connecting cylinder to lower pressure (<3000 PSIG) piping or systems. Do not heat cylinder by any means to increase the discharge rate of product from the cylinder. Use a check valve or trap in the discharge line to prevent hazardous backflow into the cylinder.

Protect cylinders from physical damage. Store in cool, dry, well ventilated area of non-combustible construction away from heavy traffic areas and emergency exits. Do not allow the temperature where cylinders are stored to exceed 125°F (52°C). Cylinders should be stored upright and firmly secured to prevent falling or being knocked over. Full and empty cylinders should be segregated. Use a “first in – first out” inventory system to prevent full cylinders from being stored for excessive periods of time. Post “NO SMOKING OR OPEN FLAMES” sign in the storage or use area.

For additional recommendations, consult Compressed Gas Association Pamphlets P-1.

Never carry a compressed gas cylinder or a container of a gas in cryogenic liquid form in an enclosed space such as a car trunk, van or station wagon. A leak can result in a fire, explosion, asphyxiation or a toxic exposure.

## Exposure Controls, Personal Protection

### Engineering Controls:

Use enclosures and local exhaust ventilation as necessary to limit exposure below the acceptable exposure limits. Exhaust gas should be vented to a gas treatment system.

### Eye/Face Protection:

Safety goggles or glasses as appropriate for the job.

### Skin Protection:

Ethylene oxide softens most plastics and produces surface blisters on most rubber-based compounds. Use gloves and protective clothing resistant to ethylene oxide. (Barricade™, Responder™, and Tychem 10000™ are effective for > 8 hour exposures).

### Respiratory Protection:

For emergency release and conditions with exposures above the applicable exposure limits use a positive pressure NIOSH approved air-supplying respirator system (SCBA or airline/escape bottle) using a full face mask and at a minimum Grade D air.

### Other/General Protection:

Safety shoes, safety shower, eyewash “fountain”.

## Physical and Chemical Properties

Parameter	Value	Units
Physical state (gas, liquid, solid)	: Gas	
Vapor pressure	: Above critical temp.	
Vapor density (Air = 1)	: 0.97	
Evaporation point	: Not Available	
Boiling point	: -320.4	°F
	: -195.8	°C
Freezing point	: -345.9	°F
	: -209.9	°C
pH	: Not Applicable	
Specific gravity	: Not Available	
Oil/water partition coefficient	: Not Available	
Solubility (H <sub>2</sub> O)	: Very slightly soluble	
Odor threshold	: Not Applicable	
Odor and appearance	: Colorless gas, slight sweet odor	

## Stability and Reactivity

**Stability:**

Unstable at elevated temperatures. Ethylene oxide should be stored at temperatures less than 125° F (52° C).

**Incompatible Materials:**

Vapors may react violently with caustic soda, hydrated lime (quicklime), magnesium chloride, ammonia, alcohols, and amines. Most materials other than stainless steel or nickel will cause polymerization or decomposition. Ethylene oxide may explosively decompose and reacts with acids, alkalis, salts, and combustible material.

**Hazardous Decomposition Products:**

Ethylene oxide vapors may explosively decompose.

**Hazardous Polymerization:**

May occur. Presence of catalysts such as pure iron, aluminum oxide, or anhydrous chlorides of iron, aluminum, or tin accelerates polymerization.

## Toxicological Information

**Skin and Eye:**

Skin contact with both concentrated and dilute solutions of ethylene oxide has caused mild to severe blisters, edema, dermatitis and burns. Irritation and chemical burns have been reported from blood pressure cuffs, surgical gloves, hospital gowns, and other hospital items sterilized with ethylene oxide. Skin exposure to ethylene oxide has caused significant nausea and vomiting in workers.

**Inhalation:**

Ethylene oxide can affect the nervous system. Lung irritation is common following inhalation and pulmonary edema may occur. Overexposure to ethylene oxide may affect a variety of organs including the liver, kidneys, endocrine system, lungs, blood-forming elements, and CNS.

**Other:**

Evidence of spontaneous abortions in humans has been reported as a result of exposure to ethylene oxide. Ethylene oxide causes chromosomal damage and reproductive and developmental toxicity.

Ethylene oxide is carcinogenic to animals and has been associated with increased incidence of leukemia in man in several epidemiologic studies. Workers exposed to ethylene oxide exhibited a dose-related increase in the frequency of sister chromatid exchanges and chromosomal aberrations in peripheral lymphocytes and micronuclei in bone marrow cells. Ethylene oxide is classified as a confirmed human carcinogen by IARC and NTP. Ethylene oxide is classified as a "suspect" human carcinogen by ACGIH (A2) and regulated by OSHA under 29 CFR Part 1910.1047.

## Ecological Information

Product does not contain Class I or Class II ozone depleting substances. See Hazards Identification for ecotoxicity information. Ethylene oxide is not expected to bioconcentrate due to its low octanol/water partition coefficient.

## Disposal Considerations

Do not attempt to dispose of waste or unused quantities in returnable cylinders. Return in the shipping container, properly labeled, with any valve outlet plugs or caps secure and valve protection cap in place, to Norco or NorLab for proper disposal. Non-refillable containers should be vented in a well ventilated area then disposed of in accordance with local regulations, or returned to NorLab.

## Transport Information

Parameter	US DOT	Canada TDG
<b>Proper Shipping Name:</b>	Compressed gases, N.O.S., (Ethylene oxide in Nitrogen)	Compressed gases, N.O. S.,
<b>Hazard Class:</b>	2.2	2.2
<b>Identification Number:</b>	UN 1956	Un 1956
<b>Shipping Label:</b>	Nonflammable Gas	Nonflammable Gas

## Regulatory Information

### SARA Title III Notifications and Information:

Ethylene oxide is listed under the accident prevention provisions of section 112(r) of the Clean Air Act (CAA) with a threshold quantity (TQ) of 10,000 pounds.

Ethylene oxide is a CERCLA Hazardous Substance with a Reportable quantity (RQ) of 10 pounds and is listed as and Extremely Hazardous Substance (EHS) with a Threshold Planning Quantity (TPQ) of 1000 pounds and an EHS RQ of 10 pounds.

### SARA Title III – Hazard Classes:

Sudden Release of Pressure Hazard

### SARA Title III – Section 313 Supplier Notification:

This product contains toxic chemicals subject to the reporting requirements of section 313 of the Emergency Planning and Community Right-To-Know Act (EPCRA) of 1986 and of 40 CFR 372.

### Regulated Ingredients:

Ingredient: Ethylene oxide      CAS Number: 75-21-8      Percent by Volume:  $\leq 3.6\%$

### California Proposition 65:

This product contains ethylene oxide, an ingredient known to the State of California to cause cancer and birth defects or reproductive harm.

## Other Information

ACGIH	American Conference of Governmental Industrial Hygienists
DOT	Department of Transportation
IARC	International Agency for Research on Cancer
NTP	National Toxicology Program
OSHA	Occupational Safety and Health Administration
PEL	Permissible Exposure Limit
SARA	Superfund Amendments and Reauthorization Act
STEL	Short Term Exposure Limit
TDG	Transportation of Dangerous Goods
TLV	Threshold Limit Value

Compressed gas cylinders shall not be refilled without the express written permission of the owner. Shipment of a compressed gas cylinder which has not been filled by the owner or with his/her (written) consent is a violation of transportation regulations.

### Disclaimer of Expressed and Implied Warranties:

Although reasonable care has been taken in the preparation of this document, we extend no warranties and make no representations as to the accuracy or completeness of the information contained herein, and assume no responsibility regarding the suitability of this information for the user's intended purposes or for the consequences of its use. Each individual should make a determination as to the suitability of the information for their particular purpose(s).