



🔍 Regulations (Standards - 29 CFR) - Table of Contents

- **Part Number:** 1910
- **Part Title:** Occupational Safety and Health Standards
- **Subpart:** Z
- **Subpart Title:** Toxic and Hazardous Substances
- **Standard Number:** 1910.1047 App B
- **Title:** Substance technical guidelines for ethylene oxide (Non-mandatory)

I. PHYSICAL AND CHEMICAL DATA

A. Substance identification:

1. Synonyms: dihydrooxirene, dimethylene oxide, EO, 1,2-epoxyethane, EtO ETO oxacyclopropane, oxane, oxidoethane, alpha/beta-oxidoethane, oxiran, oxirane.
2. Formula: (C₂H₄O).
3. Molecular weight: 44.06

B. Physical data:

1. Boiling point (760 mm Hg): 10.70 deg. C (51.3 deg. F);
2. Specific gravity (water = 1): 0.87 (at 20 deg. C or 68 deg. F)
3. Vapor density (air = 1): 1.49;
4. Vapor pressure (at 20 deg. C); 1,095 mm Hg;
5. Solubility in water: complete;
6. Appearance and odor: colorless liquid; gas at temperature above 10.7 deg. F or 51.3 deg. C with ether-like odor above 700 ppm.

II. FIRE, EXPLOSION, AND REACTIVITY HAZARD DATA

A. Fire:

1. Flash point: less than 0 deg. F (open cup);
2. Stability: decomposes violently at temperatures above 800 deg. F;
3. Flammable limits in air, percent by volume: Lower: 3, Upper: 100;
4. Extinguishing media: Carbon dioxide for small fires, polymer or alcohol foams for large fires;
5. Special fire fighting procedures: Dilution of ethylene oxide with 23 volumes of water renders it non-flammable;
6. Unusual fire and explosion hazards: Vapors of EtO will burn without the presence of air or other oxidizers. EtO vapors are heavier than air and may travel along the ground and be ignited by open flames or sparks at locations remote from the site at which EtO is being used.
7. For purposes of compliance with the requirements of 29 CFR 1910.106, EtO is classified as a flammable gas. For example, 7,500 ppm, approximately one-fourth of the lower flammable limit, would be considered to pose a potential fire and explosion hazard.
8. For purposes of compliance with 29 CFR 1910.155, EtO is classified as a Class B fire hazard.
9. For purpose of compliance with 29 CFR 1919.307, locations classified as hazardous due to the presence of EtO shall be Class I.

B. Reactivity:

1. Conditions contributing to instability: EtO will polymerize violently if contaminated with aqueous alkalis, amines, mineral acids, metal chlorides, or metal oxides. Violent decomposition will also occur at temperatures above 800 deg. F;
2. Incompatibilities: Alkalines and acids;
3. Hazardous decomposition products: Carbon monoxide and carbon dioxide.

III. SPILL, LEAK, AND DISPOSAL PROCEDURES

A. If EtO is spilled or leaked, the following steps should be taken:

1. Remove all ignition sources.
 2. The area should be evacuated at once and re-entered only after the area has been thoroughly ventilated and washed down with water.
- B. Persons not wearing appropriate protective equipment should be restricted from areas of spills or leaks until cleanup has been completed.
- C. Waste disposal methods: Waste material should be disposed of in a manner that is not hazardous to employees or to the general population. In selecting the method of waste disposal, applicable local, State, and Federal regulations should be consulted.

IV. MONITORING AND MEASUREMENT PROCEDURES

A. Exposure above the Permissible Exposure Limit:

1. Eight-hour exposure evaluation: Measurements taken for the purpose of determining employee exposure under this section are best taken with consecutive samples covering the full shift. Air samples should be taken in the employee's breathing zone (air that would most nearly represent that inhaled by the employee.)
2. Monitoring techniques: The sampling and analysis under this section may be performed by collection of the EtO vapor on charcoal adsorption tubes or other composition adsorption tubes, with subsequent chemical analysis. Sampling and analysis may also be performed by instruments such as real-time continuous monitoring systems, portable direct reading instruments, or passive dosimeters as long as measurements taken using these methods accurately evaluate the concentration of EtO in employees' breathing zones.

Appendix D describes the validated method of sampling and analysis which has been tested by OSHA for use with EtO. Other available methods are also described in Appendix D. The employer has the obligation of selecting a monitoring method which meets the accuracy and precision requirements of the standard under his unique field conditions. The standard requires that the method of monitoring should be accurate, to a 95 percent confidence level, to plus or minus 25 percent for concentrations of EtO at 1 ppm, and to plus or minus 35 percent for concentrations at 0.5 ppm. In addition to the method described in Appendix D, there are numerous other methods available for monitoring for EtO in the workplace. Details on these other methods have been submitted by various companies to the rulemaking record, and are available at the OSHA Docket Office.

B. Since many of the duties relating to employee exposure are dependent on the results of measurement procedures, employers should assure that the evaluation of employee exposures is performed by a technically qualified person.

V. PROTECTIVE CLOTHING AND EQUIPMENT

Employees should be provided with and be required to wear appropriate protective clothing wherever there is significant potential for skin contact with liquid EtO or EtO-containing solutions. Protective clothing shall include impermeable coveralls or similar full-body work clothing, gloves, and head coverings, as appropriate to protect areas of the body which may come in contact with liquid EtO or EtO-containing solutions.

Employers should ascertain that the protective garments are impermeable to EtO. Permeable clothing, including items made of rubber, and leather shoes should not be allowed to become contaminated with liquid EtO. If permeable clothing does become contaminated, it should be immediately removed, while the employer is under an emergency deluge shower. If leather footwear or other leather garments become wet from EtO they should be discarded and not be worn again, because leather absorbs EtO and holds it against the skin.

Any protective clothing that has been damaged or is otherwise found to be defective should be repaired or replaced. Clean protective clothing should be provided to the employee as necessary to assure employee protection. Whenever impermeable clothing becomes wet with liquid EtO, it should be washed down with water before being removed by the employee. Employees are also required to wear splash-proof safety goggles where there is any possibility of EtO contacting the eyes.

VI. MISCELLANEOUS PRECAUTIONS

- A. Store EtO in tightly closed containers in a cool, well-ventilated area and take all necessary precautions to avoid any explosion hazard.
- B. Non-sparking tools must be used to open and close metal containers. These containers must be effectively grounded and bonded.
- C. Do not incinerate EtO cartridges, tanks or other containers.
- D. Employers should advise employees of all areas and operations where exposure to EtO occur.

VII. COMMON OPERATIONS

Common operations in which exposure to EtO is likely to occur include the following: Manufacture of EtO, surfactants, ethanolamines, glycol ethers, and specialty chemicals, and use as a sterilant in the hospital, health product and spice industries.

➤ [Next Standard \(1910.1047 App C\)](#)

➤ [Regulations \(Standards - 29 CFR\) - Table of Contents](#)