

**MEDICAL UNIVERSITY OF SOUTH CAROLINA**  
**ETHYLENE OXIDE MANAGEMENT PLAN**

**Revised: 9/2007**

## INDEX

Ethylene Oxide Management Plan	1
Protocol for Loading and Unloading Ethylene Oxide Sterilizer	3
Precautions for Safe Use, Handling, and Storage of Ethylene Oxide	4
First Aid Procedures for Ethylene Oxide	4
Emergency Situations	5

In the health care setting, ethylene oxide is used for the sterilization of plastic and rubber items and other materials, which would be damaged by the heat, and moisture of steam sterilization. Ethylene oxide is a toxic and flammable substance that forms a colorless gas with an ethanol odor at room temperature. Employees must follow safe work practices if undesirable health effects are to be avoided. Exposure to liquid ethylene oxide may result in eye irritation, injury to the cornea, frostbite, and severe irritation and blistering of the skin upon prolonged contact. Ingestion of ethylene oxide can cause gastric irritation and liver cancer. Inhalation of vapors may result in respiratory irritation and lung injury, headache, nausea, vomiting, diarrhea, shortness of breath, and a blue or purple coloring of the skin. Exposure has been associated with reproductive disorders, mutagenic effects, neurotoxicity, and allergic sensitization.

Exposure monitoring (air sampling) for ethylene oxide has been required since June 15, 1983. The permissible exposure level is one part per million. The short-term exposure level is five parts per million. The action level is 0.5 parts per million. Periodic monitoring is required every six months for exposure at or above the action level but below the permissible exposure level, and every three months for exposure at or above the permissible exposure level. When two consecutive measurements taken at least seven days apart for any employee indicate that exposure has decreased to the permissible exposure level or below, the frequency of monitoring may be changed from quarterly to semi-annually. Although monitoring may be terminated when exposures fall below the action level experience has shown that changes in work processes can occur. For this reason, monitoring at the Medical University will be conducted from time to time to ensure that levels have remained below the action level. Although specific methods of sampling are not specified, the standard of sampling occurrence is  $\pm 25\%$  at a confidence level of 95% for airborne concentrations at one part per million and  $\pm 35\%$  for concentration at 0.5 parts per million. Affected employees must be notified within fifteen working days

of any monitoring performed, either individually or by posting the results in an appropriate location which is accessible to all affected employees.

Medical surveillance is required for employees subject to occupational exposure to ethylene oxide. Medical evaluations will be performed prior to initial assignment, at least annually thereafter, at employment termination, after emergencies, and when signs and symptoms of ethylene oxide exposure are apparent or when an employee wants medical advice on present or past ethylene oxide exposure in regard to childbearing. The medical surveillance record will include at least the following information: name and social security number of the employee, physicians' written opinions, whether the employee has any detected medical condition that would place him or her at increased risk to ethylene oxide exposure, recommended work limitations on the employee or limitations on the employee's use of personal protective equipment such as clothing or respirators, and a statement that the employee has been informed by the physician of the results of the exam and of the medical conditions resulting from ethylene oxide exposure that require fuller explanation or treatment.

Engineering and work practice controls are the primary compliance methods for maintaining a hazard free environment, with respirators serving only as a supplement. Employees wearing respirators or subject to the possibility of wearing a respirator must comply with the requirements of the Medical University Respiratory Protection Program which requires pulmonary lung function testing and formal fit-testing.

Ethylene oxide is subject to the Hazard Communication Standard. Material safety data sheets must be available to employees in the work area. Employee information concerning the nature of the hazard, approved operating procedures, protective clothing and equipment availability and use, and emergency procedures must be provided upon initial assignment to the work area, as well as annually or when a new work practice is introduced.

Regulated ethylene oxide areas must have signs posted that read as follows: "Danger. Ethylene Oxide; Cancer Hazard and Reproductive Hazard. Authorized Personnel Only. Respirators and Protective Clothing May Be Required to Be Worn in This Area."

In compliance with OSHA requirements for an Emergency alarm as specified in section 29 CFR Part 1910.1047, the Medical University of South has installed a continuous air monitoring system in sterile processing. The air monitoring system selected is the EO Eagle (Steris) which is an advance microprocessor controlled instrument utilizing gas chromatology for the analysis of ethylene oxide (ETO). The EO Eagle continuous monitoring system was installed to provide regulated ETO area air sampling data and to alert employees of potential ETO exposures. This system if in alarm will constitute emergency situation and employees will follow the steps outlined on page 7 of the Medical University of South Carolina "Ethylene Oxide Management Plant."

**PROTOCOL FOR LOADING AND UNLOADING  
ETHYLENE OXIDE STERILIZER  
(Model # 3017)**

1. Load sterilizer and lock door.
2. Start sterilizer and leave workroom until cycles are complete. (approximately 4 hours 15 minutes)
3. After completion of cycles, crack door 2" and leave room for 15 minutes.
4. Then fully open door and transfer treated articles from sterilizer to aerator, wear a pair of impermeable gloves. (Butyl Rubber.)
5. Transfer treated loads quickly, to reduce the duration of exposure.
6. Pre-plan; clear area ensuring unobstructed path for maneuvering the carts.

## **PRECAUTIONS FOR SAFE USE, HANDLING, AND STORAGE OF ETHYLENE OXIDE**

- A. Ethylene oxide is a flammable liquid, and its vapors can easily form explosive mixtures in air.
- B. Ethylene Oxide must be stored in cool (below 85 degrees F.), well-ventilated areas, away from heat, sparks, flames, strong oxidizers, alkalines, and metals such as copper, silver, and their alloys.
- C. Use only non-sparking tools when working in the ethylene oxide regulated area.
- D. No food or beverages are allowed in the ethylene oxide sterilization area.
- E. Employees working in the ethylene oxide sterilization area should know where emergency equipment is located (fire extinguishers and emergency showers) and how to operate it.

### **FIRST AID PROCEDURES FOR ETHYLENE OXIDE**

- A. Eye Exposure: If ethylene oxide gets into the eyes, wash eyes immediately with copious amounts of water (at least 15 minutes). (Obtain medical attention after applying water). Do not wear contact lenses when working in ETO areas.
- B. Skin Exposure: If ethylene oxide gets on the skin, immediately wash with copious amounts of water (at least 15 minutes). (Obtain medical attention after applying water). If ethylene oxide contaminates clothing or shoes, remove immediately. Thoroughly wash contaminated clothing before reusing. Contaminated leather shoes or other leather articles should not be reused.
- C. Inhalation: If large amounts of ethylene oxide are inhaled, the exposed person must be moved to fresh air at once. If breathing has stopped, perform cardiopulmonary resuscitation. Keep the affected person warm and at rest. Obtain medical attention at once.
- D. Swallowing: If ethylene oxide has been swallowed, give person large quantities of water immediately. After the water has been swallowed, try to get the person to vomit by having him,

or her, touch the back of the throat with his, or her, finger. Do not make an unconscious person vomit.

### **EMERGENCY SITUATIONS**

In the event of an uncontrolled release of ethylene oxide into the work area, the following action will be taken:

1. Evacuate the area.
2. Notify the Engineering & Facilities Trouble Desk (Call 2-4119) which will notify trained maintenance personnel and the appropriate Occupational Safety and Health Emergency Response Team member.
3. Employees engaged in correcting emergency conditions will wear respirators until the emergency is controlled.
4. Do not re-enter the area until reentry is cleared by the Occupational Safety and Health Emergency Response Team member.