

Ethylene Oxide

Training on the hazards of ethylene oxide (EtO) in the workplace



Developed by the Division of Occupational Safety & Health (DOSH)
for employee training

October, 2009

Ethylene Oxide

What this training will cover:

- Health and fire hazards of ethylene oxide
- How you can be exposed to ethylene oxide
- How we control your ethylene oxide exposure
- How to protect yourself from ethylene oxide
- Use of respirators
- Medical surveillance & medical removal
- DOSH rules on ethylene oxide

“You are being given this training because you may be exposed to ethylene oxide at work. This training is done to meet the Dept. of Labor & Industries – Division of Occupational Safety & Health (DOSH) training regulations on ethylene oxide and to make sure you are protected from any harm from exposure to ethylene oxide. You will also be given refresher training annually.”

What is Ethylene Oxide (EtO)?

- A colorless gas above 51°F, liquid below 51°F
- Ether-like, sweet odor at toxic levels
- Highly flammable & explosive
- Highly reactive, penetrating
- Heavier than air



Charging sterilizer with EtO

Other names for ethylene oxide:

- 1,2-epoxyethane
- oxirane
- dimethylene oxide
- ethene oxide

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“Ethylene oxide or “EtO”, is a colorless gas at room temperature or colorless liquid below 51°F. It is soluble in water and organic solvents. It is usually stored as a pressurized or refrigerated liquid; at room temperature and pressure, it rapidly evaporates.

“It has a sweet, ether-like odor at high (toxic) air concentrations. Odor is not a reliable indicator of ethylene oxide's presence and does not provide adequate warning of hazardous concentrations because dangerous exposures and symptoms may occur at levels too low to smell. We will discuss this further later in the training.

“Both the gas and liquid are potential fire and explosion hazards. EtO liquid is extremely flammable; it may be ignited by heat, sparks, or flames; vapors may travel to a source of ignition and flash back to a leak or open container; it can accumulate static charge by splashing or agitation. EtO can burn in sealed containers if ignited. Explosions will occur if gas or vapors are ignited in a confined area.

“Ethylene oxide is highly reactive, reacting with many other compounds, and highly penetrating.

“EtO gas is heavier than air and can cause asphyxiation in enclosed, poorly ventilated, or low-lying areas.

“If your clothing or skin is contaminated with ethylene oxide liquid or solution, you can secondarily contaminate others by direct contact or through off-gassing.

Uses of Ethylene Oxide

- Sterilant for medical equipment and supplies
- Fumigant for certain agricultural products
- Sterilant for spices & cosmetics
- Intermediate in chemical manufacturing of antifreeze and other products.



EtO medical sterilizers

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EtO is as a fungicide and fumigant for controlling insects in some stored agricultural products, tobacco, furs, and bedding, to sterilize surgical and other medical equipment in hospitals and veterinarian clinics and to treat processed seasonings and commercial foods during processing, handling, and storage.

Ethylene oxide is also an important industrial chemical mostly used as a chemical intermediate in the production of other chemicals. It is used primarily to synthesize ethylene glycol, a major ingredient in antifreeze, polyesters, and many other products. This use is in chemical production facilities located primarily outside the state of Washington.

This training will primarily cover its use as a medical equipment sterilant in the healthcare industry

Ethylene Oxide Is Highly Toxic

- Cancer hazard
- Reproductive hazard
- Mutagenic hazard
- Neurotoxic hazard

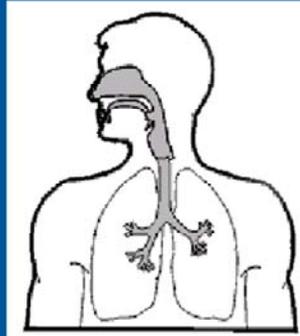
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“Ethylene oxide is VERY TOXIC and may be fatal if inhaled in high concentrations. It is a cancer and reproductive hazard; it can also cause genetic damage (mutagenic) and affect your nervous system (neurotoxic). We will discuss these in more detail when we talk about the health effects from ethylene oxide overexposure.”

Health Effects of EtO Exposure

Inhalation of large amounts of EtO can cause:

- Respiratory irritation and lung injury
- Headache
- Nausea, vomiting
- Diarrhea
- Shortness of breath
- Cyanosis - low blood oxygen levels
- Neurological dysfunction



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“Acute effects from breathing EtO gas include respiratory irritation (nose, throat, and respiratory tract) and lung injury; headache; nausea; vomiting; diarrhea; shortness of breath; and cyanosis.

“Severe overexposure can cause pulmonary edema (fluid in the lungs), which may not occur until several hours after exposure. Pulmonary edema can be fatal; if you have difficulty breathing after a severe overexposure to EtO, you should go to a hospital.

“Exposure to higher levels may cause drowsiness, loss of consciousness, convulsions, seizure and coma.

Health Effects of EtO Exposure

Chronic exposure to EtO can cause:



- Cancer - leukemia
- Reproductive effects
- Mutagenic changes
- Neurotoxicity
- Occupational asthma (reactive airway syndrome)
- Sensitization

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“Both human and animal studies show that EtO is a carcinogen that may cause leukemia and other cancers, and may increase the risk of cancer in workers who are exposed to it.

“It is also linked to reproductive effects. Women exposed to EtO during pregnancy may have a higher rate of spontaneous abortion (miscarriage). (In animal studies, it also damages the sperm and testicles of male animals, reducing their fertility; it is not known whether it can affect men the same way.)

“It may be mutagenic, which means it may cause genetic mutations or changes (chromosomal damage). These mutations can cause birth defects or other problems in following generations or may lead to cancer in the exposed person.

“It may have nervous system effects and cause peripheral nerve damage (i.e., those outside the brain and spine) in your feet and legs; peripheral paralysis; muscle weakness in the extremities; irregular gait; incoordination; and impaired thinking and memory. There is also some evidence that EtO may cause chronic effects on the brain, resulting in short-term memory loss and difficulty concentrating.

“Occupational (non-allergic) asthma. Symptoms may include coughing, wheezing, shortness of breath, and possible scarring of the lungs (pulmonary fibrosis), resulting in impaired lung function.

“EtO can cause severe skin irritation upon prolonged or confined contact.

Health Effects of EtO Exposure

Skin effects from exposure to ethylene oxide:

- Severe irritation
- Allergic contact dermatitis
- Second degree burns
- Frostbite
- Sensitization



Ethylene oxide dermatitis

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“Liquid EtO or EtO mixed with water is extremely irritating, and prolonged contact can burn your skin or cause an allergic skin reaction (allergic contact dermatitis). When your clothing (especially cloth or leather) becomes soaked with EtO, the clothing holds the EtO against your skin and can actually make the damage worse. The degree of irritation depends on concentration and length of exposure.

“EtO gas may produce irritation, mainly on wet or oily parts of the skin. Traces of gas in gloves or clothing may cause burns. Residues on sterilized face masks, gloves, and surgical gowns have also been reported to cause severe irritation. Some symptoms you may experience are tingling and chilling sensations, swelling, redness, hives, rash, and blisters. Effects on your skin may not appear until 1-5 hours after you are exposed.

“Frostbite and blistering of the skin from contact with liquefied ethylene oxide can occur. Ethylene oxide is usually stored as a pressurized or refrigerated liquid. At room temperature and pressure, liquid EtO rapidly evaporates from skin and may cause frostbite. Blisters may develop later.

“EtO is a skin sensitizer. Once you become sensitized to a compound, subsequent smaller exposures can cause even more severe skin reactions and irritation.

Health Effects of EtO Exposure

Eye effects from exposure to ethylene oxide:

- Irritation
- Corneal burn
- Cataracts



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“Exposure to high levels of EtO gas may cause corneal burns and cataracts (there is evidence suggesting that long-term exposure to high levels of ethylene oxide can result in cataracts in humans). In liquid form, ethylene oxide can cause eye irritation and injury to the cornea.

“Contact lenses shouldn’t be worn when exposed to EtO levels above the action level. If you do choose to wear them, you should use chemical-resistant goggles.

How can you be exposed?

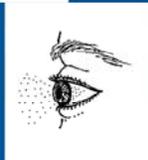
Routes of Exposure



- Inhalation



- Skin contact



- Eye contact

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“Most ethylene oxide exposures occur by inhalation or skin contact.

“You can breathe in EtO when it is released into the air. The gas is readily absorbed by the lungs.

“Skin contact can be from concentrated solutions of ethylene oxide, liquid ethylene oxide, or high vapor concentrations. Exposure can also occur from prolonged skin contact with dilute solutions of ethylene oxide, for example from contaminated clothing.

“Eye contact can occur from exposure to high levels of the gas or to liquid ethylene oxide.

“Ingestion is unlikely to occur because ethylene oxide is a gas at room temperature. If it does happen, ingesting EtO can cause gastric irritation and liver injury.

How or When Can You Be Exposed?

In healthcare, you can be exposed during:

- Unloading of sterilized or fumigated materials
- Direct handling of sterilized materials (off-gassing)
- Cylinder changing



Removing sterilized items

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“Most of your exposure is likely to occur when you open a sterilizer door and transfer materials to an aerator. The highest exposure occurs when the sterilizer door is first opened. It is important to minimize your exposure at these times.

How or When Can You Be Exposed? (con't.)

You can also be exposed from:

- Inadequate ventilation of the aerator
- Improper or incomplete aeration of the ethylene oxide chamber after the sterilizing process
- Accidental leakage from poor gas-line connections



Aerator

The following operations/work areas where you may be exposed to EtO are:

[List the operations in employee work areas where EtO is present.]

EtO Permissible Exposure Limits (PELs)

8-hour time-weighted average exposure limit:
one part per million (ppm) in the air

Short-term exposure limit (STEL):
five parts per million (ppm) in the air

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“DOSH has two permissible exposure limits (PELs):

- 1) The 8-hour “time-weighted average (TWA)” permissible limit is 1 part per million. This is the maximum concentration of ethylene oxide allowed in the air you breathe at work averaged over 8 hours.
- 2) The “short term exposure limit (STEL)” is 5 ppm. This is the maximum concentration of ethylene oxide allowed in the air you breathe at work in any 15 minute interval.

“I’ll explain the term ‘parts per million’ further. The concentration of ethylene oxide and many other gases are described in units of parts per million. Imagine if you can, 1 million bubbles floating in the air in the Astrodome, all yellow except for 1 blue one; that represents 1 bubble (part) in a million total.

“Both limits are a very small amount of ethylene oxide in the air. As was mentioned earlier, EtO has a faint, sweet, ether-like odor, but most people cannot smell it until the amount in the air is far above a safe concentration, hundreds of times above the permissible limit (around 700 ppm); therefore, you can be overexposed without knowing it. So you can’t rely on your sense of smell to warn you that you are being overexposed.

EtO Permissible Exposure Limits (PELs)

ACTION LEVEL:

0.5 parts per million in the air
as an 8-hour TWA

Levels of EtO in the air above the action level triggers the following requirements:

- air monitoring
- medical examinations
- labeling
- employee information & training

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“The Action Level is 0.5 parts per million in the air, half of the 8-hour TWA PEL of 1 ppm. It is the threshold, or minimum level, at which certain activities and procedures - such as air monitoring, medical examinations, labeling, employee information and training - must be implemented as preventive and protective measures.

Warning labels on containers are required:

- On all containers whose contents may cause exposure above action level or STEL
- On containers of EtO during transport



BREATHING AIRBORNE CONCENTRATIONS OF ETO IS HAZARDOUS

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“All containers of EtO whose contents are capable of causing exposure above the action level (0.5 ppm) or above the STEL (5 ppm) must be labeled, tagged, or marked with these warnings.

“The labels must not have any statements that contradict or detract from the labels' hazard warning.

“EtO is highly flammable and should be kept in a tightly covered container, and in a cool, well-ventilated area away from any type of ignition source.

“Warning labels must remain on containers of EtO when they are transported.

[Employer: Note exemptions

- ***Reaction vessels, storage tanks, and pipes or piping systems are not considered to be containers and do not require labeling.***

- ***Labeling requirements do not apply when EtO:***

- ***Is used as a pesticide as defined by the Federal Insecticide, Fungicide, and Rodenticides Act (7 U.S.C. 136 et seq.);***

AND

- ***Meets the Environmental Protection Agency labeling requirements for pesticides.***

Exposure Control Areas



- Exposure control areas are areas where levels of EtO exceed or could exceed the permissible exposure limits (PELs)
- Warning signs must be posted at access points to exposure control areas

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“The areas where ethylene oxide levels exceed or could exceed the permissible exposure limits are called ‘exposure control areas.’ These areas may change depending on the type of work that is done and the measured level of ethylene oxide in the air. The boundaries of the exposure areas are marked in the following way: ”

[Instructor: describe the method used at your work place, e.g. permanent or temporary enclosures, caution tape, ropes, painted lines on surfaces, or other materials to visibly distinguish exposure control areas or separate them from the rest of the workplace.]

“Warning signs must be posted at access points to exposure control areas. They should be kept in an easily read condition (clean, well-lit).

Exposure Control Areas (cont.)

- Only authorized personnel are permitted entry
- Appropriate respirators available for use
- Cannot eat, drink, smoke, chew gum or tobacco or apply cosmetics or store food, beverages or cosmetics in the area



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“Only authorized persons with appropriate training are allowed to be in exposure control areas. **[Instructor: Tell class who authorized persons are]**

“Employees entering exposure control areas may need to wear appropriate respirators; these will be provided to you. (primarily, if there is a leak or spill of EtO)

The following areas are Exposure Control Areas:

[List here all worksite exposure control areas.]

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[Employer: list or describe the specific areas where levels of EtO exceed or could exceed the permissible exposure limits (PELs)]

Exposure Control Plan

We have a exposure control plan to protect you from exposure to EtO. It includes:

- A schedule for periodic leak surveys
- procedures for emergency actions in the event of a release of EtO
- an employee alarm system
- written copy for you to view



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[Employer: Optional Slide. An Exposure Control Plan is required when employee exposure monitoring results are above either of the two permissible exposure limits (PELs)]

“ We have a written exposure control plan that describes the methods we will use to reduce your exposure to EtO below both the 8-hour TWA_8 and the STEL PELs. A copy of the plan is located at (specify where or hand out)

Exposure to EtO can be reduced by:

- Engineering Controls
- Work Practices
- Personal Protective Equipment
- Respiratory Protection

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“Engineering controls and work practices are considered first rather than personal protective equipment to prevent overexposure. Respirators, gloves, and protective clothing are used when controls aren’t feasible or if they can't completely remove the hazard. We will go over these in greater depth in the following slides.”

Engineering control examples for EtO

- EtO is only used for materials which are sensitive to heat or moisture and cannot be steam sterilized.
- Sterilizers and aerators are located so that personnel other than those required by the operations are not exposed.
- Double-tank system with a T-valve are used to prevent the release of any EtO during the switchover to a new tank.

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Note: other methods are described in Appendix A of the EtO standard (link on the last slide)

More engineering control examples for EtO

- Exhaust ventilation system (hood) are installed to protect against accidental releases
- Liquid/gas separator and local exhaust ventilation are used to control high levels of EtO at the point of waste discharge
- Specialized gas-line connections to minimize EtO leakage during use and during change-out of EtO cylinders
- Sterilizer/aerator door gaskets, valves, and fittings replaced when necessary

We use the following controls to reduce the amount of ethylene oxide you are exposed to:

[List company controls here]

Recommended Work Practices for EtO

For EtO fire hazard:

- Keep EtO containers tightly sealed in a cool, well-ventilated area
- Keep away from ignition source
- Keep areas where EtO is used clear of other combustible materials

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“EtO is highly flammable and should be kept in a tightly covered container, and in a cool, well-ventilated area away from any type of ignition source.

More recommended work practices for EtO

- Keep sterilizer door sealed until the sterilization is completed and the EtO has been removed from the chamber
- Keep sterilized materials as far away from your breathing zone as possible
- Avoid handling materials before they are aerated, by keeping materials in one container throughout the procedures
- If you must handle individual items before aeration, use disposable impermeable gloves

Required work practices at this worksite

[List worksite-specific work practices that reduce or control exposures here.]

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[Employer: list or describe the practices you require.]

Our Hazard Communication Program

All employees are trained on the hazards of the specific chemicals to which they use or are exposed.

Material safety data sheets (MSDS) provide information on product ingredients and hazards of chemicals.

All employees have access to the MSDSs.

All containers of chemicals are labeled with the name and hazards of the contents.

Material Safety Data Sheet

Chemical Name: Ethylene Oxide
Weight By %: 84 to 97%
Chemical Family: Epoxide
Formula: (CH₂)₂O
Molecular Weight: 44.06 gms/mole
CAS Number: 75-21-8
CAS Name: Oxirane
Synonyms: EO, EIO, Dihydroxirene, 1-2 Epoxyethane, Dimethylene Oxide, Oxane, Oxirane, Alkene Oxide, Alpha/Beta-Oxidoethane, Oxacyclopropane.
Product Uses: Chemical intermediate for production of antifreeze, polyester resins, non-ionic surfactants and specialty solvents, sterilizing agent for controlling microorganisms in health care applications, fumigant for controlling insect infestation in whole and ground spices and cosmetics.
Exposure Limits:
NIOSH REL: Ca TWA <0.1 ppm (0.18 mg/m³) C 5 ppm (9 mg/m³) [10-min/day] See Appendix A
OSHA PEL: [1910.1047] TWA 1 ppm 5 ppm [15-minute Excursion] IDLH Ca [800 ppm] See: 75218 Conversion 1 ppm = 1.80 mg/m³
Physical Description
Colorless gas or liquid (below 51°F) with an ether-like odor.
MW: 44.1 BP: 51°F FRZ: -171°F
Sol: Miscible VP: 1.46 atm IP: 10.56 eV
RGasD: 1.49 Sp.Gr: 0.82 (Liquid at 50°F)
Fl.P. NA (Gas) -20°F (Liquid) UEL: 100% LEL: 3.0%
Flammable Gas
Incompatibilities & Reactivities
Strong acids, alkalis & oxidizers; chlorides of iron, aluminum & tin; oxides of iron & aluminum; water

Sample MSDS

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[Employer: Explain the details of your hazard communication program, which is required by another chapter, Employer chemical hazard communication, WAC 296-800-170]

Detection and monitoring of ethylene oxide

We conduct air monitoring by attaching air sampling devices to employees exposed to ethylene oxide.



You or your representatives are allowed to observe the monitoring.

EtO sampling dosimeter

We must provide written notification of monitoring results to you within five business days after we receive them.



EtO direct reading instrument

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“We are required to perform air monitoring when ethylene oxide is first used in the workplace, at least every 6 months if the levels are between 0.5 ppm and 1 ppm, every 3 months if the levels are above 1 ppm, and as often as necessary if the short term levels are above 5 ppm. You or your designated representatives are allowed to observe this monitoring.”

[Employer: Air monitoring results can be kept in a accessible location, sent by email or passed out as a handout. The results should be compared to the action limit and the Permissible Exposure Limits (PEL).]

Notification of results

If air monitoring results are above either the TWA_8 or STEL permissible exposure limit (PEL), we will provide you with written notification of the following within fifteen business days after we receive the results :

When monitoring results are:

$TWA_8 > 1 \text{ ppm}$
or
 $STEL > 5 \text{ ppm}$

Corrective actions being taken and a schedule for completion;
and
Any reason why exposures cannot be lowered to below the PELs.



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[Employer: Air monitoring results can be kept in a accessible location, sent by email or passed out as a handout. The results should be compared to the action limit and the Permissible Exposure Limits (PEL).

[Tell employees how you provide air monitoring results to them.]

Detection and monitoring of ethylene oxide

We also use an ethylene oxide detector system and room monitors to detect any leakage of gas.



EtO Room Monitor



EtO Monitoring Station

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[Employer: this is a good place to go over the alarm system.]

Detection and monitoring of ethylene oxide



We also monitor for leaks at gas-line connectors.

We keep a written log for any detected leak and any service done on an ethylene oxide chamber.

These are the results of our air monitoring:

[List results here.]

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“We are required to perform air monitoring when ethylene oxide is first used in the workplace, at least every 6 months if the levels are between 0.5 ppm and 1 ppm, every 3 months if the levels are above 1 ppm, and as often as necessary if the short term levels are above 5 ppm. You or your designated representatives are allowed to observe this monitoring.”

“Air monitoring may be suspended after results are consistently below the action level.

Personal Protective Equipment

When working with EtO you may need to wear:

- A respirator assigned to you
- Eye protection either through the use of a full-facepiece respirator, or chemical safety goggles
- Skin protection by use of chemical protective gloves, coveralls, boots and/or other protective clothing

When is a respirator needed?

You will need a respirator for protection from ethylene oxide if the PEL is exceeded. This can occur in the following situations:

- During installation or implementation of feasible engineering controls and work practices;
- During maintenance, repair, and operations when engineering and work practice controls are not feasible;
- When engineering and work practice controls are not currently available to reduce exposures to or below the PEL; and
- During emergencies (leaks or spills of EtO)

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[Instructor: Show or describe the respirators used at the specific jobsite or task. Training on the use of these respirators can be done here or separately.]

“Respirators are required if the amount in the air is more than the Permissible Exposure Limit (PEL).” TWA $\frac{1}{8}$ of one part per million or STEL of 5 parts per million.

Respirators for EtO protection

Because of EtO's poor warning properties, a supplied air respirator is the only acceptable respirator suitable for protection.

Either an airline respirator or self-contained breathing apparatus (SCBA) must be used.



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Normally, respirators would only be required in the case of an EtO leak or spill. Because the permissible exposure limit is so low, any other type of respirator is not protective enough. An airline respirator provides fresh clean air to a facepiece through a hose from an air compressor. An SCBA or tank type respirator provides up to 60 minutes of fresh air from a back-pack tank of compressed air. A person is much more mobile with an SCBA.

Using a respirator

To prevent inhaling ethylene oxide, make sure your respirator fits properly before entering an area where ethylene oxide gas exists.

If you think your respirator is leaking, leave the area immediately and have it re-fitted, repaired or replaced.

If you know or believe you have inhaled ethylene oxide, let your supervisor know immediately.

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“As we mentioned earlier, ethylene oxide has a sweet ether-like odor which most people can detect only at a level far above the permissible limit. If you can smell it, it probably means you have been overexposed to it. EtO can be detected by odor only when it has already reached dangerous concentrations. If you smell it while wearing your respirator, then your respirator is leaking and either needs to be fit properly or the reason for the leak determined. If you develop any symptoms commonly associated with ethylene oxide exposure, we will make a medical exam available to you.”

Personal Protective Equipment

The following PPE provides at least 4 hours of protection:

- Butyl rubber gloves, suits, and boots
- Teflon™ gloves, suits, and boots
- PE/EVAL - 4H™ and Silver Shield™ brand gloves



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- This type of PPE would normally be required only in the case of a spill or leak of EtO and would be used with an SCBA. In an extreme case where a large amount of EtO was spilled the following emergency protective suits are recommended: Barricade™ coated suits, Responder™ suits, Trelchem HPS™ suits or Tychem 10000™ suits. These suits provide at least 8 hours of protection.

Spills And Emergencies

If EtO gas is leaked or liquid EtO is spilled, we will do the following :

- Evacuate persons not wearing protective equipment from area of leak until clean-up is complete.
- Remove all ignition sources.
- Ventilate area of leak to disperse the gas and to allow liquid EtO to evaporate.
- Stop flow of gas. If a cylinder is leaking and can't be stopped in place, we will move it to a safe place in the open air, and repair the leak or allow cylinder to empty.

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[Instructor: Refer to your Emergency Response plan and let employees know how to access it during an emergency.]

How to Protect Yourself

In the case of a spill or release of EtO:

- Leave the area immediately
- Do not attempt to clean up the spill
- Secure the area to prevent others from entering
- Notify your supervisor

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“If ethylene oxide spilled on you, or if you think you may have inhaled ethylene oxide in the incident, we will make a medical exam available to you.”

Our EtO spill & emergency procedures

[Detail your emergency response procedures here:]

Medical Evaluations

What medical evaluation is needed?

A medical exam is made available to you before you start working around ethylene oxide.

Annual medical exams are made available to you if you are or may be exposed to ethylene oxide above 0.5 ppm, 30 days or more per year.

The medical exam includes a complete physical exam and blood tests.



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“Medical monitoring is required if the EtO level of 0.5 ppm is or may be exceeded more than (30) days per year. The purpose of the medical exam is to make sure you are not having any health problems from inhaling too much ethylene oxide. We are required to make available to you this medical exam even if you wear a respirator. You can only decline the exam by signing a “declination” form. We have passed out a copy of what must be included in the medical evaluation.”

Medical Evaluations (con't.)

Medical evaluations will also be made available to you:

If you have been exposed to EtO during an emergency situation.

If you want medical advice on EtO exposure and reproductive health.

Whenever you develop signs and symptoms commonly associated with ethylene oxide.

Medical Evaluations (con't.)

Medical evaluations will be provided at no cost to you. This includes travel costs and wages associated with any time spent obtaining the medical evaluation.

The medical evaluations will be available at reasonable times and places.

When employment with exposure ends, you are entitled to a medical evaluation if you have not had an evaluation within the six-month period before exposure ends.

Results of the Medical Evaluation

We must obtain the licensed health care provider's written opinion for the medical evaluation and make sure that you receive a copy within five business days after we receive the written opinion.



Temporary Medical Removal

If abnormalities show up in the blood tests, the doctor may ask for additional tests and temporary removal from exposure.

In that case, we will find other work for you in an area where you are not exposed to ethylene oxide.



Permanent Medical Removal



Permanent medical removal may be required if you have experienced serious health effects of ethylene oxide exposure.

Depending on your medical condition, you may not be able to return to your original position.

If the doctor recommends permanent job removal, we will seek a job transfer for you.

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“As stated earlier, exposure to ethylene oxide can result in serious health effects. In these cases, a doctor may recommend permanent removal from a job where you are exposed to ethylene oxide.”

Our Medical Evaluation Program

[Describe details of worksite specific medical evaluation program here.]

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[Instructor: describe medical evaluation program here including how to obtain evaluations in the event of an emergency exposure.]

Medical and Air Monitoring Records

You have the right to see any of your medical records related to ethylene oxide.

You also have the right to see results of any air sampling for ethylene oxide we have done.



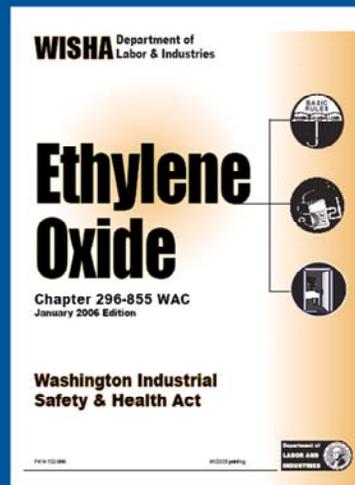
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“Medical records are kept at [name location] and you can see them.” **[Employer: If you have any records of air samples taken at the job site, inform your employees where these results can be viewed or post them, or give copies to affected employees.]** We keep medical records for duration of employment plus 30 years and air sampling records for 30 years from creation of the record.

Ethylene Oxide Regulations

The DOSH ethylene oxide regulations contains much more information in detail.

A copy of this standard is available.



Links to handouts:

The Substance safety data sheet, [WAC 296-62-07383 Appendix A](#)

The Substance technical guidelines, [WAC 296-62-07385 Appendix B](#)

Medical Surveillance guidelines [WAC 296-62-07387 Appendix C](#)

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“The points we have covered here are required in this standard. We have given you copies of information about ethylene oxide which covers the health effects of ethylene oxide, what to do in an emergency and other requirements of the standard plus additional information about the physical characteristics of this chemical. You can also get a copy of the standard at the following location:”

[Instructor: specify location]