



Toxic Gases

Principal Investigator (PI) Approval is Required Prior to Performing this Procedure

Description

This standard operating procedure outlines the handling and use of toxic gases. Review this document and supply the information required in order to make it specific to your laboratory. In accordance with this document, laboratories should use appropriate controls and personal protective equipment when handling toxic gases.

Potential Hazards

Check the Safety Data Sheet (SDS) of the gas for exposure limits and to determine inhalation hazards and for skin warnings to determine skin hazards. The SDS will also provide information on other hazards such as whether the gas is flammable, corrosive, etc.

All toxic gases will be supplied in compressed gas cylinders, and the [Compressed Gases SOP](#) must be followed. Some toxic gases will also be flammable, pyrophoric, corrosive, or water reactive. In those cases the SOPs for those physical hazards must also be followed.

Engineering Controls

All toxic gas cylinders (greater than lecture bottle size) with a NFPA fire diamond health hazard rating of 3 or 4 and cylinders of gases that have a health hazard rating of 2 without physiological warning properties located in a laboratory unit shall comply with the following as a minimum:

1. Keep cylinders in approved continuously mechanically ventilated gas cabinets.
2. Equip with a continuous gas detection system. (Note: Gas detection may not be required where the physiological warning properties for the gas are at a level below the accepted permissible exposure level or ceiling limit of the gas.)
3. The gas detection system shall initiate a local alarm that is both visible and audible.

Any use of Toxic Gas in quantities above UM Maximum Allowable quantities (refer to the [Compressed Gas Guideline](#)) in any size cylinder may be required to have the following upon consultation with your ESH representative:

1. Keep cylinders in approved continuously mechanically ventilated gas cabinets.
2. Equip with a continuous gas detection system. (Note: Gas detection may not be required where the physiological warning properties for the gas are at a level below the accepted permissible exposure level or ceiling limit of the gas.)
3. The gas detection system shall initiate a local alarm that is both visible and audible.
4. The gas detection system shall transmit a signal to a constantly attended control station.

5. Activation of the gas detection system shall automatically shut off the flow of gas related to the system being monitored.
6. The gas detection system shall detect the presence of gas at or below the MIOSHA permissible exposure level or ceiling limit of the gas.
7. Emergency power must be provided for the exhaust ventilation, gas detection system and alarm systems when required.
8. Treatment systems for the exhaust.
9. Sprinkler protection for gas cabinets and other protective features.

Contact EHS at (313) 593-4914 to request an evaluation to determine what controls may be necessary.

Work Practice Controls

- Designate areas where toxic gases are stored and used.
- In addition to the [Hazard Guideline for Compressed Gas Use](#), review the [additional requirements for toxic, pyrophoric and flammable gases](#).
- Purchase toxic gases in the lowest concentration and in the smallest cylinder that makes sense for the lab.
- Check all fittings for leaks.
- Keep valve closed and valve cover in place when gas is not in use.
- All compressed gas cylinders shall be legibly marked by stenciling or stamping with at least the chemical name or commonly accepted name of the material contained. In addition, cylinders should bear the approved markings of the Department of Transportation stamped in the metal at the top of the cylinder.

Personal Protective Equipment (PPE)

Engineering controls will provide the primary means of minimizing employee exposure to toxic gases. Other PPE may be necessary during cylinder change out for gases that are also corrosive or pyrophoric. Contact EHS at (313)593-4914 for an evaluation. As with all lab work, wear a fully buttoned lab coat, safety glasses, standard nitrile laboratory gloves, clothing covering the legs, and closed-toed shoes.

Transportation and Storage

- Cylinders (full or empty) shall be secured by chains, straps, or other sturdy tiedowns during storage and transport.
- Cylinders shall be grouped by type of gas and the groups segregated as to compatibility.
- Full cylinders shall be separated from empty cylinders within the storage area.
- A "Just in Time" delivery system should be utilized to minimize quantities on hand.
- Flammable gases shall be separated from oxidizing gases by 20 feet when in storage.
- Cylinders shall not be stored at temperatures above 125 °F or in direct sunlight, or outside of the temperature range specified by the manufacturer.
- Cylinder valves shall be kept closed when not in use.
- Removable caps shall be kept on cylinders at all times, except when cylinders are in use.
- Cylinders shall be protected against tampering and damage.
- Cylinders shall not be stored near combustible materials.
- Cylinders shall not be refilled.
- Cylinders shall not be used or stored in cold rooms or other unventilated enclosures.

Waste Disposal

The compressed gas cylinder, including any unused gas, must be returned to the vendor from which the cylinder was purchased. Contact EHS at (313) 593-0921 to arrange for the removal of lecture bottles that cannot be returned to the supplier. If the cylinder is empty, write "empty" on the outside of each cylinder.

Exposures/Unintended Contact



If the employee is in need of emergency medical attention, call 911 immediately.



Be prepared to provide them with a copy of the SDS so that medical personnel are aware of the material(s) involved and can take precautions to protect themselves.

Report all work related accidents, injuries, illnesses or exposures to WorkConnections within 24 hours by completing and submitting the [Illness and Injury Report Form](#). Follow the directions on the WorkConnections website [Forms Instructions](#) to obtain proper medical treatment and follow-up.

Complete the [EHS Laboratory Incident and Near-Miss Report](#) form.

TREATMENT FACILITIES:

Midwest Medical Center -- *Campus Employees (including student employees)*

Mon-Fri 7:30 am - 4:30 pm
9301 Middlebelt Road
Romulus, MI 48174
Phone: 734-941-1000

After hours - go to:

Midwest Medical Center

Open 24/7
4700 Schaefer
Dearborn, MI 48126
Phone: 313-581-2600

Henry Ford Medical Center-Fairlane -- *University students (non-life threatening conditions)*

19401 Hubbard Drive
Dearborn, MI 48126
Phone: 313-928-8278

Click [here](#) for more information

Emergency Release Procedure

- When a release occurs, ***personal safety should always come first.***
- Alert and clear everyone in the immediate area where the release occurred.

For any release of uncontained gas:

- Attend to injured or contaminated persons and remove them from exposure.
- Alert people in the laboratory to evacuate.
- If the gas is flammable, turn off ignition and heat sources if appropriate. Don't light Bunsen burners or turn on other switches.
- **Call Public Safety at (313) 593-5333 or (911 from a campus phone) immediately for assistance.**
- Close doors to affected area.
- Post warnings to keep people from entering the area.
- Have person available that has knowledge of incident and laboratory to assist emergency personnel.

Additional Spill Links:

- [Chemical Spill Control Information](#)

Report all emergencies, suspicious activity, injuries, spills, and fires to Public Safety by calling at (313) 593-5333 or 911 from a campus phone. Register with the University of Michigan-Dearborn [Emergency Alert System](#).

Training of personnel

All person are required to attend initial (first-time) training in class (go to <http://www.umd.umich.edu/training/> to register). Refresher training can be completed via [MyLINC](#), the **Comprehensive Laboratory Safety** session (BLS009 or equivalent). Furthermore, all personnel shall read and fully adhere to this SOP when handling any toxic gas.

Certification

I have read and understand the above SOP. I agree to contact my Supervisor or Lab manager if I plan to modify this procedure.

| Name | Signature | UM ID # | Date |
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Principal Investigator _____

Revision Date _____