



## 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 [OSEH Compressed Gas Guideline](#)) in any size cylinder may be required to have the following upon consultation with Environment, Health and Safety (EHS):

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 (810) 766-6763 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 [OSEH 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 changeout for gases that are also corrosive or pyrophoric. Contact EHS at (810) 766-6763 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 (810) 766-6763 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 and place in a cardboard container and attach a completed [hazardous waste manifest](#).

## 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.

Contact EHS for advice on symptoms of chemical exposure, or assistance in performing an exposure assessment.

Report all work related accidents, injuries, illnesses or exposures to UM-Flint DPS. Additionally, employees and supervisors must be sure to report the injury to EHS and complete and submit the [Illness and Injury Report Form](#) to WorkConnections within 24 hours. Follow the directions on the WorkConnections website [Forms Instructions](#) to obtain proper medical treatment and follow-up.

If you were involved in or observed an incident or near miss, please complete the [EHS Laboratory Incident and Near-Miss Report Form](#). This will be valuable in improving laboratory safety on UM-Flint campus.

## TREATMENT FACILITIES:

<b><u>MAJOR INJURIES</u></b>	<b><u>MINOR INJURIES –During Business Hours</u></b>	<b><u>MINOR INJURIES –After Business Hours</u></b>
<b>Genesys Hospital</b> One Genesys Parkway Grand Blanc, MI 48439 (810) 606-5710  <b>Hurley Medical Center</b> One Hurley Plaza Flint, MI 48503 (810) 262-9000  <b>McLaren Hospital Flint</b> 401 South Ballenger Hwy Flint, MI 48532 (810) 342-2000	<b>Genesys Occupational Health Network</b> 1460 Center Rd. Burton, MI 48509 (810) 715-4620 Mon. to Fri. 7:30 am to 10 pm Sat. & Sun. Noon to 8 pm  <b>McLaren Flint-Burton OCC Center</b> 1459 S. Center Rd. Burton, MI 48509 (810) 496-0900 Mon. - Fri. 8 am to 8 pm Sat & Sun 10 am to 2 pm	<b>Downtown Flint</b> 420 S. Saginaw St. Flint, MI 48502 (810) 762-1550  <b>Genesys East</b> 1096 S. Belsay Rd, Suite F Burton, MI 48509 (810) 743-3351  <b>Genesys North</b> 4154 W. Vienna Rd Clio, MI 48420 (810) 686-7397  <b>Genesys South</b> 8447 N. Holly Rd Grand Blanc, MI 48439 (810) 603-0856 Mon. - Fri. 6 to 10pm / Sat. & Sun. 1-10pm

Click [here](#) for more information on the UM – Flint Emergency Preparedness and Response Plan.

## 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 University of Michigan-Flint Department of Public Safety (DPS) at 911 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:

- [www.oseh.umich.edu/pdf/chemspil.pdf](http://www.oseh.umich.edu/pdf/chemspil.pdf)
- <http://www.oseh.umich.edu/emer-chemical.shtml>.

Report all emergencies, suspicious activity, injuries, spills, and fires to the UM-Flint Department of Public Safety (DPS) at 911 from any university telephone or (810) 762-3333 from cell phone or non-university telephone. Register with the [University of Michigan Emergency Alert System](#) via Wolverine Access. Also, preprogram the UM-Flint DPS telephone number (810) 762-3333 into your cell phone for quick, easy use.

## Training of Personnel

All personnel are required to complete Laboratory Safety Training. Documentation of the training is required. This training can be accomplished by completing the **Comprehensive Laboratory Safety** session (BLS009 or equivalent) via [MyLINC](#), or UM-Flint EHS on-line training or other equivalent approved by EHS. 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

Principal Investigator \_\_\_\_\_

Revision Date \_\_\_\_\_