

Date: 11/26/07
SOP Number: 0013

Effective: 11/26/07
Review Date: 11/26/13

Developed By: University Department of Safety and Health

Standard Operating Procedure For the Safe Handling and Storage of Poisonous Gases

Purpose

The purpose of this document is to provide standard operating procedures for laboratory personnel when working with poisonous gases.

Standard Operating Procedures (SOP)

Hazard Communication Labeling

Laboratory entrance door must have a label that states the following:

DANGER!
Poisonous Gas
Inhalation Hazard
Authorized Personnel Only

Material Safety Data Sheets (MSDS)/Training

1. Review material safety data sheets (MSDS) prior to working with any poisonous gas. MSDS must be posted on or near the gas cylinder(s) accompanied with this SOP.
2. Emergency spill and safe handling training must be performed prior to working with poisonous gases. Training must be documented. Contact the University Department of Safety and Health to schedule training.

Handling

1. All work with poisonous gases must be conducted in a working chemical fume hood or local exhaust ventilation system to prevent exposure by inhalation (if feasible).
2. The experimental by-products must be treated prior to exhausting into the building laboratory exhaust system. The treatment system must be approved by the Department of Safety and Health prior to implementation. The system must be maintained as designed. All waste generated must be collected and disposed according to the University's waste management plan. The treatment procedure must be posted for all personnel to review.

3. **Poisonous gas cylinders shall be located within a gas cabinet or exhausted enclosure that is connected to the laboratory exhaust system. The gas cabinet or exhausted enclosure design must comply with the current fire code. Contact the Department of Environmental Health and Safety for assistance.**
4. Proper personal protection equipment should be worn at all times to prevent eye and skin contact (i.e. safety glasses; splash shields; gloves; laboratory coat/apron).
5. No work with poisonous gases will be performed alone. A second person familiar with the dangers and emergency procedures for handling these materials must be present at all times within the laboratory while operations are being carried out.
6. Do not drag, roll, slide or drop cylinder. Use a suitable hand truck for cylinder movement. Never attempt to lift a cylinder by its cap.
7. Secure cylinders at all times while in use.
8. Only use approved regulators and valves. **Consult you gas supplier for approved regulators and valves.**
9. Laboratory personnel must draft cylinder change out procedures and submit to the Department of Safety and Health for approval. The procedures must include the following: valve operations, purge process (must include description of exhaust for purging), inert gas purge time, required personal protection equipment, and emergency procedures. Cylinder change out procedures must be posted in the laboratory for all personnel to review and understand. These procedures must be followed by everyone in the laboratory.
10. Once a cylinder has been connected to process, open valve slowly and carefully. If experiencing difficulty operating cylinder valve, discontinue use and contact supplier. Forced freeing of "frozen" or corroded valve should **NOT** be attempted.
11. Regulators and valves should be kept free of moisture. Purge system with dry inert gas (e.g. helium, nitrogen, argon, etc.) before the product is introduced and when system is out of service.
12. The main valve on the all the poisonous gas cylinders must be closed at all times when the cylinders are not in use.
13. Carbon steel, stainless steel, Monel or copper are suitable materials for regulators and valves for use when no moisture is present. Hastelloy, platinum or gold offer good resistance to corrosion when moisture is present. Kel-F or Teflon are the preferred gasket materials.
14. Pressure requirements should be considered when selecting materials and designing systems.

Storage

1. Maintain inventory of poisonous gases at a minimum. Purchase the smallest size cylinder possible for research activities. The Department of Safety and Health reserves the right to remove excess cylinders if deemed necessary.
2. Store cylinders in **a gas cabinet or exhausted enclosure system that is connected to the laboratory exhaust system. The gas cabinet or exhausted enclosure system design must comply with the current fire code.**
3. Cylinders of poisonous gases should be stored in secure locations appropriate for compressed gas storage and separated from incompatible compounds.

4. Cylinders must be stored upright with valve outlet seals and valve protection caps in place.
5. Do not allow storage temperature to exceed 125 degrees F.
6. Store cylinders away from heavily traveled areas and emergency exits.
7. Visually inspect cylinders on a routine basis, at least weekly, for any indication of leakage or other problems.

Emergency Procedures

1. Post in the laboratory the emergency response procedures for laboratory personnel as outlined in the University's Emergency Response plan.
2. In case of accidental release of a poisonous gas in any amount, such as a leaking cylinder, turn off all ignition sources (if time permits), evacuate the area immediately and close the door. Immediately implement the University's emergency spill response plan.
3. In the event personnel have become contaminated immediately implement personal decontamination procedures. Skin contact, immediately wash with soap and water and remove contaminated clothing. Other representatives from the laboratory must contact the 24-Hour Public Safety Dispatcher at 215-895-2222.
4. Eye contact, promptly wash with copious amounts of water for 15 minutes. Call 9-911 for immediate medical attention. Other representatives from the laboratory must contact the 24-Hour Public Safety Dispatcher at 215-895-2222.
5. If inhaled, remove to fresh air and call 9-911 for immediate medical attention. Other representatives from the laboratory must contact the 24-Hour Public Safety Dispatcher at 215-895-2222.
6. The MSDS sheet for the poisonous gas should be brought to the hospital to aid in treatment.

Leak Detection

1. The system should be carefully leak-tested prior to introduction of any poisonous gas into the system, periodically thereafter, and after any maintenance or modifications to the system which could affect its integrity. Appropriate personal protection equipment must be worn when testing for leaks. If leak is detected implement the emergency procedures as state above.
2. Atmospheric monitoring equipment with visual and audible alarms **must** be installed to alert laboratory personnel of a possible poisonous gas release. The gas detection system must comply with the following:
 - a. The system must detect the presence of gas at or below the permissible exposure limit (PEL) or ceiling limit of the gas for detection is provided.
 - b. A fixed detector must be placed near the system to provide accurate readings. The Department of Safety and Health can provide assistance regarding the placement of the detector.
 - c. The system must initiate a local alarm and transmit an alarm signal to the Department of Safety and Health. The alarm must be both visual and

audible and must provide warning both inside and outside the area where gas is detected.

- d. The system must be connected to emergency power.