

July 2013

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**EHS RULE FOR COMPRESSED GAS CYLINDERS**

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**I. PURPOSE:**

To establish a procedure for the safe use of compressed gas cylinders on campus in order to prevent injuries, illnesses and losses.

**II. REFERENCE:**

29 CFR 1910.101 Compressed gases (general requirements)  
Compressed Gas Association Pamphlets and Technical Bulletins

**III. SCOPE:**

This procedure applies to all campus operations and applies to all compressed gas cylinders.

**IV. ROLES AND RESPONSIBILITIES:**

Lab coordinators are responsible for:

1. Supervision of compressed gas cylinders in the laboratory.
2. Preparing, providing, implementing, and enforcing required safety procedures and recommendations prescribed in this rule or as noted during a laboratory inspection.
3. Providing gas cylinder operators with training in the proper handling of compressed gases and standard operating procedures related to their use.
4. Ensuring the availability of proper personal protective equipment.
5. Conducting or coordinating compressed gas safety training for personnel who are assigned to an area where lasers are operated.
6. Notifying EHS immediately in the event of an exposure to a hazardous compressed gas.
7. Ensuring that all compressed gases are included in the laboratory's Chemical Inventory
8. Documentation of all provided training and maintenance of training records.

**Gas Cylinder Operators** are responsible for:

1. Following all established standard operating procedures without deviation.
2. Inspecting compressed gas equipment prior to use and at the beginning of each procedure, including, but not limited to, inspecting of equipment, such as regulators, piping, etc. for damage, leak testing of fittings and connections, etc.
3. Notification of the lab coordinator of any departure from established safety procedures. This includes notification of near miss situations as well as exposure/release incidents.

**The Environmental Health & Safety (EHS) Department** is responsible for:

1. Providing advice and counsel related to the safe handling storage and use of compressed gases.
2. Periodic Review and update of this rule.
3. Providing incident investigation services for incidents involving compressed gasses.

## V. PROCEDURE:

The following procedures for the handling, use, and storage of compressed gas cylinders are based upon accident prevention experience and established industrial and governmental standards and best practice. It should not be assumed that every necessary safety precaution is contained herein, or that unusual circumstances may not require further or additional procedures.

### A. RECEIVING AND STORAGE

1. Arrange a return agreement with suppliers prior to purchase.
2. Ensure laboratory door caution signage is current each time gases are received. (Contact EHS for updated Caution Signs).
3. Cylinder contents must be clearly labeled. Color coding, in lieu of labels, does not constitute adequate labeling.
4. Valve caps shall remain in place except during use.
5. Always transport cylinders with valve caps securely in place.
6. Do not accept cylinders which are damaged, not clearly labeled, or do not have a valve protection cap.
7. Keep oxygen cylinders a minimum of twenty feet from flammable gas cylinders or combustible materials. If this can not be done, separation by a non-combustible barrier at least 5 feet high having a fire-rating of at least one-half hour is required.
8. Components used for other gases and purposes must never be interchanged.
9. Cylinders, upon filling, should have current hydrostatic test date (normally less than 5 years old for steel and 3 years old for aluminum) engraved on the cylinder.
10. All gas cylinders shall be secured in an upright position with upper and lower restraints in racks, holders, or clamping devices. *The lower restraint may be exempted only if in consultation with EHS it is determined impractical.* When cylinders are grouped together, they should be individually secured and conspicuously labeled on the neck area.
11. Do not place cylinders near heat, sparks, or flames or where they might become part of an electrical circuit.
12. Do not store cylinders in exit or egress routes.
13. Store cylinders in a well ventilated area.

### B. TRANSPORT

1. Cylinder handlers must always wear certain minimum personal protective equipment prescribed by OSHA: Gloves to protect the hands against common pinching injuries. Safety glasses to protect the eyes against injuries associated with pressure release. Safety shoes with metatarsal supports to protect against foot injuries from falling cylinders.
2. Always use carts or hand trucks designed for cylinder transport. Refrain from sliding, dragging or rolling cylinders on edge.
3. A cylinder's cap should be screwed all the way down on the cylinder's neck ring and should fit securely. Do not lift cylinders by the cap. The cap is for valve protection only.
4. Cylinders shall not be transported with the regulator attached to the cylinder.
5. Cylinders shall be secured at all times, unless actively moving from one secured point to another; such as, moving the cylinder from a secured position in a truck to a secured position on a transfer dolly or lift gate.

6. Only one cylinder should be handled (moved) at a time. Equipment specifically designed to handle more than one cylinder securely is exempted from this requirement.

### C. USE

1. Only properly trained personnel should handle compressed gas cylinders.
2. Only Compressed Gas Association (CGA) fittings and components are permitted for use with gas cylinders. Only use regulators approved for the type of gas in the cylinder. Do not use adapters or fittings to interchange or modify regulators.
3. Contents of the cylinder must be labeled as installed including hazard class (e.g., poison, flammable, inert, etc); the label facing the wall is not acceptable. Cardboard labels secured on the neck of the cylinder with wire serve this purpose well.
4. Ensure all connections are tight via leak testing. Cylinders, connections, and hoses should be checked regularly for leaks. Use a flammable gas leak detector (for flammable gases only) or soapy water, or a 50% glycerin-water solution and look for bubbles. At or below freezing temperatures, the glycerin solution should be used instead of soapy water. [Note: When the gas to be used in the procedures is a flammable oxidizing or highly toxic gas, the system should be checked first for leaks with an inert gas (helium or nitrogen) before introducing the hazardous gas.
5. Ideally leak tests should be witnessed by a third party (e.g., department Safety Coordinator or designee, safety committee representative, etc.) and logged; e.g., written in research notebook with time and date. The intent is to have historical information in one retrievable location.
6. When a special wrench is required to open a cylinder or manifold valve, the wrench shall be left in place on the valve stem when in use; this precaution is taken so the gas supply can be shut off quickly in case of an emergency; and that nothing shall be placed on top of or near a cylinder that may damage the safety device or interfere with the quick closing of the valve.
7. After installing an approved regulator, back off the pressure adjusting screw/handle of the regulator, open the cylinder valve slowly and away from the direction of people (including yourself). Never force a gas cylinder valve. If the valve cannot be opened by the wheel or small wrench provided, the cylinder should be returned; *do not attempt to repair a cylinder valve or regulator yourself*. Never open a valve without the regulator in place.
8. No attempt shall be made to transfer gases from one cylinder to another, to refill cylinders, or to mix gases in a cylinder in the laboratory.
9. Keep cylinder valves, regulators, couplings, hoses, and apparatus clean and free of oil and grease.
10. Compressed gases must not be used to clean your skin or clothing.
11. Never heat cylinders to raise internal pressure.
12. Use flashback connectors and reverse-flow check valves to prevent flashback when using oxy-fuel systems.
13. Do not leave regulators in a pressurized condition if the system is not in use.
14. Regulators must be removed when moving cylinders, when work is completed, and when cylinders are empty.
15. Do not use copper (>65%) connectors or tubing with acetylene. Acetylene can form explosive compounds with copper, silver, and mercury.
16. Always leave at least 30psi minimum pressure in all "empty" cylinders.
17. Label all cylinders when "Empty". All cylinders are to be considered full unless labeled as empty by the user. Empty cylinders must be returned to the supplier and not accumulated.
18. Before moving a cylinder to the storage area or point of use or before returning the cylinder

to the supplier, ensure the following: The outlet valve is fully closed. The outlet valve dust plug or pressure cap is on tight for cylinders equipped with these protection devices. The valve protection cap is properly secured in place on cylinders with neck threads.

**NOTE:** EHS discourages the use of lecture bottles if other cylinders are available. Lecture bottles are very difficult to dispose of and they use universal threads and valves (some of which are interchangeable), thus increasing the potential for unintentional mixing. If lecture bottles are used, label all associated equipment with the gas name to prevent unintentional mixing.

### **Special Use Considerations**

The use of certain high or special hazard compressed gases requires specific procedures in addition those detailed here. This category may include highly flammable or corrosive gases, cryogenics, pyrophorics, highly toxic gases and others, including but not limited to, hydrogen, liquid nitrogen and silane. See Appendix A for examples.

## **V. EMERGENCY PROCEDURES**

If a cylinder leak cannot be stopped by tightening the valve gland or packing nut, follow the appropriate guidelines below, contact EHS by calling 801-957-4902, after hours contact SLCC Public Safety.

If the release of the gas creates a situation which you believe places occupants within the building in imminent danger, leave the area immediately, closing doors behind you as you go, initiate building evacuation by activating the nearest fire alarm pull station as you leave the building, once in a safe location contact SLCC Public Safety.

### **A. POISON GASES**

1. Immediately leave the room, close the door(s), pull the nearest fire alarm pull station, evacuate the area and call EHS at 801-957-4902 or SLCC Public Safety. Tell the person where responders should meet you. Explain that you have a cylinder of poison gas that is leaking. Tell them the location of the leaking cylinder.
2. Meet responders as they arrive to explain the situation.
3. Once the situation is stabilized, work with EHS to contact the supplier for disposal.

### **B. FLAMMABLE OR OXIDIZING GASES**

1. Turn off all sources of ignition in the room before leaving if safe to do so and shut offs are accessible. Do not operate light switches or other electrical equipment.
2. Leave the room, close door(s), pull the nearest fire alarm pull station, evacuate the area and call EHS at 801-957-4902 or SLCC Public Safety.
3. Tell the person where responders should meet you. Explain that you have a cylinder of flammable gas that is leaking. Tell them the location of the leaking cylinder.
4. Meet responders as they arrive to explain the situation.
5. Once the situation is stabilized, work with EHS to contact the supplier for disposal

### **C. INERT GASES**

1. Place the cylinder in a well-ventilated location, preferably an outdoor cylinder storage area and contact the vendor for removal.

**VI. CONTACTS**

Questions about this Rule and any related Rules, Procedures and Guidelines should be directed to Environmental Health and Safety, at 801-957-4902.