

Appendix C

Flammable, Oxidizing and Other Pressurized Gases

Gas Cylinders

I. Guidelines for using and storing pressurized gases

The following guidelines shall be followed by all personnel using or storing pressurized gases.

- A. All personnel who will be working in areas where compressed gases are used or stored shall receive instruction regarding the safe handling of cylinders, the use of appropriate personal protective equipment, and the steps to be taken in the event of a leak or fire in an adjacent area.
- B. Do not remove any labels or other form of identification from any gas cylinder.
- C. Know how to detect the presence of leaks from any gas cylinder in your work area. Of particular importance are flammable and toxic gases. Contact ESD at 2-5801 in the event of a cylinder or valve leak.

II. Gas cylinder storage and labeling

- A. When receiving a gas cylinder do not accept it until the following items are verified:
 - 1. the contents are identified either by labels or stencils,
 - 2. it contains the appropriate DOT label,
 - 3. it contains a valve protection cap (if so designed).
- B. Store gas cylinders in a well-ventilated area away from direct heat. All cylinders must be stored in an upright position secured to a sturdy permanent structure to prevent the cylinder from falling or being knocked over. Place protective caps on those cylinders which are not in use. All cylinders should be anchored individually.
- C. Gases should be stored in accordance with their physical and chemical properties. See individual material safety data sheets (MSDS) for specifics with regards to this information.
- D. Close valves on empty gas cylinders and mark them empty. Empty cylinders should be removed from the lab as soon as possible. (See [Appendix D](#) for copies of optional tags that may be used for labeling gas cylinders.) Store empty and full gas cylinders separately. Cylinders are considered empty if their pressure is less than 25 psig. All cylinders will be considered full that are not properly identified.

- E. Store flammable gases away from oxidizing gases.
- F. Do not store gas cylinders near elevators, ventilating systems, or other openings through which gas may spread to other parts of the building should a leak occur. Do not store cylinders where there is a risk of dropping them or having heavy objects fall on them.
- G. Cylinders containing gases that are corrosive to cylinders or cylinder valves or that may become unstable while stored in the cylinder shall have a maximum retention period of six months, unless a shorter period is otherwise specified by the manufacturer.
- H. Cylinders of all gases having a health hazard rating of 3 or 4 (refer to the MSDS for rating) must be kept in a continuous mechanically ventilated storage hood or other continuous mechanically ventilated enclosure. There must be no more than three cylinders within the hood or other ventilated enclosure. Contact ESD if you have questions regarding the storage of cylinders in continuous mechanically ventilated enclosures/storage hoods.
- I. The maximum volume size of a cylinder of a gas with a health hazard rating of three or four stored in a laboratory work area shall be limited to 0.1 cubic feet. Cylinders of a gas with a health hazard rating of three or four stored in a laboratory work area shall be limited to no more than three maximum size cylinders or an equivalent volume (0.3 cubic feet) of smaller sized cylinders.
- J. The maximum volume size of a flammable or oxidizing gas cylinder stored in a laboratory work area shall be limited to two cubic feet. Cylinders of flammable and/or oxidizing gases stored in a laboratory work area shall be limited to no more than six maximum sized cylinders or an equivalent volume (12 cubic feet) of smaller sized cylinders.
- K. The maximum volume size of a liquefied flammable gas cylinder stored in a laboratory work area shall be limited to 0.6 cubic feet. Cylinders of liquefied flammable gas stored in a laboratory work area shall be limited to no more than three maximum sized cylinders or an equivalent volume (1.8 cubic feet) of smaller size cylinders.
- L. Gas cylinders shall not be retained for more than ten years. Small, disposable, empty, lecture cylinders may be discarded in the lab trash after the valve stem has been removed. Small disposable lecture cylinders that are not empty may either

be reacted off to render them empty, returned to the supplier or disposed of by a licensed gas cylinder disposal company. ESD shall be consulted prior to disposing of a cylinder using the preceding methods. Non-disposable cylinders must be returned to the supplier.

- M. Cylinders and other containers stored outdoors shall be stored off the ground on a raised concrete pad and within a covered non-combustible rack. They shall not be stored where they are at risk of dropping, having heavy objects dropped on them or being struck by a vehicle.

III. Proper handling of gas cylinders

- A. Always open cylinder valves slowly. Never force the valve open. If the valve cannot be opened by the wheel or small wrench provided, return the gas cylinder. To shut down a system, close the cylinder valve and relieve the pressure from the entire system through a hose that is not being used.
- B. Never interchange regulators and hose lines among different types of gases.
- C. Always turn off cylinders from the main stem valve (not the regulator). Turn off cylinders slowly.
- D. Suitable equipment must be available for moving cylinders and other portable containers. Hand trucks must be equipped with a clamp or chain to secure the container in place or they must be specifically designed for container handling. Never drag, roll, or slide a cylinder in an attempt to move it.
- E. Never drop cylinders; never permit cylinders to strike each other; and never strike cylinders with a metal instrument.
- F. Inspect cylinders regularly for corrosion or leaks. In case of a leak, promptly remove the cylinder to the outside (in accordance with manufacturers recommendations) and call ESD for assistance.
- G. Do not use cylinders without a regulator.
- H. Never attempt to refill a cylinder.
- I. Never tamper with any part of a valve such as the safety nuts or packing nuts.