

Gas Cylinder Safety

Background Information

This document contains basic guidelines and rules to help ensure the safe handling and storage of compressed gas cylinders. Compressed gases are used in a variety of programs. Compressed gases serve the university in many ways, but gases under high pressure also present a number of hazards.

Mishandled cylinders may rupture violently, release their hazardous contents or become dangerous projectiles. If a neck of a pressurized cylinder should be accidentally broken off, the energy released would be sufficient to propel the cylinder to over three-quarters of a mile in height. A standard 250 cubic foot cylinder pressurized to 2,500 PSIG can become a rocket attaining a speed of over 30 miles per hour in a fraction of a second after venting from the broken cylinder connection.

Basic Safety:

- Select the least hazardous gases that will work.
- Purchase only the necessary quantities.
- Select gases with returnable containers.
- When receiving gas cylinders:
 - Check for leaks
 - Visually inspect the cylinder for damage
 - Ensure the valve cover and shipping cap is on
 - Check for proper labeling
- If a cylinder is damaged, in poor condition, leaking, or the contents are unknown, contact your cylinder vendor. Have the vendor return the damaged cylinder to the manufacturer.
- Wear appropriate foot protection when engaged in moving or transporting cylinders:
 - Sturdy shoes are a minimum.
 - Steel-toed shoes if required by your supervisor, instructor or department.
- Proper personal protective clothing and equipment shall be worn.
- Always have an appropriate Safety Data Sheet (SDS) available and be familiar with the health, flammability and reactivity hazards for the particular gas.

Cylinder Markings:

- Cylinders must be properly labeled, including the gas identity and appropriate hazards (e.g., health, flammability, reactivity).
- Cylinders have several stamped markings. The top mark is either a DOT or an International Code Council (ICC) marking indicating pertinent regulations for that cylinder. The second mark is the serial number. Under the serial number is the symbol of the manufacturer, user or purchaser. Of the remaining marks the numbers represent the date of manufacture, and retest date (month and year). A (+) sign indicates the cylinder may be 10% overcharged, and a star indicates a ten-year test interval.

Cylinder Storage:

- Cylinders should be stored in compatible groups:
 - Flammables from oxidizers
 - Corrosives from flammables
 - Full cylinders from empties
 - Empty cylinders should be clearly marked and stored as carefully as those that are full because residual gas may be present.
 - All cylinders from corrosive vapors.
- Store cylinders in an upright position.
- 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.
- Compressed gas cylinders should be secured firmly at all times. A clamp and belt or chain, securing the cylinder between "waist" and "shoulder" to a wall, are generally suitable for this purpose.
- Cylinders should be individually secured; using a single restraint strap around a number of cylinders is often not effective.
- Keep valve protective caps in place when the cylinder is not in use.
- Mark empty cylinders EMPTY or MT.
- Keep valves closed on empty cylinders.
- Cylinders must be kept away from sources of heat.
- Cylinders must be kept away from electrical wiring where the cylinder could become part of the circuit.
- Store cylinders in well-ventilated areas designated and marked only for cylinders.

Moving Cylinders:

- Use a cylinder cart and secure cylinders with a chain.
- Don't use the protective valve caps for moving or lifting cylinders.
- Don't drop a cylinder, or permit them to strike each other violently or be handled roughly.
- Unless cylinders are secured on a special cart, regulators shall be removed, valves closed and protective valve caps in place before cylinders are moved.

Cylinder Use:

- Be sure all connections are tight. Use soapy water to locate leaks.
- Keep cylinders valves, regulators, couplings, hose and apparatus clean and free of oil and grease.
- Keep cylinders away from open flames and sources of heat.
- Safety devices and valves shall not be tampered with, nor repairs attempted.

- Use flashback arrestors and reverse-flow check valves to prevent flashback when using oxy-fuel systems.
- Regulators shall be removed when moving cylinders, when work is completed, and when cylinders are empty.
- Cylinders shall be used and stored in an upright position.
- The cylinder valve should always be opened slowly. Always stand away from the face and back of the gauge when opening the cylinder valve.
- 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 a cylinder that may damage the safety device or interfere with the quick closing of the valve.
- Fire extinguishing equipment should be readily available when combustible materials can be exposed to welding or cutting operations using compressed cylinder gases.

Things Not To Do:

- Never roll a cylinder to move it.
- Never carry a cylinder by the valve.
- Never leave an open cylinder unattended.
- Never leave a cylinder unsecured.
- Never force improper attachments on to the wrong cylinder.
- Never grease or oil the regulator, valve, or fittings of an oxygen cylinder.
- Never refill a cylinder.
- Never use a flame to locate gas leaks.
- Never attempt to mix gases in a cylinder.
- Never discard pressurized cylinders in the normal trash.

Poison Gases:

Poison gases represent a significant hazard. Special precautions not otherwise necessary become prudent when using poison gases:

- Common poison or highly toxic gases include:
 - arsine (AsH₃)
 - ethylene oxide (EtO)
 - hydrogen cyanide (HCN)
 - nitric oxide (NO)
 - phosphine (PH₃)
- Certain poison gases (e.g., Ethylene Oxide) can only be used if specific guidelines (see OSHA regulations 1910.1047) and safe practices are followed.

- Emergency procedures should be made clear to all involved, including personnel from adjacent labs and building managers.
- Poison gas use after normal working hours requires the approval of the Chemical Hygiene Officer for your department.
- Fume hoods and other ventilation need to be tested before use and checked frequently during the project involving poison gas.
- Notify the Department of University Safety & Assurances before your first use of the poison gas.
- The University Police should also be informed about the locations and types of poison gas in use.
- Document these procedures in your lab's chemical hygiene plan. As with all chemicals, obtain and review the SDS for the poison gas. Maintain an extra copy of the SDS in your department's chemical hygiene plan.

Disposal of poison gas cylinders can often cause problems. Contact Risk Management and Safety's Environmental Health and Safety unit.

Source: University of Wisconsin–Milwaukee