

COMPRESSED GAS CYLINDER FACT SHEET

Based on 29 CFR 1910.1450, Occupational exposure to hazardous chemicals in laboratories, by reference to Prudent Practices in the Laboratory, National Research Council.

PROPERTIES AND HAZARDS

Handling compressed gases may be more hazardous than handling solid and liquid materials because of the unique properties of gases. These properties and their associated hazards are:

- pressure hazards causing equipment failure and leakage
 - rapid diffusion, causing dangerous toxic or anesthetic effects, asphyxiation, and rapid formation of explosive concentrations
 - low boiling-point materials, cryogenic materials, or liquefied gases causing frostbite
 - the same hazards as those associated with solid or liquid chemicals, including corrosion, irritation, flammability, and high reactivity.
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PROPER WORK AND HANDLING PRACTICES

A. Storage Practices.

- The regulator is removed and the valve protection cap is in place when cylinders are stored.
- Cylinders are situated away from heat and ignition sources.
- Flammable gases (e.g., hydrogen, carbon monoxide) are stored away from other gases, especially oxidizers (e.g., oxygen and nitrous oxide).
- Cylinders are situated away from major traffic flow.
- Cylinders are maintained in an environment at near-room temperatures. They are not subjected to a temperature greater than 125 F or lower than -21 F.
- Flames never come into contact with any part of a compressed gas cylinder.
- A valve protection cap is left on each cylinder until it has been properly secured in the lab and when it is not in use (after having been secured).
- Cylinders are secured in accordance with local fire codes. In Evanston, cylinders may be secured against a wall or bench with cylinder clamps, chains, or straps, or are placed in a cylinder stand. In Chicago, city code requires that cylinders be secured to a wall with chains or straps.

B. Transportation.

- If applicable, large cylinders are transported only on a wheeled cylinder cart. Cylinders are not slid or rolled, since even practiced handlers can easily lose control of them.
- If applicable, small cylinders are transported in a manner that protects them from potential damage from falling or striking objects.

C. Use Of Cylinders.

- Lab workers wear eye protection when changing regulators or manipulating tubing or equipment potentially under pressure.
- Cylinders are situated away from heat and ignition sources.
- Cylinders are situated away from major traffic flow.
- Cylinders are maintained in an environment at near-room temperatures. They are not subjected to a temperature greater than 125o F or lower than -21o F.
- Flames never come into contact with any part of a compressed gas cylinder.
- Cylinders are used only with a regulator. Cylinders contain pressures greater than most lab equipment can withstand. Cylinder users are aware that inadvertent closing of a valve or stop cock or plugging of a line could result in a violent failure of the apparatus.
- A regulator and gauge shall be installed at the point of use to show the outlet pressure when the source cylinder is outside of the lab.
- Cylinder valves are closed when not in use, if feasible. They are never tampered with, forced, lubricated, or modified.
- Cylinder leaks are attended to immediately. If a leak persists and/or cannot be controlled by simple adjustment, the supplier and ORS are contacted immediately. The cylinder is removed to a chemical fume hood or location where the leakage can be exhausted or diluted and left there until the contents can be disposed of according to manufacturer's directions.
- When discharging a gas into a liquid, a trap or suitable check valve is used to prevent liquid from backflowing into the cylinder or regulator.
- Cylinders are used only with fittings, valves, regulators, and tubing designated by the manufacturer for the gas being used.
- Connections are not forced or used with homemade adapters.
- Incompatible gases linked by a direct potential pathway are protected by check valves or other safety devices appropriate for the gases being used.
- Ventilation in the use location is adequate to exhaust potential asphyxiant (e.g., carbon dioxide, helium, nitrogen) releases.

D. Empty Cylinders.

Note: Cylinders are never truly "empty." Empty cylinders shall be handled in the same manner as full and partially full cylinders.

- Full and empty cylinders are not manifolded together.
- Empty cylinders are promptly removed from manifolded systems. (Hazardous suckback can occur when an empty cylinder is mistakenly attached to a pressurized system.)
- Empty cylinders are labeled "Empty" or "MT."
- Valves are closed on empty cylinders, leaving a positive pressure. (This prevents the interior from becoming contaminated.)
- Valve outlets and protective caps received with the cylinder are replaced on empty cylinders.

E. Specific Procedures For Corrosive Gases.

- Corrosive gases are stored only for short periods before use, preferably less than three months. Using small cylinders ensures a reasonable turnover.

- Corrosive gases are removed from areas containing instruments or other devices sensitive to corrosion.
- Storage areas for corrosive gases are as dry as possible.
- A supply of water is available in case of emergency leaks in corrosive gas cylinders. (Most corrosive gases can be absorbed in water.)
- Cylinder valve stems on corrosive gases are manipulated frequently to prevent "freezing."
- Regulators and valves are closed when corrosive gas cylinders are not in use.
- Regulators and valves are detached from the cylinder except when it is in frequent use (weekly or daily).
- When corrosive gases are in use, an eyewash is available in the lab.
- When corrosive gases are in use, a shower is available in close proximity to the work area.
- Appropriate gloves are worn by lab workers handling corrosive gases.

F. Specific Procedures For Using Acetylene Gas.

- Acetylene cylinders are stored upright (because they are partially filled with acetone).
- Acetylene cylinders that have not stood upright are used only after they have been upright for at least 30 minutes.
- The outlet line of acetylene cylinders contains a flash arrestor.
- Pressures are always maintained below the limit indicated by the red warning line on an acetylene pressure gauge.
- Appropriate tubing is used with acetylene gas. (Copper tubing forms explosive acetylides and shall not be used.)

G. Specific Procedures For Use With Oxygen.

- When oxygen is used, the cylinder valve is opened momentarily and then closed to blow dirt from the outlet. The valve outlet of an oxygen cylinder valve is never wiped or touched; this avoids leaving organic residues that might be ignited by exposure to high oxygen pressure.
- Oil or grease are avoided on the high-pressure side of oxygen and chlorine cylinders or other cylinders containing oxidizing material. (Otherwise a fire or explosion could result.)

H. Specific Procedures For Use With Toxic, Flammable, And Pyrophoric Gases.

- Toxic gases are purchased and stored in the smallest sizes possible.
- During use and storage, highly toxic gases are located in continuously ventilated gas cabinets or mechanical spaces.
- A continuous gas monitoring system is available for signaling releases of highly toxic gases.
- Lecture bottles of highly toxic gases are used in a chemical fume hood.
- Flash arrestors are present on the cylinder lines leading from flammable gases. When flammable gases are used in conjunction with oxygen, the flammable gas lines are equipped with backflow protection to prevent mixing of oxygen with the fuel.
- Fires of pyrophoric or highly combustible gases are not considered extinguished until the source of gas is closed off; otherwise, it can reignite and cause an explosion.