

Regulations

- *Hazardous Materials Regulations of the Department of Transportation (49 CFR parts 171-179 and 14 CFR part 103).*
- *Compressed Gas Association Pamphlets C-6-1968 and C-8-1962, which is incorporated by reference as specified in Sec. 1910.6.*

I. Introduction

Many laboratory procedures require the use of compressed gases for variety of different procedures. Compressed gases presents unique hazard therefore compressed gas cylinder should be handled by individuals familiar with the hazards and proper handling techniques.

Hazards associated with compressed gases include oxygen displacement, fires, explosions, and toxic gas exposures, as well as the physical hazards associated with high pressure systems. Special storage, use, and handling precautions are necessary in order to control these hazards.

II. Identification

- The content of all compressed gas cylinder must be clearly identified on the cylinder.
- The information should be stenciled or stamped on the cylinder or a label.
- The labels should be color coded to distinguish the hazardous gases.
- Always read the label; never rely on the color of the cylinder tag for identification.

III. Handling and Use.

- Avoid dragging or sliding cylinders, even for short distances. Cylinders should be moved by using a suitable hand truck.
- Never drop cylinders or permit them to strike violently against each other. When cylinders are moved, they should not be subjected to abnormal mechanical shocks that may cause damage to their valves, their pressure relief devices, or to the cylinders themselves.
- The cylinder protection cap should always be in place when moving a cylinder or until the cylinder has been secured against a wall or a bench, placed in a cylinder stand, and is ready to be used. Cylinders should always be secured when not in use.
- Regulators must be removed from the cylinders when not in use and replaced with the safety cap.
- Never tamper pressure relief devices in valves or on the cylinders.
- Never permit oil, grease, or other readily combustible substances to come in contact with oxygen cylinders, valves, or regulators.
- Do not remove the product identification label or change the cylinder color.
- When returning empty cylinders, close the valve before shipment. Leave some positive pressure in the cylinder. Replace any valve outlet and protective caps originally shipped with the cylinder. Mark and label the cylinder **EMPTY**.
- Compressed gas cylinders should not be refilled except by qualified producers of compressed gases.

- Shipment of a compressed gas cylinder which has not been filled by the owner, or filled without the consent of the owner, is a violation of U.S. law.
- Never lift a cylinder by the cap except with an approved cylinder cart designed for this purpose.

IV. Securing compressed gas cylinders



V. Tagging compressed gas cylinders



VI. Transportation of gas cylinders.

- Gas cylinders should be moved with the safety cap in place and using two wheeled transportation cart designed for this purpose. Ensure that the transportation cart has straps or chain to secure the cylinder.
- Avoid dropping and striking the cylinder together. The cylinder should not be lifted by the cap
- Use a cradle for hoisting, never a lifting magnet or sling.
- Avoid dragging, sliding or rolling cylinder.
- When transporting a filled gas cylinder, use the freight elevator when possible. If there is no freight elevator, do not use an elevator with people in it and do not allow other people to enter the elevator when transporting the cylinders.

VII. Classification and Characteristics.

- a) **Asphyxiating gas:** Is usually inert, that may cause suffocation by displacing the oxygen in the air necessary to sustain life. Examples: Acetylene (S), Argon (P), Carbon Dioxide (P), Ethane (S), Helium (P), Hydrogen (S), Liquid Nitrogen (P), Methane (S), Nitrous Oxide (P), Propane (S), Sulfur Hexafluoride (P)
- b) **Compressed gas:** A gas or mixture of gases having an absolute pressure exceeding 40 psi at 70 degrees F (21.1 degrees C) or, A gas or mixture of gases having an absolute pressure exceeding 104 psi at 130 degrees F (54.4 degrees C) regardless of the pressure at 70 degrees F, or, A liquid having a vapor pressure exceeding 40 psi at 100 degrees F (37.8 degrees C)
- c) **Corrosive Gas:** A gas that causes visible destruction of, or irreversible alterations in living tissues by chemical action at the point of contact or which has a DOT label Corrosive. Examples: Ammonia (P), Chlorine (S)
- d) **Cryogenic fluid:** A refrigerated liquefied gas having a boiling point colder than - 90 deg C (- 130 deg F) at 14.7 psi absolute, or which DOT requires the label of nonflammable, nonpoisonous compressed gas including - compressed gas, liquefied gas, pressurized cryogenic gas, compressed gas in solution, asphyxiating gas and oxidizing gas. Examples: Ammonia (S), Ethane (S), Liquid Nitrogen (S), Propane (S).
- e) **Flammable gas:** A gas which, at ambient temperature and pressure, forms a flammable mixture with air at a concentration of 13 percent by volume or less, or a gas which at ambient temperature and pressure, forms a range of flammable mixtures with air wider than 12 percent by volume, regardless of the lower limit, or one for which the DOT requires their red flammable gas label. Examples: Acetylene (P), Ammonia (S), Arsine (S), Carbon Monoxide (S), Ethane (P), Germane (S), Hydrogen (P), Methane (P), Propane (P), Silane (P).
- f) **Oxidizer gas:** A gas that is nonflammable but can support and vigorously accelerate combustion in the presence of an ignition source and fuel or is labeled by the DOT as oxidizer. Examples: Compressed air (S), Chlorine (S), Nitric Oxide (S), Nitrous Oxide (S), Oxygen (P).
- g) **Toxic gas:** a gas that has a lethal concentration (LC 50) in air of 2000 ppm or less by volume of gas (Highly Toxic has an LC 50 of 200 ppm or less) or gas that required DOT label poison. Examples: Arsine (P), Carbon Monoxide (P), Chlorine (P), Germane (P), Nitric Oxide (P).

To provide the best protection to the user, most severe hazard of a gas has been designated with a (P) for Primary. Any additional hazards for which additional precautions are recommended have been designated with an (S) for Secondary.