



Compressed Gas Cylinder Safety

Office of Environmental Health & Safety
East Carolina University

What are Compressed Gases?

Compressed gases are gases that are stored under pressure in cylinders. The major groups of compressed gases are:

- Non-Liquefied or Compressed Gases – Nitrogen, Oxygen, Air, Carbon Dioxide, Helium
- Liquefied Gases – LPG, Liquefied Nitrous Oxide
- Dissolved Gases – Acetylene
- Refrigerated Liquefied Gases – Cryogenic Gases







Types of Compressed Gas Cylinders

Compressed gas cylinders generally exist as:

- High Pressure Cylinders –Nitrogen, Helium, Hydrogen, Oxygen and Carbon Dioxide.
- Low Pressure Cylinders –Liquid Petroleum Gas and refrigerant gases.
- Acetylene Cylinders – aggregate filled, and acetylene dissolved in acetone



Compressed Gas Hazard Classification

Hazard Symbol	Class	Examples
	Class 2.1 Flammable gas	Liquid Petroleum Gas, hydrogen, acetylene
	Class 2.2 Non-flammable, non-toxic gases	Compressed air, nitrogen, argon, carbon dioxide, helium.
	Class 2.2, Sub-risk 5.1 Oxidizing gas	Oxygen, nitrous oxide, Entonox (50% oxygen, 50% nitrous oxide).
	Class 2.3 Toxic Gas	Methyl bromide, anhydrous ammonia, chlorine.

Compressed Gas Hazards

▪ High Pressure



▪ Corrosive



▪ Flammable



▪ Toxic



▪ Asphyxiant



▪ Oxidizer



▪ Cryogenic



Compressed Gas Identification

- The contents of any compressed gas cylinder must be clearly identified.
- The labels applied by the gas manufacturer to identify the cylinder contents shall not be defaced or removed.
- No compressed gas cylinder should be accepted for use that does not legibly identify its contents.
- Never rely on the color of the cylinder for identification.



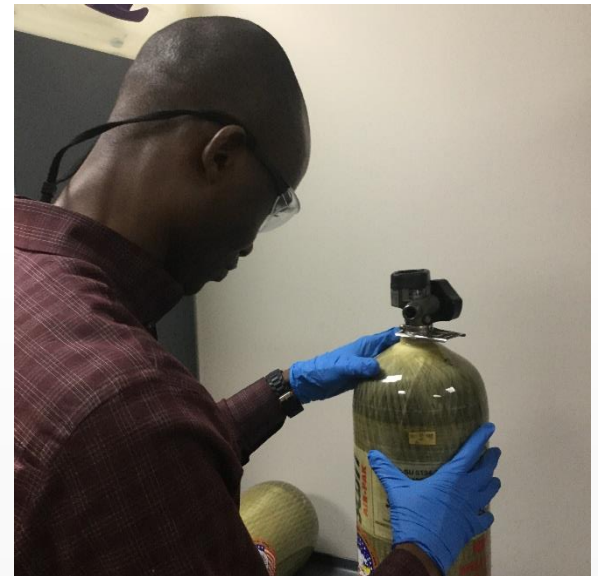
Compressed Gas Visual Inspection

- Gas cylinders should be visually inspected to ensure they are in safe condition.
- The content of each cylinder should always be identified, including its status (full, empty or in service).
- Cylinders shall be equipped with connections as required by the Compressed Gas Association standards.



Visual Inspection Cont'd

- Cylinders should be inspected daily and prior to each use for corrosion, leaks, cracks, etc.
- Inspection should include the cylinder, piping, safety relief devices, valves, protection caps and stems.
- Leaking regulators, cylinder valves or other equipment should be taken out of service.



Compressed Gas Use and Handling

- Cylinders must be always secured in an upright position.
- The user shall not modify, tamper with, obstruct, remove, or repair any part of the cylinder. This includes, but not limited to, the pressure relief device, cylinder valve or the valve protective device.
- Compressed gas streams shall not be directed toward any person as this may cause serious injury to the eyes or body.



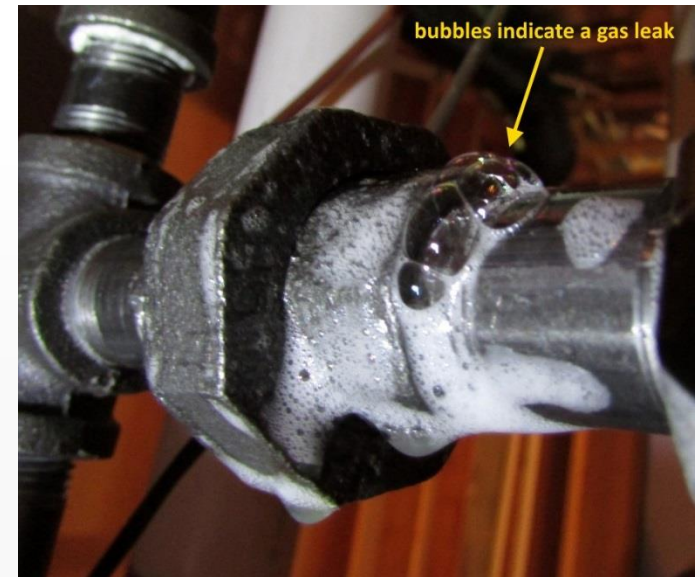
Use and Handling Cont'd

- Cylinder valve connections that do not fit should not be forced. Threads on regulator connections or other equipment shall match those on the cylinder valve outlet.
- If a valve must be forced, it is a good sign that the wrong valve is being used.
- The cylinder valve should be kept closed at all times except when in use. Valve outlets should be pointed away from all personnel when the valve is being opened.



Use and Handling Cont'd

- Piping, regulators, and other apparatus shall be kept gas tight to prevent leakage. This can be confirmed using a compatible leak test solution.
- A leak test must be conducted every time the cylinder is re-connected such as during cylinder replacement.
- Never use oil or grease on cylinders.



Use and Handling Cont'd

- Before a regulator is removed from a cylinder, the cylinder valve shall be closed, and the regulator relieved of gas pressure.
- Regulators, gauges, hoses and other apparatus shall not be used on gas cylinders having different chemical properties unless information obtained from the gas manufacturer indicates that this can be done safely.



Use and Handling Cont'd

- Maintenance of cylinders and their valves or relief devices shall be performed only by trained personnel.
- An emergency response plan shall be developed and implemented wherever compressed gas cylinders are used, handled or stored.
- Never smoke around compressed gas cylinders.



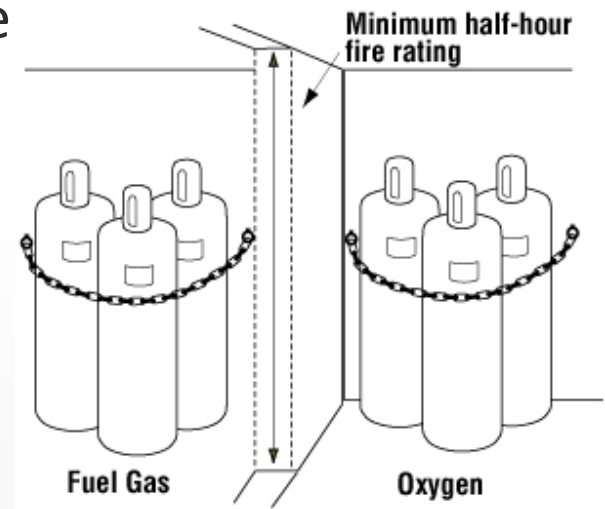
Compressed Gas Storage

- Containers shall not be placed where they might become part of an electrical circuit or arc.
- Containers shall not be exposed to temperature extremes. Storage areas shall not exceed 125 degrees Fahrenheit.
- Valve protection caps must remain in place at all times except when cylinders are secured and connected to dispensing equipment.



Compressed Gas Storage Cont'd

- Adequate spacing, or segregation by partitioning shall be provided to group cylinders by hazard class. When oxygen and any fuel gas are stored, they shall be separated by a distance of 20 feet or by a non-combustible barrier at least 5 feet high with a fire rating of one-half hour.
- Full and empty cylinders should be separated.
- Containers are not to be stored near readily ignitable substances or be exposed to corrosive chemicals or fumes.



Compressed Gas Storage Cont'd

- Containers shall not be stored near elevators, walkways, building egresses, unprotected platform edges, or in locations where heavy moving objects may strike or fall on them.
- All cylinders shall be secured to prevent falling/tipping/rolling and shall be stored and used valve end up. Secure with straps or chains connected to a wall bracket or other fixed surface, or by use of a cylinder stand. Do not secure by the valve.



Transportation of Compressed Gas Cylinders

- Cylinders shall not be rolled in the horizontal position or dragged. A suitable cart carrier or similar material handling device designed for cylinder transport should be used with the container properly secured to the device. Never lift cylinders by the cap.
- Care must be taken not to drop cylinders or anything that could damage the cylinder valve as these high-pressure vessels have the potential to destroy property and/or injure personnel.



Responsibilities

- Compressed gas cylinders shall be handled and used only by trained personnel in accordance with applicable regulations and guidelines.
- Cylinders will not be issued to personnel until they have received appropriate training.
- In addition to this general safety training, individual departments must provide specific training for the gas and cylinder system used in their areas.



Responsibilities Cont'd

- At BSOM, medical storeroom personnel receive cylinders from the supplier and are responsible only for delivery and removal of stored cylinders for clinics and laboratories. Elsewhere, cylinders are delivered to the end user by the supplier.
- They are not authorized to make connections or disconnections of piping, regulators or other apparatus.



Responsibilities Cont'd

- The end user is responsible for the safe use of compressed gas cylinders and their contents and for maintaining the cylinder in the same condition as it was received.
- They are also responsible for placement of the cylinder in the work area, connection of piping, regulators and other apparatus, as well as performing a leak testing of the system.



Key Safety Precautions

- Always use gas cylinders in well ventilated areas. **DO NOT** use gas cylinders in confined spaces unless qualified to do so and the appropriate PPE is used.
- Know the gas you are using and possible reaction products. Additional mechanical ventilation may be required. Ensure the correct regulator is used for the purpose.
- Ensure there is a suitable emergency response procedure in place.
- Wear appropriate PPE for each specific gas, refer to the SDS.
- Ensure connections, fittings and lines are leak tight and suitable for use.
- Ensure that flammable and oxidizing gases are not used near ignition sources.



Key Safety Precautions

- Disconnect empty cylinders from equipment to avoid backflow issues
- Always close the cylinder valve when not in use.
- **DO NOT** use an empty cylinder as a waste receptacle.
- Fit non-return valves in line if required
- **DO NOT** use a gas cylinder that shows evidence of damage or corrosion.
- If the cylinder contents cannot be clearly identified, **DO NOT** use it. Return it to the supplier.



Questions



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