

Compressed Gas Safety

OAR
Division 2/H

Compressed Gases

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General-Industry Requirements

The storage, handling, use, and inspection of compressed gas must follow the Compressed Gas Association (CGA) guidelines referenced in 29 CFR 1910.101, **Compressed Gases (General Requirements)**, Division 2/H. CGA guidelines provide accepted storage, handling, and use practices and precautions for users of compressed gas. Employers must also follow local fire codes.

Employers are responsible for safe use of compressed gas cylinders and liquid containers and their contents. Compressed-gas hazards include oxygen displacement, explosion, and toxic effects as well as the physical hazards of a ruptured cylinder. Employers must evaluate compressed-gas hazards and have an emergency-response plan that defines procedures and responsibilities to address emergencies.

Safe Handling and Use

Compressed gases must be handled and used only by trained persons. Employers must inform employees about chemical hazards by means of a hazard communication program, labels and other forms of warning. Always consult the gas supplier's material safety data sheets (MSDSs) for specific information.

- Ensure that cylinders are clearly identified. Labels must not be defaced or removed. Do not accept or use containers whose content labels are not legible; segregate containers and return them to the supplier. Do not use the container color to identify the cylinder content; do not repaint the container. All gas lines leading from a compressed gas supply must be clearly labeled or identified in compliance with 437-002-0378 **Oregon Rules for Pipe Labeling**, Division 2/Z.
- Leave valve protection caps in place (if provided) and hand-tightened until cylinders are secured and in use or connected for use. Some types of gas cylinders have valve outlet caps and plugs that form a gas-tight seal. Keep the device on the valve outlet except when containers are secured and connected.
- Keep cylinder valves closed except when the cylinder is being used. Closing the valve isolates the cylinder's contents from the surrounding atmosphere and prevents corrosion and contamination of the valve. When opening a cylinder valve, stand to the side of the regulator and open it slowly.
- Replace protective caps and outlet caps or plugs before returning empty cylinders to the supplier.
- Never tamper with or alter cylinders, valves, or safety-relief devices. Do not tighten connections or leaking fittings or attempt other repairs while the system is under pressure.
- Do not subject cylinders to artificially low temperatures or temperatures above 125 F. Do not place them next to heat sources or allow a flame to contact any part of the cylinder.
- Do not place cylinders where they become part of an electric circuit or use them as a ground during electric welding.
- Transfer of compressed gases from one container to another should be performed only by the gas supplier or by personnel familiar with the hazards. They must be trained and qualified to use the proper transfill equipment and must have detailed written operating procedures that include equipment inspections and maintenance procedures. Nonrefillable cylinders cannot be refilled.
- Avoid dragging or sliding cylinders. Do not lift cylinders by the caps. Firmly secure the cylinder and move with a suitable hand truck, lift truck, or crane with a cradle or platform. Do not use lifting magnets. Slings, ropes, or chains are acceptable if the cylinder is equipped with lifting attachments. Never drop cylinders or strike them against one another or other surfaces.



Cylinder Storage

Group and store compressed gases based on their hazard class. Provide adequate space or segregate by partitions and post a conspicuous sign that identifies the gas or hazard class. For example:

ACETYLENE
FLAMMABLE GAS - ASPHYXIAN
NO SMOKING - NO OPEN FLAME

Storage areas should be dry, well-drained, ventilated, and fire-resistant. Avoid sub-surface storage. Cylinders can be stored in the open but should be protected from the ground or continuous dampness to prevent rusting. Prevent exposure to salt, corrosive chemicals or fumes. Cylinders can usually be stored in the sun; check with the supplier. Always refer to the manufacturers' storage requirements and MSDSs.

Storage areas should protect cylinders from damage; do not store on unprotected platform edges; do not obstruct walkways or exits. Use brackets, chains, or straps around the upper third of the cylinder to secure cylinders in storage or in use. Store charged and empty cylinders apart, if possible. Empty cylinders have residual pressure and should always be handled as if full.

CGA's P-1-2000 *Safe Handling of Compressed Gases in Containers, Appendix D*, provides a list of common compressed gases by hazard classification: flammable, asphyxiant, oxidizer, toxic, corrosive, and extreme cold. It also lists characteristics such as carcinogenic and pyrophoric. Many gases have multiple hazards. The following table is an example of common welding gases and the hazard-classification system.

Gas	Flammable	Asphyxiant	Oxidizer	Ext. cold	Other
Acetylene	P	S			1
Oxygen			P		
Propane	P	S		S	
Argon		P			
CO ₂		P			

P = primary hazard S = secondary hazard

Oxygen's primary hazard is an oxidizer, which with an ignition source and a fuel, vigorously accelerates combustion. A minimum of 20 feet must be maintained between oxidizers and flammable gases and other combustible materials, such as oil or grease. A firewall (partition) five feet high with a half-hour fire rating can be substituted. Common oxidizing gases include chlorine, nitrous oxide, and fluorine.

The primary hazard for acetylene and propane is flammability; both are secondarily asphyxiants. Acetylene's "other" hazard is that it may decompose violently under pressure in excess of 15 pounds per square inch gauge. The two gases can be stored together. Store flammables away from oxidizers, open flame, sparks, and other sources of heat or ignition in a well-ventilated area. Storage areas must have appropriate fire protection (fire extinguishers or fire suppression equipment). See 1910.106, *Flammable and Combustible Liquids*, Division 2/H, for storage and use requirements.

Argon and carbon dioxide are asphyxiants. Asphyxiants (including inert gases) can displace oxygen and may cause suffocation. Atmosphere-supplying respiratory protection is required in an oxygen-deficient atmosphere, which has less than 19.5% oxygen by volume.

Corrosive and toxic gases present serious hazards: keep exposures as low as possible and avoid inhaling or contact with skin or eyes. Employee exposures should not exceed OR-OSHA exposure limits. **Safety showers and eyewash stations must be available for those using corrosive gases such as ammonia and chlorine.**

Appropriate protective equipment, readily accessible, for an emergency response depends on proper assessment of the hazards. Emergency entry or planned entry into unknown concentrations or conditions immediately dangerous to life and health (IDLH) for toxic, corrosive, or asphyxiation hazards require the use of NIOSH-approved full-facepiece pressure-demand self-contained breathing apparatus (SCBA) or a pressure-demand supplied-air respirator with auxiliary self-contained air supply used in compliance with 1910.134, **Respiratory Protection**, Division 2/H.

Cryogenic liquids are extremely cold and cause thermal burns upon contact with the body. Provide suitable personal protective equipment. Commonly used liquid cryogens include argon, helium, methane, oxygen, and hydrogen. Hazards vary according to the specific cryogen and include explosion or flammability and asphyxiation. Store containers upright and follow distributors' recommendations.

Cylinder Inspections

Employers must visually inspect compressed-gas cylinders. CGA's Pamphlet C-6, *Standards for Visual Inspection of Compressed Gas Cylinders* gives detailed instructions and Appendix A provides a sample inspection report form. In general, inspect for exterior corrosion, denting, bulging, gouges or digs; measure these flaws with a variety of devices and compare to defined limits. Experience is important in the inspection of cylinders. Users who lack experience should return questionable cylinders. Leaking regulators, cylinder valves, or other equipment should be taken out of service.

Resources

Standards containing requirements for compressed gases include *Welding and Cutting*, Division 3/J and *Compressed Gases*, Division 2/H. Others contain provisions for the use of compressed gas. For example, chemical-related standards, such as 1910.1025 – *Lead*, Division 2/Z, do not permit the use of compressed air for cleaning contaminated surfaces. The full text of Oregon OSHA rules is on our Web site, www.orosha.org, Rules/Laws.

Related resource links

www.cbs.state.or.us/external/osha/pdf/rules/division_2/1910-101.pdf

www.ccohs.ca/oshanswers/chemicals/cryogenic/cryogen1.html

www.osha.gov/SITC/compressedgasequipment/index.html

www.cganet.com

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