

Compressed Gas Cylinder Safety

Hazards

A highly pressurized container may become a:

- Projectile
- Fragmentation bomb

Tipped or dropped cylinders can crush fingers and limbs.

Chemical hazards may also present:

- Reactions between incompatible gases
- Toxicity/Poisoning
- Asphyxiation

Identification

Before beginning any work with compressed gas, always identify the contents of a cylinder. Read the label; the cylinder must be stenciled, stamped or labeled. NEVER rely on cylinder color! Cylinder color varies depending on the region and supplier. If in doubt, do not use the cylinder! Do NOT rely on valve-cap color because valve caps are often interchangeable; the valve cap on a cylinder may not belong on that cylinder.

Gas Types and Hazards

- *Asphyxiant*: Reduce or remove breathable oxygen
- *Inert*: Main hazardous property is asphyxiation
- *Flammable*: Burn or explode in the presence of an ignition source
- *Pyrophoric*: Self-ignite, burn, or explode in the presence of air
- *Oxidizer*: Support vigorous burning of other materials
- *Toxic or Poisonous*: Hazardous to health in small quantities
- *Corrosive*: Begin destroying materials on contact

Gases often present multiple hazards.

Cylinder Storage

Environment

Always store cylinders:

- In a well-protected, well-ventilated, dry location
- Protected from collisions with vehicles, moving equipment, elevators, stairs
- On smooth, level floor with a means for securement
- Free from materials that might catch fire

Temperature

Keep cylinders away from temperature extremes and ignition sources. Never allow the temperature to rise above 52° Celsius (125° Fahrenheit). Concrete and asphalt surfaces absorb radiant heat making them significantly warmer than ambient air temperatures. Gas suppliers may recommend storage in shaded areas to prevent overheating.

Segregation

Store incompatible gases by hazard class in separate areas

- This includes empty cylinders, which may contain small amounts of gas
- Store upright and at least 6 meters (20 feet) from highly combustible materials
- Oxygen cylinders (full or empty) must never be stored near flammable gases and materials
 - A minimum separation of 6 meters (20 feet) must be maintained
 - Some jurisdictions allow the placement of a firewall between storage areas when distance requirements cannot be met
 - Never place greasy or oily materials near oxygen
- Always refer to the gas supplier's specific recommendations

Restraints and Signs

Secure the cylinder at all times to a wall, holding cage, heavy workbench or lab bench, or no-tip base. Fasten restraints on the upper half of the cylinder, above the center of gravity.

Post signs identifying the substances and appropriate precautions in all areas where flammable compressed gases are stored, for example:

- "Hydrogen"
- "Flammable Gas"
- "No Smoking"
- "No Open Flames"

Handling and Transportation

Before handling any compressed gas cylinder, locate the Safety Data Sheet (SDS) for the gas you will be using. This document contains vital information that you need to keep in mind such as health effects, first aid for exposure and protective equipment requirements.

Follow these simple guidelines when transporting cylinders:

1. Remove the regulator. Never move a cylinder with the regulator still in place
2. Replace the valve cap. Never lift a cylinder by the valve or protective cap
3. Secure the cylinder to a suitable hand truck or cart in an upright position
4. Never roll a cylinder on its side
5. Never drag or slide the cylinder or strike cylinders against each other
6. Move only one cylinder at a time

Personal protective equipment (PPE) may save your life:

- Always wear safety glasses and a face shield, especially when connecting and disconnecting regulators and lines
- Use gloves or other PPE, if required

Highly Hazardous Materials

Leaking or damaged gas cylinders or systems and those endangered by fire often present a true emergency. Emergency plans and specially trained responders may be needed. Follow your site's plan. Evacuation may be necessary.

Valve and Regulator Safety

Regulator Safety

Follow these simple steps to avoid hazards:

- Attach the regulator to the cylinder valve outlet
- Turn the delivery pressure adjustment knob counterclockwise
 - Ensure the flow control valve is in the closed position
- Stand to the side and slowly open the cylinder valve until the regulator registers the cylinder pressure
- Turn the delivery pressure adjustment knob clockwise
- Regulators are gas-specific and not necessarily interchangeable
- Always make sure that the regulator and valve fittings are compatible
- Never tighten any fittings while under pressure

Valve Safety

- Valve caps must be on when the cylinder is not in use
- The valve threads may vary in diameter, internal or external, right-handed or left-handed
- Only use standard valves, regulators and fittings that are approved for the particular gas. Do not assemble miscellaneous parts
- Make sure a cylinder's valve is accessible whenever you're working with it
- Never leave the main cylinder valve open when the equipment is unattended or not operating. This prevents cylinder contamination and slow leaks
- Never use pliers to open a cylinder valve!
- Check if the valve requires a washer
- If cylinder or gas system parts are not moving smoothly, **DON'T FORCE IT**
- Work with your gas supplier to determine appropriate parts and torque values
- Do not use wrenches on handwheels
- Do operate cylinders using a gloved hand
- Discontinue use and contact the supplier if a cylinder valve is difficult to operate
- Leave keys on cylinders when valves are open

Inspections and Repairs

Regularly inspect all cylinders. Check for the following:

- Are there signs of defects?
- Is there any deep rusting?
- Does it contain the correct gas in the designated usage area?
- Is there any dirt, paint, corrosion or other material obstructing the pressure relief device?
- Check all hoses and other equipment for leaks
 - Apply an appropriate leak check solution to check all connections for leaks
 - Never use an open flame to detect leaks

If a leaking cylinder is discovered:

- Move it to a safe place (if it is safe to do so)
- Inform your supervisor
- Remove the cylinder from service
- Repairs should be made by qualified personnel
- Under no circumstances should you attempt to repair a leaking cylinder or valve!