

Handling, storage, and use of compressed gas cylinders

Air Products would like to ensure the safe handling of our products. As our customer, you need to share in the responsibility for safe handling, storage, and use of our products.

Follow these seven general safety recommendations:

1. Know and understand the properties, uses, and safety precautions before using any gas or gas mixture. Consult the Air Products Safety Data Sheet (SDS) and Safetygrams for safety information on the gases and equipment you will be using.
2. Determine the appropriate equipment required to use the product and know how to safely operate the equipment.
3. Be aware of potential hazards and develop plans to cover possible emergencies. Use emergency drills to practice implementing these plans. Inform local hospitals, fire departments, and other emergency response organizations of the gases in use so that they, too, will be prepared in the event of an emergency.
4. Provide personal protective equipment (PPE) and the required training for its use. Require personnel to wear the proper PPE for each task. Locate other safety equipment such as fire extinguishers, eye wash stations, and showers at appropriate locations. Thoroughly inform everyone about the hazards of the gases they are using and how to respond to an emergency.
5. Follow all national, state, and local regulations pertaining to the storage, use, and disposal of compressed gases and cryogenic liquids. This document highlights the recommendations set forth in ISO Standard 11625, "Gas Cylinders—Safe Handling." In the United States, this document is published by the Compressed Gas Association as Pamphlet P-1, "Safe Handling of Compressed Gases in Containers," and has been incorporated into the regulations, making the contents of the document legal requirements in the United States, not recommendations. Other regional organizations such as the Asian Industrial Gases Association (AIGA),

the European Industrial Gases Association (EIGA), and the National Fire Protection Association (NFPA) also provide guidance for the storage and use of compressed gas cylinders.

6. If you are unfamiliar with the hazards associated with a particular gas, contact your supplier for additional information.
7. Use appropriate equipment when handling portable cylinder banks. They have a high center of gravity, and extreme care must be taken during their movement. Portable banks may fall over when being moved if they are stopped suddenly by an object or crack in the floor.

Handling

Compressed gas cylinders should be handled only by those familiar with the hazards and who are trained in the proper handling techniques. Cylinders containing compressed gases are heavy and awkward to move. Improper handling of compressed gas cylinders can result in sprains, strains, falls, bruises, or broken bones. Other hazards such as fire, explosion, chemical burns, poisoning, and cold burns could occur if gases accidentally escape from the cylinder due to mishandling. Take the following precautions to prevent injuries caused by the improper handling of compressed gas cylinders.

NEVER

- Drag or slide cylinders, even for short distances.
- Drop cylinders or permit them to strike each other violently.
- Subject cylinders to mechanical shocks that may cause damage to their valves.
- Use cylinders as rollers for moving material or other equipment.
- Tamper with pressure-relief devices.
- Permit oil, grease, or other readily combustible substances to come in contact with cylinders, valves, or other equipment in oxidizer service.
- Remove any product labels or shipping hazard labels.
- Refill compressed gas cylinders. This is to be done only by qualified producers of compressed gases.
- Lift a cylinder by its cap using a sling or a magnet.
- Attempt to catch a falling cylinder.

ALWAYS

- Move cylinders using a suitable hand truck or cart. (refer to figure 1)
- Leave the valve protection cap and valve seal outlet in place until the cylinder has been secured in place and is ready to be used.
- Secure cylinders when in storage, transit, or use.
- When returning cylinders to the supplier, properly close the cylinder valve, replace and secure any valve outlet seals, and properly install the cylinder cap.
- Use a cylinder cage or cradle to lift a cylinder.

- Use the proper PPE for cylinder handling. Wear safety glasses with sideshields, leather gloves, safety shoes, and other appropriate equipment.
- Use extreme care and restrict the movement of portable banks to localize movement on clean, smooth, level stationary surfaces.
- Use two people for localized manual movement of a portable bank. Stay out of the bank's travel path. Also, be aware of escape routes should the bank get out of control or start falling. If a smooth, level surface is not available over which to move the portable bank, use a forklift, crane, or other appropriate moving equipment.

Figure 1: Typical Cylinder Hand Trucks



Storage

Take the following precautions to prevent injuries caused by asphyxiation, fire, explosion, high pressure, and improper handling of compressed gas cylinders.

NEVER

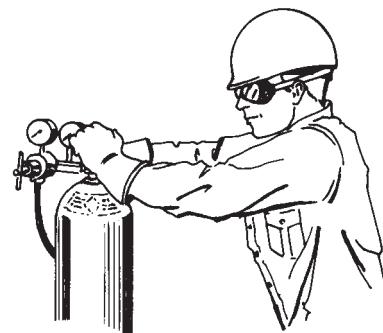
- Allow storage temperature to exceed 125°F (52°C).
- Permit smoking or open flames in oxidizer or flammable gas storage areas.
- Expose cylinders to corrosive materials such as ice melting compounds.

ALWAYS

- Store cylinders in accordance with ISO Standard 11625 or CGA Pamphlet P-1.
- Store cylinders upright with valve outlet seals and valve protection caps in place. See Air Products' Safetygram-14, "Don't Turn a Cylinder Into a Rocket."
- Secure cylinders when in storage, transit, or use.
- Store cylinders in areas designated for that purpose.
- Segregate full and empty cylinders.
- Store cylinders in a dry, cool, well-ventilated, secure area protected from the weather and away from combustible materials.
- Ensure that there is adequate separation from combustibles as specified by national regulations.
- Monitor the atmosphere in areas where gases may vent and collect.
- Use a first-in, first-out (FIFO) inventory system to prevent full containers from being stored for long periods of time.

- Store only the amount of compressed gas required for the specific application.
- Store cylinders away from heavily traveled areas and emergency exits.
- Provide adequate access for cylinder handling.
- Visually inspect stored cylinders on a routine basis, or at least weekly, for any indication of leakage or problems.
- Restrict access to cylinder storage areas.
- Protect cylinders from wet or damp ground.

Figure 2: The Correct Way to Safely Check a System



- Use cylinder color as a primary means to identify the contents of a cylinder.
- Heat a cylinder to increase its pressure or withdrawal rate unless using an approved method. See Air Products' Safetygram-30, "Handling of Liquefied Compressed Gases."
- Discharge the contents from any gas cylinder directly toward any person.
- Refill any nonrefillable cylinder after use of the original contents.
- Force cylinder valve connections that do not fit.
- Reduce the residual pressure of a cylinder below the operating pressure of the system or 7 psig (0.5 bar), whichever is higher.
- Change service of equipment from the particular gas or group of gases for which they were intended.
- Use a mechanical adapter to connect to the cylinder valve.

Proper use of compressed gases

Take the following precautions to prevent injuries caused by the improper use of compressed gases.

NEVER

- Attempt to mix gases in a cylinder.
- Insert an object (e.g., wrench, screw driver, etc.) into valve cap openings to remove a stuck cylinder cap. Doing so may damage or open the valve, causing a leak to occur. Use an adjustable strap wrench to remove over-tight or rusted caps.
- Allow any part of a cylinder to be exposed to temperatures exceeding 125°F (52°C).
- Permit cylinders to become part of an electrical circuit.
- Use oxygen as a substitute for compressed air.
- Strike an arc on a cylinder.
- Return product into a cylinder.
- Introduce another product into a cylinder.

ALWAYS

- Know and understand the gases and associated equipment you will be using. Refer to the supplier's MSDS to determine the proper PPE and any other special requirements for the gas being used.
- Secure cylinders when in storage, transit, or use.
- Use a pressure-reducing regulator or separate control valve to safely discharge gas from a cylinder.
- Use regulators approved for the specific gas.
- Leak-test lines and equipment with an inert gas before using.
- Use regulators and pressure-relief devices when connecting cylinders to piping circuits with lower pressure service ratings.
- Use check valves to prevent reverse flow into the cylinder.
- Loosen the valve outlet seal slowly when preparing to connect a cylinder.
- Open cylinder valves slowly and carefully after the cylinder has been connected to the process.
- Stand clear of the regulator and valve outlet while opening the valve.
- Prevent sparks and flames from contacting cylinders.

• Discontinue use and contact the supplier if a cylinder valve is difficult to operate. Wrenches should not be used on valves equipped with handwheels. If the valve is faulty, tag the cylinder, identifying the problem, and notify the supplier.

- Close the cylinder valve and release all pressure from the downstream equipment connected to the cylinder anytime an extended non-use period is anticipated.
- Use oxygen-compatible threading compounds, such as Teflon® tape on systems for use in oxygen or oxidizer service.
- Remember, the cylinder label or decal is the only positive way to identify the contents of a cylinder.

More information on gas handling is provided in Air Products' Safetygram-12, "Regulator Selection, Installation, and Operation."

Emergency Response System

T 800-523-9374
(Continental U.S. and Puerto Rico)
T +1-610-481-7711 (other locations)
For regional ER telephone numbers, please refer to the local SDS 24 hours a day, 7 days a week for assistance involving Air Products and Chemicals, Inc. products

Technical Information Center

T 800-752-1597 (U.S.)
T +1-610-481-8565 (other locations)
Monday–Friday, 8:00 a.m.–5:00 p.m. EST
F 610-481-8690
gastech@airproducts.com

For more information, please contact us at:

Corporate Headquarters

Air Products and Chemicals, Inc.
1940 Air Products Blvd.
Allentown, PA 18106-5500
T: 610-481-4911

For regional contact information, refer to the local SDS or contact your local sales representative.

