

Use and Storage of Compressed Gas Cylinders at UAB

Compressed gas cylinders of all shapes and sizes are used all over campus for everything from welding to research. There are two types of hazards associated with the use, storage and handling of compressed gas cylinders:

1. the hazards associated with the chemicals that the cylinder holds (corrosive, toxic, flammable, etc.), and
2. the physical hazards represented by the presence of a high-pressure vessel in the laboratory. Some cylinders can be pressurized up to 2,200 pounds per square inch (psi).

Improper handling, storage and use could lead to catastrophic events like:

- Oxygen depleted atmosphere
- Fires
- Adverse health effects or even death

A leaking compressed gas cylinder can penetrate through walls just like a torpedo and can cause structural damage, severe injury, and even death.

General Handling Guidelines

- All compressed gases received, used or stored must be fabricated and labeled according to the specifications of the Department of Transportation (DOT) and the Occupational Safety and Health Agency (OSHA) regulations.
- A label or a tag with the name of its contents must mark each cylinder.
 - Never accept cylinders without the appropriate labels.
 - Use the cylinder tag to identify the contents of the cylinder.
 - Never rely on the tag color for identification purposes.
- Safety Data Sheets (SDS) must be obtained and maintained for all compressed gases. SDSs can be obtained online at [ChemWatch](#) or from the vendor directly.
- Only trained employees are allowed to handle compressed gas cylinders.
- Cylinders must be transported, stored and used at up right position and firmly secured to prevent falling at all times.
- Use compressed gases only in well-ventilated areas.
- When using compressed gases, wear appropriate protective equipment, such as safety goggles or face shield, rubber gloves, and safety shoes.

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- Never use a leaking, corroded, or damaged cylinder. Contact the supplier immediately for return.
- Never transfer gases from one vessel to another except for cryogenic liquids.
- Never use a cylinder without a regulator.
 - Use only those regulators designed for the gas being used.
- Cylinder “not in use” shall not be stored in a laboratory unit.
- Do not have full and empty cylinders connected to the same manifold.
- Keep the cylinder cap on when the cylinder is not in use (empty or full).

General Storage Guidelines

- Cylinder storage areas must be prominently posted with the names and hazard class of the gases being stored.
- Secure all cylinders in racks, holders, or clamping devices. Fasten cylinders individually (not ganged) in a well-ventilated area.
- Close valves, and release pressure on the regulators when cylinders are not in use.
- Minimize the number of hazardous gas cylinders in a laboratory.
- Ensure that gas cylinders are stored away from hallways, public areas, exits or egress routes.
- Store the cylinders in well-ventilated areas.
- Store cylinders of flammable and oxidizing gases at least 20 feet apart, or separate these items with a firewall.
- Never store cylinders at extreme temperature or near combustible materials or never expose cylinders to corrosive fumes, toxic chemicals or excessive dampness.
- Keep heat, sparks, flames, and electrical circuits away from gas cylinders.
- Never store empty and full cylinders together.
- Never store cylinders more than a year without use.

General Transportation Guidelines

When cylinders are being moved from a storage area into the laboratory or from one lab to another:

- Transport by means of a suitable hand truck with a chain or belt for securing the cylinder.
 - Use hand trucks even for short distances.

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- Never move without the cylinder cap is in place, and the cylinder is chained or otherwise secured to the cart.
- Do not lift cylinders by the cap.
- Avoid dragging or sliding cylinders.
- Secure the cylinder to a wall, or to some other firm support once the cylinder reaches its destination.
- Use freight elevators to transport cylinders.
 - When moving cylinders in an elevator, place the cylinder chained securely to the cart in the middle of the elevator with the cart handgrip.
 - If a passenger elevator is used, it should be locked out to ALL other users. This is a confined space that would be impossible to escape from if there were an accidental release of gases.
 - When transporting dangerous gases, send the cylinder alone and a second person must receive it at the destination and warning signs must block all the exits between the floors.

General Guidelines for Labeling and Warning Signs

- Empty cylinders must be marked **EMPTY or MT** and never store along with full cylinders
- Rooms or cabinets containing compressed gases must be conspicuously labeled COMPRESSED GAS.
- Areas of flammable and toxic gases must be clearly **posted with:**
 - **the hazard class,**
 - **the name of the gases stored, and**
 - **emergency contact information.**

Storage and Handling of Specialty Gases

Flammable Gases

Examples of flammable gases include: acetylene, hydrogen.

- Flammable gases must be stored in well-ventilated areas away from flammable liquids, combustible materials, oxidizers, open flames, sparks and other sources of heat or ignition.
 - A distance of 20 feet or a noncombustible barrier having a fire rating of at least 1/2 hour is the minimum separation requirement.

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- All lines and equipment associated with flammable gas systems must be grounded and bonded.
- Do not use flammable gases near ignition sources (except for welding gases).
- Have a portable fire extinguisher (carbon dioxide or dry chemical type) readily available for fire emergencies.
- Use spark-proof tools when working with, or on, a flammable compressed gas cylinder or system.
- Post a sign stating "**No Open Flames**" on access doors to areas where flammable gases are stored and used.
- Manifold systems must be designed and constructed by trained personnel.
 - Consultation with the gas supplier and OH&S before installing manifolds is required.
- In an emergency involving a flammable gas leak, fire or explosion,
 - Leave the lab immediately!
 - Do not attempt to extinguish burning gas if the flow of product cannot be shut off immediately and without risk.

Oxidizer Gases

Oxidizing gas is defined as a gas that can support and accelerate combustion of other materials. Examples include: oxygen, chlorine, fluorine, and nitrous oxide.

Follow the guidelines below to work safely with oxidizer gases.

- Oxidizers shall be stored separately from flammable gas containers or combustible materials.
 - A distance of 20 feet or a noncombustible barrier at least 5 feet high having a fire rating of at least 1/2 hour is the minimum separation requirement.
- Do not use oil or other hydrocarbon products to clean any equipment used with oxidizer gases.
- Gauges and regulators for oxygen use should be labeled with a warning statement - "**Oxygen - Use No Oil**".

Highly Toxic Gases

Toxic gases, as defined by NFPA 704, are those having a health hazard rating of 3 or 4. The toxic effects of a substance can be either acute or chronic. Examples include: arsine, phosphine, phosgene, and nitric oxide.

Guidelines for working with toxic gases:

- **Store all toxic gases with a health hazard rating of 3 or 4 in a continuously, mechanically ventilated gas cabinets, or other exhausted enclosures.**

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- **Exhausts must be vented directly to outside.**
- **Lecture bottles of toxic gases must be kept in fume hoods.**
- Post Container Storage Areas with signs that give:
 - **the hazard class,**
 - **the name of the gases stored, and**
 - **emergency contact information.**
- A gas detection system with visible and audible alarms to detect the presence of leaks, etc. must be installed for all toxic and highly toxic gases with hazard rating 3 or 4 (in compliance with NFPA 55 Guidelines).
 - Gas detection and alarm system must be serviced and maintained according to manufacturer's guidelines.
- Standard Operating Procedures (SOPs) shall be developed when using Highly Toxic gases.
 - The SOPs must include emergency response procedures.
 - Everyone working in the area must be trained, prepared, and ready to execute the procedures in an emergency.
 - Only trained employees are allowed to work with highly toxic gases.
 - Review the Safety Data Sheets (SDS) to determine safety use guidelines.
 - Use PPE at all times while working with toxic gases.
 - Work under a fume hood only, and avoid contact with skin and eyes.

Corrosive Gases

Cylinders of corrosive or unstable gases should be returned to the vendor when the expiration date of the maximum retention period has reached. In the absence of this date, a 36-month interval should be used. In the case of hydrogen chloride and hydrogen fluoride the cylinder should be returned to the vendor after 2 years.

Examples of corrosive gases: hydrogen bromide, hydrogen chloride and ammonia

Special precautions for the use of corrosive gases:

- Use only under an approved fume hood.
- Always use required PPE, and avoid contact with skin and eyes.
- An emergency shower and eyewash station must be installed within 50 feet where corrosive gases are used and the path to the fixture must not be hindered with obstructions.

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- Emergency response procedures must be in place. Everyone working in the area must be trained on these procedures.

Inert Gases

Inert gases are non-combustible, non-flammable, and non-reactive to many materials. Examples include argon, helium, nitrogen, and neon. Precautions include:

- Inert gases also displace oxygen and can produce a localized oxygen-deficient atmosphere. Therefore, they should not be used in enclosed or confined spaces without proper ventilation.

Cryogenic Gases

Cryogenic liquids rapidly freeze human tissue and cause embrittlement of many common materials, to crack or fracture under stress. All cryogenic liquids vaporize to large volumes of gases and may create oxygen-deficient atmosphere. Examples include: liquid nitrogen, and helium.

Safety Precautions:

- Store cylinders or dewars containing cryogenic liquids in well-ventilated areas.
 - A leak or venting from the container could cause an oxygen deficient atmosphere.
- Use appropriate personal protective equipment when working with cryogenic liquids, including insulated gloves, goggles and a face shield.
- Never allow an unprotected part of the body to touch uninsulated pipes or containers of cryogenic material.
 - Do not rub the skin in the event of any skin contact with cryogenic liquids.
 - Place the affected part in a warm water bath.

Disposal

Close the valve and place the safety cap, and contact the vendor for return. Contact OH&S for removal of cylinders that cannot be returned to the supplier/vendor or supplier is not known.



If you have any questions about using, handling, transporting, or disposing of gas cylinders, please contact OH&S at (205) 934-2487.