

## Introduction

Welcome to the Managing Compressed Gas Cylinders (OHS200) Course Material. This training is required for anyone responsible for handling, using, or transporting compressed gas cylinders. Specialty courses are required if you are working with Flammable, Toxic, or Cryogenic Gas Cylinders.

## Objectives

At the conclusion, participants should be able to:

1. Properly use, handle, transport, store, dispose or, order, receive, and maintain gas cylinders according to regulatory standards and guidelines.
2. Identify the correct Personal Protection Equipment (PPE) to wear when working with a gas cylinder.
3. Recognize the dangers associated with gas cylinders by examining the labels on the gas cylinders and in the SDS.
4. Design an emergency plan and accurately describe what to do in case an incident occurs with a gas cylinder.

## Defined

### *What is a compressed gas?*

The official definition from the Compressed Gas Association's (CGA) handbook is "Material or mixture having the container an absolute pressure exceeding 40 PSI at 70°F or, regardless of pressure at 70°F, having an absolute pressure exceeding 104 PSI at 130°F or any liquid material having a vapor pressure exceeding 40 PSI absolute at 100°F." For more information, check out this [video](#).

## Rules of Safety

### First Rule

#### Know the properties of the materials involved!

- Is the gas a health hazard? Is it toxic? Can it cause severe damage to the eyes, respiratory system, skin, etc.? Is it carcinogenic? Is it an asphyxiant?
- Is it a physical hazard? Is it explosive, flammable, pyrophoric, corrosive, etc.?

### Second Rule

- Treat all gas cylinders, full or empty, as objects that have a genuine potential to injure you severely.

## Description

- Lecture Bottles
- Cylinders
- Constructed of carbon steel or aluminum
- Made to be compatible with gas contained inside
- Types: Inert, Flammable, Corrosive, Cryogenic

## Hazards

There are two primary hazards associated with **ALL** compressed gas cylinders:

- a) All compressed gases, except air and oxygen, when released, will expand rapidly. They will deplete the oxygen in the room and quickly asphyxiate all life in the area.
- b) If mishandled and dropped, compressed gas cylinders can become dangerous projectiles.



A 9" X 52" gas cylinder pressurized to 2,000 pounds per square inch (PSI) has the stored energy equivalent to one pound of dynamite.

## Labeling

**Never accept an unlabeled or improperly labeled cylinder!** All compressed gas cylinders must be:

- Properly labeled – the label should be visible and durable
- Accurately labeled – if a cylinder’s contents are unknown, it must be marked as “Contents Unknown,” and the vendor contacted **immediately!**



Color coding vary from supplier to supplier, therefore, they are unreliable as to identification.

## Safety Data Sheets (SDS)

- Required in the workplace
- Substance fact sheet listing characteristics, hazards and as much detail as possible concerning the particular gas

### *How to get an SDS?*

Safety Data Sheets (SDS) must be obtained and maintained for all compressed gases. SDS’s can be obtained from the vendor directly

## Handling

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

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

Place all cylinders, so the valve is accessible at all times. The valve should be closed when the cylinder is no longer in use.

## Storage

1. Post storage areas with the names and hazard class of the gases
2. Secure cylinders in holders or clamping devices> Keep properly secured at all times using straps, belts, or chains.
  - a. **NEVER** leave a cylinder unsecured or unattended!
3. Fasten cylinders individually or up to a maximum of two cylinders.
4. Close valves and release pressure on the regulators when cylinders are not in use.
5. Keep cap valves on when not in use.
6. Store in a well-ventilated area.
7. Keep cylinders away from:
  - a. Heat:
    - i. Store in areas less than 125° Fahrenheit
  - b. Ignition sources
  - c. Electrical circuits
8. Store cylinders “not in use” in an area outside the laboratory area.
  - a. If necessary, one reserve cylinder may be maintained next to the cylinder that is in use.
9. Never store cylinders near hallways, public areas, exits, or egress routes.
10. Segregate empty and full cylinders.
  - a. Label empty cylinders

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b. Return empty cylinders as soon as possible to the vendor.

11. Never store cylinders for more than a year without use.

### Maintenance

#### *Frequently*

You should:

- Inspect valves, hoses, and flashback arrestors (if applicable) for leaks or other issues
- Confirm operating pressures
- Verify secure connections when in use

#### *Avoid*

You should avoid:

- Using or allowing oil or grease to come in contact with the regulator, valves, fittings, or the cylinder
- Repairing the cylinder valves while the cylinder still contains gas pressure
- Using a leaking, corroded, or damaged cylinder
- Never use a flame to locate a gas leak

### Proper Usage

- Allow only trained employees to operate/handle compressed gases.
- Wear the appropriate Personal Protective Equipment (PPE) when working with compressed gases.
- Secure the area from other potential hazards before bringing the cylinder (e.g., remove or move other flammable, toxic, or hazardous chemicals in the area away from the space where the cylinder will be located).
- Use only cylinders with regulators with both high and low-pressure gauges that are designed for the gas being used. **NEVER** use a cylinder without a regulator!
- Use compressed gases only in well-ventilated areas.
- Place cylinders, so the valve is accessible at all times.

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- Ensure that the cylinder in use is in an upright position and firmly secured before use.
- Attach the regulator securely before opening the valve.
- Open the cylinder valves **slowly!**
- Stand to one side of the regulator when opening the valve.
- Close the valve when not in use.

### Transportation

- Always use a cylinder cart and secure the cylinders with a chain when moving.
- Do not remove the protective valve caps when moving or lifting cylinders.
- Secure cylinders **before** removing regulators and protective caps.
- Ensure that valves are closed before moving.

### *Things NOT TO DO*

#### **NEVER:**

- Roll cylinders in a vertical position on the edge of the bottom
- Roll cylinders horizontally
- Drag along the floor or any surface
- Drop cylinders ([video here](#))
- Permit cylinders to strike each other or be handled violently or roughly
- Drag along the floor or any surface
- Carry large cylinders even if empty
- Carry or drag by the valve
- Leave a cylinder unattended/unsecured during a transport

### Disposal

When the cylinder is empty:

- Close the valves
- Bleed the system
- Remove the regulator
- Replace the valve cap
- Mark the cylinder as “Empty”
- Return the cylinder to the storage area for empty cylinders
- Secure empty cylinders as though they were full
- Store empty cylinders away from full cylinders

## Ordering and Receiving

### Ordering

Review the Safety Data Sheet for physical and health hazards.

- Ensure the storage location has the required ventilation
- Ensure piping, regular, etc. are compatible with the gas
- Verify that the laboratory staff has been properly trained to handle that particular type of compressed gas (e.g., specific hazards, regulators, storage, maintenance, etc.)
- Safety shoes – both toes and heels enclosed, hard shoes in case of a falling cylinder, preferable steel-toed shoes.

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## Receiving

- Inspect for proper labeling, dents, rust, and other damage – return to the vendor if there are issues.
- Look for visible signs of leaks like odors, visible fumes, or hissing sounds – return to the vendor if there are issues.
- Verify the hydrostatic pressure test stamped on the cylinder is within the required time (usually five years).
- Do not accept a cylinder that is rusted, unlabeled, mislabeled, or damaged.
- **If acceptable**, mark the cylinder as **FULL** and write the date received on it.

## General Safety Precautions

### Personal Protective Equipment (PPE)

1. Appropriate clothes covering (lab coat or other) for the gas being used
2. Safety goggles or a face shield
3. Rubber gloves or gloves appropriate for the gas
4. Safety shoes – both toes and heels enclosed, hard shoe in case of a falling cylinder, preferable steel-toed shoes

### Lab Ventilation

1. Maintain an occupied lab air exchange rate of six to ten times an hour per applicable standards
2. Keep an unoccupied lab air exchange rate to four times in one hour per the National Fire Protection Association's (NFPA) recommendation
3. Change the heating, ventilation, and air conditioning (HVAC) filters quarterly
4. Never recycle air supplies to labs, storerooms, or prep areas to other parts of the building or offices
5. Conduct only experiments that the ventilation system can handle without a fume hood

## Emergency Plans

- Every location where compressed gases are handled should have a written emergency plan covering steps to be taken in the event of an accidental release of gas
- This plan should consider the nature of the gases being handled, that is their chemical and physical properties
- Plan elements:
  - At a minimum, the plan should specify the following:
    - The type of alarm system(s) you have in place
    - Evacuation procedures
    - Emergency equipment available for smaller issues
    - Emergency response contact and numbers displayed predominantly
    - Containment and disposal procedures for smaller issues.

## Leaks

- Never attempt to handle a gas cylinder alone.
  - Call a trained co-worker or supervisor.
- Stop all leaks which occur from the cylinder in gas lines, tubes, or apparatus by closing the main cylinder valve.
- In the event of an emergency
  - Clear the affected area and floor immediately if the leak cannot be stopped and it is an inert gas (e.g., Nitrogen, Carbon Dioxide, etc.)
  - Call 911 from a UAB phone if possible or UAB Police from a cell phone at 205-934-3535.

### Conclusion

This concludes the Gas Cylinders: Handling, Use, Care, and Emergency Response (OHS200) Training Course. You should now take the assessment. 90% or higher is considered passing. You have two chances to complete the assessment. Failing both attempts means that you fail the course and must start over.

### EHS Decision Tree

EHS has many training courses available to all UAB active employees and students. This includes topics such as in-depth radiation training, biosafety, bloodborne pathogens, chemical safety, Controlled Substances, building life safety, hazardous and medical waste, universal waste, PPE, Hazard Communication, etc.

We have a [decision tree](#) to assist you in choosing the right course to match the knowledge/skills you may need at work every day, as well.

If you have any questions or comments, please feel free to contact EHS at 205-934-2487.