



#### SUPERVISOR INSTRUCTIONS:

- Use toolbox trainings to encourage safety/environmental discussions during monthly meetings with employees.
- Campus Services' employees should maintain the employee sign-in sheet in their department's safety/environmental compliance binder as a record of training. All other groups should maintain a record of training in accordance with their Division's training procedures.

Compressed gas cylinders and liquefied gas cylinders are commonly found on University campuses; primarily in laboratories and maintenance areas. These cylinders come in different sizes and can contain such chemicals as oxygen, acetylene, air, liquefied petroleum gas (LPG), carbon dioxide, nitrogen, isobutylene or other gases. These cylinders and their contents pose unique risks, such as, uncontrolled high-pressure releases from a damaged valve; or a sudden release of toxic, flammable or poisonous gas. Using this equipment without the proper knowledge of the hazards is dangerous and can have devastating consequences.



Listed below are general “safe work” guidelines to follow when using gas cylinders and compressed gases.

### Safe Work Conditions

Listed below are general “safe work” guidelines to follow when using gas cylinders and compressed gases.

- **Only use compressed and liquefied gases if you are trained and qualified!**
- **Read the manufacturers Safety Data Sheet (SDS)** and understand the properties, uses, and safety precautions before using any gas or gas mixture.
- **Be knowledgeable of the potential hazards** and know how to respond in the event of an emergency.
- **Verify that all cylinders are properly labeled** with their contents via a printed label or stenciling by the gas supplier – do not rely on the color of the cylinder as an indication of its contents.
- **Wear the correct personal protective equipment (PPE)** when handling compressed gases and participate in all required training.
- **Use only approved valves, regulators and other associated equipment,** following proper configurations for each class of gas to prevent mixing of incompatible gases.
- **Keep valves on gas cylinders closed when they are not in use.**
- **Follow all federal, state and local regulations** pertaining to the storage, use and disposal of compressed gases and cryogenic liquids; including but not limited to compliance requirements from the Occupational Health and Safety Administration (OSHA), Compressed Gas Association (CGA), National Fire Protection Association (NFPA), the Department of Transportation (DOT) and local fire codes.
- **Contact your gas supplier or the Environmental Health and Safety Office (EHSO) for additional information** or if you are unfamiliar with the hazards associated with a particular compressed gas.

### Associated Hazards

Compressed gas cylinders present a variety of hazards due to their pressure and/or their content. Depending on the particular gas, there is also a potential for simultaneous exposure to both mechanical and chemical hazards. Compressed gases may be:

- Flammable or Combustible
- Explosive
- Corrosive
- Acidic
- Reactive
- Toxic
- Inert



### Physical Hazards

Compressed gas cylinders have very high internal pressures, in some cases up to 2,500 psig. Exposing these cylinders to heat, knocking them over or allowing them to become part of an electric circuit can contribute to weakness in the cylinder wall or damage to the valve. Such careless actions or damage can cause:

- The cylinder to tip over onto the user causing a contusion or crushing injury.
- The cylinder wall to rupture and explode sending metal shrapnel flying into the air.
- The valve to become broken off, rapidly releasing all of the gas contents and possibly spinning out of control or actually becoming airborne.

### Content Hazards

Each compressed gas cylinder has unique hazards based on the contents. An incident involving the release of flammable, corrosive, explosive, toxic or a combination of these gases could cause harm to human health. Some gases are inert; but do not confuse this with being “safe”! Depending on the gas or mixture of gases, an accidental release or leak from a cylinder could cause:

- Burns or frostbite from contact with rapidly expanding gases
- Suffocation (asphyxiation) or death
- Chemical poisoning from toxic gases
- Damage to certain target organs
- Exacerbation of pre-existing health problems
- An increased risk of fire and may aid combustion
- Destruction of skin and mucous membranes

### Storage of Compressed Gas Cylinders

Proper storage of gas cylinders is paramount to the safety and health of anyone using compressed gas cylinders. Follow these simple guidelines to ensure that cylinders are guarded against damage:

- Store cylinders upright, in well-ventilated areas and out of inclement weather.
- Place cylinders in a location where they will not be subject to damage, heat or electrical contact. Do not store cylinders in exits or egress routes, like public hallways or other unprotected areas.
- Store gases with the same hazard class in the same area. Inert gases are compatible with all other gases and may be stored together.
- Mark the storage area with proper precautionary signs, such as no smoking, fuel gas storage or oxidizer storage.
- Properly secure tanks to a stable object, using chains, straps or cages. Fix or secure tanks at approximately 2/3 the height of the cylinder – secured above the midpoint,



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but below the shoulder. Cylinders less than 18" tall may be secured by approved stands or wall brackets.

- Never store acetylene cylinders on their sides.
- Completely close the valves, and keep the valve protection caps on cylinders when not in use or attached to a system.
- Keep oxygen cylinders at least 20 ft. away from all flammable, combustible or incompatible substances.
- Store empty cylinders separately from full cylinders.
- Ensure that empty tanks are labeled or tagged indicating that the tank is “empty” and that the valves are closed with the protective cover in place.

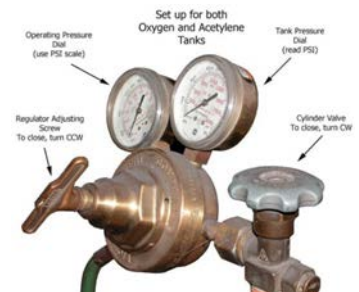


### Handling and Transport of Gas Cylinders

Most accidents or injuries involving cylinders happen when moving or handling gas cylinders. Use the right equipment, follow the correct procedures and use the sufficient number of personnel to lift or move cylinders to avoid personal injury and cylinder damage.

#### Handling and Use Requirements

- Keep cylinders upright and away from heat, sparks, fire, physical damage or electrical circuits to avoid rupture.
- Clean valves of any dust or dirt before attaching the regulator and always use the correct regulator for the specific gas intended.
- Never force connection fittings and do not tamper or alter the regulators.
- Stand off to the side of the cylinder when opening a valve.
- Inspect the regulator and cylinder valves for grease, oil, dirt and solvent. Never use grease or oil to lubricate regulators or cylinder valves because they can cause an explosion.
- Position the cylinder so that the valve handle at the top is easily accessible.
- When using toxic or irritating gas, the valve should only be opened while the cylinder is in a working fume hood.
- Always open valves slowly and only use wrenches or tools that are provided by the cylinder supplier. Never use screwdrivers or pliers to open a cylinder valve.
- Use in a well-ventilated area to avoid gas accumulation.
- Do not bring cylinders into a confined space.
- Never use copper fittings or tubing on acetylene tanks – an explosion may result.
- Close the cylinder valve and release all pressure before removing the regulator from the cylinder.
- Never leave pressure in a regulator when it is not in use.
- If you suspect that a cylinder is leaking, use soapy water. Never use a flame to detect a gas leak.



#### Transport Requirements

- Wear protective footwear, safety glasses or goggles, face-shield and protective gloves; specific to the hazard of the chemical in the cylinder
- Transport cylinders in a special cylinder cart and make sure the cylinder is securely in place before moving it. Never drag, slide or roll a cylinder.
- Always have the protective cap securely in place (for cylinders that accept caps). Never transport the cylinder with the regulator attached.
- Do not drop cylinders or strike them against each other.



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- Never use the valve cover to lift cylinders; they could be damaged and become unattached. If the cylinder is dropped on a hard surface it can cause an explosion.  
*To prevent injury, always store, handle, use and transport cylinders properly!*

### Questions for Discussion

- 1) **True or False:** If the regulator to an oxygen cylinder is difficult to thread, you should oil the threads.  
**Answer:** False. Never put any oil or grease on the cylinders or regulators/gauges, particularly those containing oxygen, to avoid fire or explosion. If the regulator is difficult to thread, mark the cylinder “not for use” and return it to the supplier.
- 2) True or False: Store cylinders upright, in well-ventilated areas, away from other incompatible materials, sources of flame or heat or areas where they may receive damage.  
**Answer:** True. Proper storage of gas cylinders is essential to safety, because unsecured cylinders can be easily knocked over and become missiles.
- 3) True or False: What are some of the hazards associated with compressed gas cylinders?
  - a) Asphyxiation
  - b) Burns
  - c) Pressure release
  - d) All of the above**Answer:** d) All of the above. Compressed gas cylinders present a variety of hazards due to their pressure and/or their content. Depending on the particular gas, there is also a potential for simultaneous exposure to both mechanical and chemical hazards.