

Calvin College Compressed Gas Cylinder Policy		Revision 1	
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1.0 POLICY

It is the policy of Calvin College that special precautions are taken to assure the safe use, storage and transportation of compressed gas cylinders.

2.0 PURPOSE

The purpose of this procedure is to ensure that all gas cylinders that are received, handled or stored are done so in accordance with safe practices in order to minimize potential hazards.

3.0 RESPONSIBILITIES

The Environmental Health and Safety office or the lab supervisor will provide training for all personnel who handle compressed gas cylinders.

4.0 PROCEDURE FOR TRANSPORTING CYLINDERS

- Remember that compressed gases are high-energy sources and should be treated as a potential explosive.
- When handling a cylinder, make sure the caps are in place to protect the withdrawal valve. A cylinder should never be transported with the regulator in place.
- Do not roll or drag a cylinder.
- When transporting a cylinder, only use hand trucks and carts that are specially designed for this task. Make sure the cylinder is secured with a strap, for stability. While transporting, you should push the cart rather than pull it. Transport only one cylinder cart per operator.

5.0 SECURING CYLINDERS

Restrain compressed gas cylinders securely with a chain, belt or stand at all times to prevent them from falling over. If a cylinder falls, it may shear off its valve, and the escaping high-pressure gas has been known to propel the cylinder like an unguided rocket. It can smash through masonry walls, go long distances and ricochet.

Secure the cylinder above its center of gravity (~2/3 up the cylinder). If the chain or belt is too low or too high, it will not hold the cylinder if it starts to fall.

Protect the cylinder valve with a securely attached valve cap whenever a cylinder is being moved, and at all other times unless a regulator is attached to the cylinder.

6.0 STORAGE OF CYLINDERS

- To mount wall brackets with straps or chains for the cylinders, send a work request to Physical Plant. Please do not attempt to do this on your own. There are specific requirements for strap and chain thickness.
- Do not store cylinders near an ignition source.
- Cylinders should be
 - stored away from all sources of heat,
 - stored in a dry, well-ventilated area,
 - checked periodically. If there is damage to cylinders, they must be returned to the vendor/ supplier immediately.
- Cylinders should **not** be stored in an area where there is a potential to be struck by heavy objects, such as service corridors, loading docks, or near elevators.
- Never store a cylinder in a corridor, stairwell or any route of egress.
- Store like gases together. If possible, separate the flammable gases from other gases. Oxidizing gases such as, oxygen and nitrous oxide, should be stored separately from flammable gases or liquids.
- Highly toxic (health rating 4) and pyrophoric gases, and nitrous oxide, should be stored secured from unauthorized access.
- Empty cylinders should be marked as empty and stored securely and separately from full or partially full cylinders.

7.0 HANDLING

- Only persons familiar with the hazards should handle compressed gas cylinders. All cylinder movement should be done with material handling equipment.
- Always secure the cylinders when in storage or use. Safety glasses, work gloves, and appropriate work shoes should be worn.
- Never use a cylinder of compressed gas without the proper regulator attached to the valve.
- Compressed gas cylinders shall only be used for their intended purposes.
- Cylinders or valves should not be repaired, painted or altered.
- Do not expose cylinders to temperatures higher than 50 degrees Celsius. (125 degrees Fahrenheit)
- Do not use compressed gas or compressed air to blow away dust or dirt.
- Never direct high-pressure gases at a person or clothing.
- Always close the main cylinder valve tightly when not in use.
- Cylinders must not be placed where they might become part of an electrical circuit or arc. All cylinders, piping, and equipment used should be grounded.

- Cylinders should not be dropped, dragged, slid or used as rollers for moving material.
- When returning an empty cylinder, close the valve before shipment, leaving 25 psi of residual pressure in the cylinder. Replace the valve cap and any valve outlet caps or plugs originally shipped with the cylinder. If repair is needed on a cylinder or its valve, be sure to mark it and return it to the supplier.
- If a cylinder is leaking, do not attempt to repair. If possible, verify suspected leaks using a flammable gas detector or soapy water solution (a flame should not be used for detection). **If the leak cannot be stopped by tightening a valve gland or packing nut, emergency action procedures should be initiated and Campus Safety contacted (3-3333).**
- For flammable, inert or oxidizing gases, move the cylinder to an isolated, well-ventilated area (e.g., within a fume hood) away from combustible materials. Post signs that describe the hazard.
- For corrosive and toxic gases, move the cylinder to an isolated, well-ventilated area (e.g., within a fume hood) and use suitable means to direct the gas into an appropriate chemical neutralizer. Post signs that describe the hazards.
- If it is necessary to move a leaking cylinder through populated portions of the building, place a plastic bag, rubber shroud or similar device over the top and tape it (duct tape preferred) to the cylinder to confine the leaking gas.
- In the event of a large gas release or if an accident takes place in which readily available personal protective equipment (PPE) is inadequate to ensure worker safety, **activate the following Emergency Procedures:**
 - **Immediately call 3-3333 for Campus Safety emergency** and report the incident. CS will contact the fire department.
 - Activate building and area fire alarms.
 - Evacuate the area, securing entrances and providing assistance to others on the way out.
 - Provide emergency response officials with details of the problem upon their arrival. The Grand Rapids Fire Department will respond to all chemical emergencies.

8.0 LABEL AND SIGNS

- Cylinders should be clearly identifiable by means of attached labels or stencil. Labels should identify the individual components and their proportions.
- Do not deface, alter or remove labels.
- Never use a cylinder for which the contents are unknown. If a cylinder cannot be identified it should be marked as “unidentified” and returned to the vendor.

9.0 SPECIFIC PROCEDURES:

Acetylene Gas

- When storing inside a building, always store in a well-ventilated and dry storage area that is at least 20 feet from any combustible material.
- Always store acetylene cylinders upright.
- If a cylinder has not been stored upright, it may only be used after it has been upright for at least 30 minutes. (Acetylene cylinders are partially filled with acetone.)
- The outlet line of acetylene cylinders must contain a flash arrestor.
- The appropriate tubing must be used. (Copper must not be used)

Argon, Carbon Dioxide and Nitrogen Gas

- Avoid storing in heated areas (could result in explosion).
- Ruptured cylinders may rocket. Therefore the condition of the cylinders must be checked periodically. If there is damage to cylinders, they must be returned to the vendor/ supplier immediately.

Corrosive Gases

Examples include chlorine, hydrogen chloride, fluorine, hydrogen fluoride, hydrogen sulfide, carbon monoxide and carbon dioxide.

- Metals become brittle when used in corrosive gas service, check equipment and lines frequently for leaks.
- A diaphragm gauge should be used with corrosive gases that would destroy a steel or bronze gauge. Check with gas supplier for recommended equipment.
- Remove regulators after use and flush with dry air or nitrogen.
- Corrosive gases should be removed from areas containing instruments or other devices that are sensitive to corrosion.
- Keep storage area for corrosive gases as dry as possible. If stored for too long it may corrode the valve internally and may be impossible to open or if opened, may not close.
- Regulators and valves must be closed when cylinders are not in use.
- When corrosive gases are used, an eyewash and shower must be in the immediate area.

Oxygen

- When oxygen is used, open the cylinder valve momentarily and then close it. This should blow any dirt from the outlet. Avoid touching the valve outlet with cloth or hands to prevent organic residues from being left on it that might be ignited by exposure to high oxygen pressure.
- Avoid oil and grease. Having these near or on the high-pressure side of oxygen could result in a *fire or explosion*.

Toxic or Flammable gases

Examples of flammable gases include acetylene, hydrogen, methane, propane and iso-butane.

- Flammable gases, except for protected fuel gases, shall not be used near ignition sources. Ignition sources include open flames and sparks, sources of heat, oxidizing agents and ungrounded or non-intrinsically safe electrical or electronic equipment.
- Portable fire extinguishers shall be available for fire emergencies. The fire extinguisher must be compatible with the apparatus and the materials in use.
- Flames shall not be used for detecting leaks. A compatible leak detection solution shall be used for leak detection.
- Spark proof tools shall be used when working with or on a flammable compressed gas cylinder or system.
- Access doors to areas which use or store flammable gases shall be posted "No Open Flames."
- Always store in a continuously ventilated area.
- A gas monitoring devise/system should be available in the event of a release of toxic gases.
- Highly toxic gases should be used in a chemical fume hood.
- Use flash arrestors and backflow protection on cylinder lines leading from flammable gases.

10.0 REVISIONS

Revision	Date	Description
1	9/27/10	Changed formatting; added sections 1.0, 2.0, 3.0 and 4.0; updated sections 6.0, 7.0, 8.0 and 9.0 with new information