

# Laboratory Safety Committee



Northern Illinois  
University

## Compressed Gas Cylinder Policy

### Purpose

Compressed gas cylinders are an important component of many research laboratories. Wide varieties of gases are packaged in compressed gas cylinders. The hazards associated with gas cylinders include explosion, toxicity, oxygen displacement, and dropped or ruptured cylinders. Proper care and training in the use of compressed gas cylinders are essential for a safe research environment.

### Policy

#### 1. Training

Anyone who transports, stores or uses compressed gas cylinders in the laboratory setting at Northern Illinois University must receive gas cylinder training and will be required to provide proof of training. Online training is available through Airgas at <https://airgas.csod.com/client/airgas/default.aspx>. Information regarding training available can be found at the Laboratory Safety website under the resources tab: <http://www.niu.edu/orci/lab-safety/chemsafety/training.shtml>

Training Modules Required:

- a. Hazards of Industrial Gases – should be completed by those who transport, store or use compressed gas cylinders in the laboratory.
- b. Regulator Change-Out Training – should be completed by those who transport and change cylinders.

Once a training module is completed a certificate can be printed and should be given to the supervisor/PI and a copy sent to M. Crase at ORCIS.

This training is in addition to the laboratory specific training needed. This training **does not** reduce the responsibility of the principle investigator and lead laboratory researcher to conduct lab specific training.

#### 2. Acceptance and Transport

**All deliveries of gas cylinders shall be received in person.** All cylinders will be transported via a gas cart appropriate for the size of the cylinder. Cylinders should never be left unattended in public areas.

#### 3. Handling

- a. **Identify a gas and its dangers before using it.** Look for this information on

labels, Safety Data Sheets, and cylinder markings. If you don't know what's in a cylinder, don't use it.

- b. **Do not** tamper with connections and do not force connections together.
- c. **Do not** modify, paint, deface or otherwise tamper with the cylinder or relief valve.
- d. **Always** secure gas cylinders upright to a wall, cylinder truck, cylinder rack or post.
- e. **Always** replace the steel protective cap when the cylinder is not in use and when it is being moved.
- f. **Do not** drop, bang, slide, clank, or roll cylinders.
- g. **Never** electrically ground a cylinder or place it near an electrical conductor including conduit, piping, plumbing, or anything that might carry stray electric current.
- h. Keep cylinders out of direct sunlight. Gases expand when heated. The hotter a cylinder gets, the higher the gas pressure.

#### 4. Storage

- a. **Only store cylinders in designated areas.**
- b. Keep flammable gas cylinders well away from oxygen cylinders. OSHA regulations require that oxygen cylinders in storage be separated from flammable-gas cylinders and combustible materials by at least 20 feet or by a noncombustible barrier at least 5 feet high and having a fire-resistance rating of at least 30 minutes.
- c. Make sure leaking cylinders or cylinders with stuck valves are properly tagged and moved to a safe outdoor location. Notify the supplier to pick them up.
- d. Always place steel protective caps on cylinders that are being stored or moved.
- e. To keep cylinders from falling over, secure them with chains or cables above the midpoint.
- f. Make sure fire extinguishers near the storage area are appropriate for gases stored there.
- g. Never tamper with, repair or alter any cylinder valves, regulators or pressure release devices.
- h. Do not transfer gas from one commercial cylinder to another commercial cylinder.
- i. Pyrophoric and toxic gases are to be stored in approved gas cabinets for cylinder storage and must contain both remote manual and automatic shutdown devices. See section 6. Special Conditions Gas Cylinder Guidelines for more information.

#### 5. Emergency/Accident Procedures

- a. Follow the Laboratory Emergency Plan. Proceed via the building escape routes during a compressed gas emergency. After evacuating the building call 911 for emergency response.

- b. For non-emergency advice or hazard information contact Laboratory Safety, M. Crase Faraday 327, 815-753-9251, or J. Gable Montgomery Hall 207, 815-753-1610.

## 6. Special Conditions Gas Cylinder Guidelines

- a. Oxygen
  - i. **Never** oil or grease torches, regulators, hoses, cylinder valves, or anything else that will come into contact with oxygen. **Do not** place oxygen cylinders or equipment where oil or grease from machinery can drop on them.
  - ii. **Never** allow anyone to dust themselves with an oxygen (or even a compressed-air) line because clothes can become oxygen saturated and therefore extremely flammable.
  - iii. **Never** allow a jet of oxygen to contact an oily surface or a greasy cloth, or to enter a fuel-oil or other storage tank unless it has been thoroughly cleaned according to approved procedures.
  - iv. **Never** use oxygen to run air tools. Oxygen and other gases should be used only for their intended purposes. Never use oxygen to blow out pipelines or to provide ventilation. The oxygen may cool the operator, but it also increases the oxygen content of the room. A spark that is inconsequential in air can be extremely hazardous in an oxygen-enriched environment.
- b. Flammable Gases - All flammable gases are hazardous. They will burn and can explode when mixed with air or oxygen. Following are general rules that apply to all fuel gases:
  - i. Treat flammable-gases with respect. Follow the correct procedures for assembling and disassembling equipment. Use only regulators and other equipment designed for the gas being used and always follow the manufacturer's instructions.
  - ii. **Always** keep flammable-gas cylinders upright. Never use them on their sides. Use, move and secure them with the same care used for high-pressure cylinders.
  - iii. Close the cylinder valve of a leaking flammable-gas cylinder, take the cylinder to a safe place outside and away from ignition sources, mark it, and call the supplier or gas distributor.
  - iv. Cylinders should not be placed where they could be part of an electrical circuit.
  - v. Flammable gas cylinders must be stored in either a ventilated gas cabinet, fume hood, or well ventilated space.
- c. Pyrophoric Gases -Pyrophoric gases are very hazardous. They have an autoignition temperature in air at or below 130° F. Pyrophoric gases include; arsine, silane disilane, dichlorosilane, diborane and phosphine. Silane leaks have

resulted in serious fires and explosions in gas storage cabinets, supply systems, and ductwork. Following are general rules that apply to all pyrophoric gases:

- i. Cylinders are to be stored in approved gas cabinets for pyrophoric cylinder storage and must contain both remote, manual and automatic shutdown devices.
  - ii. Minimal quantities are to be stored.
  - iii. Emergency back-up power shall be provided for all electrical controls, gas detection devices, and alarms associated with the gas storage and process systems.
  - iv. Pyrophoric gas storage areas should be located on the exterior of the building or in an area designed and approved for such storage.
- d. Acetylene - Special care is needed when working with acetylene because it is highly unstable:
- i. **Never** use acetylene at a pressure above 15 psig.
  - ii. **Never** open the cylinder valve more than one turn. Leave the valve key or wrench on the valve whenever the valve is open so that the valve can be closed quickly in case of fire or accident.
  - iii. **Never** use an acetylene cylinder on its side. Keep it upright and chained to a cylinder truck, wall, or other safe, stable object so that it cannot be knocked over or otherwise damaged.
- e. Nonflammable Gases – Oxygen Deficiency Hazards.
- i. Under certain conditions, otherwise harmless gases can kill. Inert gases such as **argon, helium, carbon dioxide, and nitrogen** can asphyxiate a person.
  - ii. Asphyxiation occurs rapidly and without warning. All possible precautions should be taken to ensure that an adequate oxygen supply is available. Neither respirators nor gas masks supply oxygen. They only filter or purify the air.
  - iii. If asphyxiation is possible, workers should be equipped with supplied air masks, or the area should be well ventilated to assure the availability of air suitable for breathing.
  - iv. For information on oxygen deficiency hazards contact Laboratory Safety, M. Crase Faraday 327, 815-753-9251, or J. Gable Montgomery Hall 207, 815-753-1610.
- f. Toxic Gases
- i. Toxic compressed gases present a unique set of hazards for their safe storage and use. These gases may require specialized ventilation or detection equipment for their safe use.
  - ii. Any compressed gas with a National Fire Protection Association (NFPA) health rating of 2, 3 or 4 requires approval from ORCIS before its use.

- iii. For information on ordering toxic gases contact Laboratory Safety, M. Crase Faraday 327, 815-753-9251, or J. Gable Montgomery Hall 207, 815-753-1610.

**Annual Review**

The Laboratory Safety Committee will review and revise this policy on an annual basis to reflect operational and procedural changes internal to the University as well as changes to applicable rule, and regulations and consensus standards.

Date	Reviewed by	Changes
2/21/2018	Lab Safety Committee	Annual review

**Reference**

NFPA 45 Standard on Fire Protection for Laboratories Using Chemicals, 2015 Edition