

**The University of Texas at Dallas**

**Compressed Gas Cylinder  
Safety Manual**



**Environmental Health & Safety**

## **PURPOSE:**

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### **I. Responsibility**

The person who administers an account that is used to purchase or otherwise obtain a compressed gas cylinder at the University of Texas at Dallas has a “cradle-to-grave” responsibility for the safe use of the material in the cylinder, i.e., for safe transport and use of the cylinder, for securing the cylinder properly, and for return/disposal of the cylinder in accordance with this policy. This responsibility cannot be transferred or assigned without the written approval of the person’s administrative supervisor.

The person responsible for the compressed gas cylinder is also responsible for seeing that every user of the cylinder complies with the safety, use and disposal regulations set out in this policy.

### **II. Safety**

Due to the nature of gas cylinders, special storage and handling precautions are necessary. The hazards associated with compressed gases include oxygen displacement and asphyxiation, explosion, and toxicity, as well as the physical hazards of a ruptured cylinder. To avoid a dangerous situation, there are several general procedures to follow for safe storage and handling of compressed gas cylinders.

#### **A. Identification of Contents of Compressed Gas Cylinders**

- The contents of any compressed gas cylinder should be clearly identified.
- A durable label should be provided that cannot be removed from the cylinder.
- No compressed gas cylinder should be accepted for use that does not identify its contents legibly by name.  
*Note:* Color-coding is not a reliable means of identification; cylinder colors vary from supplier to supplier, and labels on caps have no value because many caps are interchangeable.
- Tags should be attached to the gas cylinders on which the names of the users and dates of use can be entered.
- If the labeling on the gas cylinder becomes unclear or defaced so that the contents cannot be identified, the cylinder should be marked "contents unknown" and the manufacturer or EH&S contacted regarding appropriate procedures.

#### **B. Receiving Gas Cylinders from Suppliers**

- Gas cylinders will not be delivered to Central Shipping and Receiving. Shipping and Receiving will not be delivering cylinders.
- Suppliers should deliver gas cylinders to the UT Dallas building where they will be used or the closest building with a loading dock accessible by the suppliers’ delivery vehicles. As of the current revision of this policy, the delivery locations are:

- Berkner dock – for deliveries to Berkner, Founders, Founders Annex, Founders North
- ECS dock – for deliveries to ECS
- RL dock – for deliveries to NSERL
- MP (cylinder cage at west entrance) – for deliveries to MP
- You must be present to accept the delivery from the supplier. Suppliers will not leave cylinders without obtaining a signature.
- One cylinder cart will be kept at BE and one will be kept at MP for general use. Please return these carts to their storage locations when you are done moving cylinders.

### **C. Transporting Gas Cylinders**

- Cylinders should only be moved by trained personnel. Contact your supervisor or EH&S for information and training on gas cylinder safety.
- Only one cylinder should be handled (moved) at a time.
- Cylinder safety caps should be securely affixed during transport. A cylinder's cap should be screwed all the way down on the cylinder's neck ring and should fit securely.
- Do not lift cylinders by the cap. The cap is for valve protection only.
- Always use a cylinder cart to move compressed gas cylinders. Strap the gas cylinder to the cylinder cart in an upright position.
- Cylinders should not be transported with the regulator attached to the cylinder.
- Never slide, drag or roll cylinders on edge.

### **D. Storage of Compressed Gas Cylinders**

- Always secure cylinders, whether empty or full, to prevent them from falling. Secure individual cylinders by chaining or strapping them to a wall, lab bench, or other fixed support. For locations where more than one cylinder is located, appropriate racks or cages must be used.
- Cylinders should not be allowed to drop nor be struck violently.
- Caps used for valve protection should be kept on the cylinders at all times except when the cylinder is being used or charged.  
*NOTE:* Having the safety cap in place provides extra protection for the valve and for personnel.
- Cylinders should not be used for any purpose other than the transportation and supply of gas.
- Cylinders should be stored in a well ventilated area away from flames, sparks, or any source of heat or ignition. Keep cylinders away from electrical circuits.
- Cylinders should not be exposed to an open flame or to any temperature above 125 °F.
- Only compatible gases should be stored together in a gas cylinder cabinet.
- Cylinders of liquefied flammable gas should be stored in an upright position or such that the pressure relief valve is in direct contact with the vapor space of the cylinder.

- Oxygen should be stored in an area that is at least 20 feet away from any flammable or combustible materials or separated from them by a non-combustible barrier at least 5 feet high and having a fire-resistance rating of at least 1/2 hour.
- Flammable gases must be stored in properly labeled, secured areas away from possible ignition sources and kept separate from oxidizing gases.
- Cylinders may be stored outdoors in appropriate racks or cages, but they should be protected from the ground to prevent bottom corrosion. Where extreme temperatures prevail, cylinders should be stored so they are protected from the direct rays of the sun.
- Cylinders should not be exposed to continuous dampness or stored near salt or other corrosive chemicals or fumes. Corrosion may damage cylinders and cause their valve protection caps to stick.
- Try to avoid storing gas cylinders for extended periods of time. Only keep gases you will use. Cylinders should not be kept past their inspection or pressure test date. Prolonged storage may also increase cylinder rental fees you will pay to the cylinder supplier.
- Remove regulators from unused cylinders and put the safety cap in place.
- Always mark empty cylinders with a prominent sign saying “EMPTY” or “MT” and store them separately from full and in-use cylinders.

#### **E. Use of Compressed Gases**

- Know and understand the properties, uses, and safety precautions of the gas before using the cylinder.
- Do not use any cylinder which is not provided with a legible decal that identifies its contents.  
*Note: Color-coding is not a reliable means of identification; cylinder colors vary from supplier to supplier, and labels on caps have no value because many caps are interchangeable.*
- Always use the appropriate regulator on a cylinder. Always check the regulator before attaching it to a cylinder. If the connections do not fit together readily, the wrong regulator is being used. Do not attempt to adapt or modify a regulator to fit a cylinder it was not designed for.
- Before attaching cylinders to a connection, be sure that the threads on the cylinder and the connection mate are of a type intended for the gas service.
- Wipe the outlet with a clean, dry, lint-free cloth before attaching connections or regulators. The threads and mating surfaces of the regulator and hose connections should be cleaned before the regulator is attached.
- Attach the regulator securely before opening the valve. Always use a cylinder wrench or another tightly fitting wrench to tighten the regulator nut and hose connections.
- Open cylinder valves SLOWLY. Do not use a wrench to open or close a hand wheel type cylinder valve. If it cannot be operated by hand, the valve should be repaired by the manufacturer.
- Stand to the side of the regulator when opening the cylinder valve.

- Place all cylinders so that the main valve is always accessible.
- Do not use Teflon tape on connections for gas cylinders containing toxic, corrosive, or flammable gases.
- Do not permit oil or grease to come in contact with cylinders or their valves.  
*NOTE:* When oxidizing gases come in contact with organic material, a fire or explosion can result.
- Close the main cylinder valve whenever feasible. If the cylinder is not to be used immediately, the main cylinder valve should be closed.
- Never completely empty cylinders during lab operations; rather, leave approximately 25 PSI pressure.  
*NOTE:* Leaving 25 PSI pressure will prevent the residual gas in the cylinder from becoming contaminated.
- Close valves on empty cylinders and mark the cylinder "empty" or "MT." Remove regulators and secure the safety cap on empty cylinders.
- Whenever possible, use flammable and reactive gases in a fume hood or other ventilated enclosure. As noted in Section III. Compressed Gas Cylinder Cabinets, certain toxic/reactive gases must always be stored and used in ventilated enclosures.
- Inspect regulators, pressure relief devices, valves, cylinder connections, and hose lines frequently for damage.
- Do not attempt to repair cylinder valves or their relief devices while a cylinder contains gas pressure. Tag leaking cylinders or cylinders with stuck valves and move to a safe, secure outdoor location.

#### **F. Things Not To Do**

- Never roll a cylinder to move it.
- Never carry a cylinder by the valve or the safety cap.
- Never leave an open cylinder unattended.
- Never leave a cylinder unsecured.
- Never force improper attachments onto a cylinder.
- Never grease or oil the regulator, valve, or fittings of an oxygen cylinder.
- Never refill a cylinder.
- Never transfer gases from one cylinder to another. The gas may be incompatible with the residual gas remaining in the cylinder or may be incompatible with the cylinder material.
- Never use a flame to locate gas leaks.
- Never attempt to mix gases in a cylinder.
- Never discard pressurized cylinders in the normal trash.

### **III. Compressed Gas Cylinder Cabinets**

- A.** Cylinders containing the compressed gases listed below must be kept in a continuously mechanically ventilated enclosure. Full size cylinders must be stored in a gas cylinder cabinet. No more than two small cylinders can be stored in a chemical fume hood, a

storage cabinet under the fume hood (if properly ventilated into fume hood exhaust), or some other ventilated enclosure.

Acetylene	Fluorine
Ammonia	Formaldehyde
Arsenic Pentafluoride	Germane
Arsine	Hydrogen Chloride, anhydrous
Boron Trifluoride	Hydrogen Cyanide
1,3 - Butadiene	Hydrogen Fluoride
Carbon Monoxide	Hydrogen Selenide
Carbon Oxysulfide	Hydrogen Sulfide
Chlorine	Methylamine
Chlorine Monoxide	Methyl Bromide
Chlorine Trifluoride	Methyl Chloride
Chloroethane	Methyl Mercaptan
Cyanogen	Nitrogen Oxides
Diborane	Phosgene
Dichloroborane	Phosphine
Dichlorosilane	Silane
Dimethylamine	Silicon Tetrafluoride
Ethane	Stibine
Ethylamine	Trimethylamine
Ethylene	Vinyl Chloride
Ethylene Oxide	

- B.** Compressed gas cylinder cabinets must meet Article 80 of the Uniform Fire Code, including the following requirements:
- negative pressure relative to the surrounding area, with the exhaust from the cabinet going outside the building;
  - self-closing doors; and
  - internally sprinkled.
- C.** Cylinders stored in compressed gas cylinder cabinets or other ventilated enclosures must be secured at all times. When stored in a cabinet or hood, small cylinders must be positioned and secured so that they will not fall out.
- D.** The person responsible for an area that is not in compliance with the regulations in Section III, A-C, shall
- notify, in writing, EH&S, Physical Plant, and the person's administrative supervisor (for faculty both the Department Head and Dean) and describe the situation, the extent of non-compliance, and any plans to bring the facility into compliance; and
  - request, through the person's administrative supervisor, a waiver from EH&S to keep specified amounts of materials in the current area

*NOTE:* In considering a request for a waiver, EH&S should take into account the identity, amounts, risk levels, and plans for bringing a facility into compliance.

#### IV. Purchase and Disposal of Non-Returnable Gas Cylinders

Non-returnable compressed gas cylinders present special disposal problems. Therefore, purchase of such cylinders requires prior approval, and such cylinders should be held at UT Dallas for a maximum of three years.

- A. A request to purchase a non-returnable gas cylinder shall be submitted to the department chair and to EH&S for review and approval. The request should include:
  - a. the gas(es) and amount(s) to be purchased,
  - b. the time the cylinder(s) is to be at UT Dallas (**maximum three years**), and
  - c. the reason why a non-returnable gas cylinder purchase is essential.
- B. The request must contain a Letter of Credit commitment that specifically states the requesting PI will be responsible for the proper disposal of the non-returnable cylinder and agrees to pay a \$1,000 disposal fee if the university is required to dispose of the cylinder.

*NOTE:* Identification of a specific account or funding source for the possible \$1,000 disposal expenditure is not required, but submission of the request by the PI and approval by the department constitutes a commitment by them that, if the PI is unable to cover the required disposal costs, department funds will be made available to cover any required disposal costs.

- C. Once approved by EH&S, the request will then be forwarded to the Dean for approval and to the Provost for final action.
- D. The Provost will return a copy of the approved request to the PI and a send a copy to EH&S.
- E. The PI shall attach a copy of the approved request to the purchase requisition for the desired gas and shall clearly state on the purchase requisition that it is for the purchase of a non-returnable gas cylinder.

**Non-returnable gas cylinders cannot be purchased through the SOS system.**

- F.** If an extension of the three year period is desired, the PI should prepare and submit a request as described in Section III.D. above.
- G.** Final disposal of the non-returnable gas cylinder should be completed no later than three years after purchase. The PI shall provide evidence of the proper disposal of the cylinder to EH&S.
- H.** The \$1,000 Letter of Credit commitment will be canceled when the cylinder:
  - a. is disposed of through normal EH&S waste disposal procedures,  
*NOTE:* The cylinder will be acceptable for normal waste disposal if it contains a non hazardous gas and is in good condition, i.e., not damaged or corroded.
  - b. has been returned to the manufacturer or distributor, verified by a receipt or a bill of lading, or
  - c. is disposed of through an appropriate hazardous waste disposal company, verified by a complete and correct Uniform Hazardous Waste Manifest and Certificate of Disposal.
- I.** If the university must dispose of the cylinder outside of normal procedures, the disposal fee of \$1,000 will be assessed to the PI, and the PI shall provide an appropriate account for the charge at that time.

For more information on compressed gas cylinders or training, contact EH&S at 972-883-4111.