Compressed Air and Gas Cylinder

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A. **SCOPE**

This program covers the proper use of compressed gases, compressed gas cylinders and related equipment throughout UNC Charlotte to ensure safety of employees working with or near compressed gases.

B. **INTRODUCTION**

It is imperative that employees using compressed gas cylinders be familiar with cylinder characteristics, safety features, and precautionary measures which must be observed in their use. Gases drawn from cylinders are usually characterized as:

1. Permanent gases having boiling points of -150o F or lower and cannot be liquefied at room temperature no matter how high the pressure. Such gases include oxygen, nitrogen, and helium.

2. Liquid gas which liquefy at temperatures of -130o F or higher at one atmosphere, but can be liquefied and maintained as liquids at higher pressures. Such gases include propane, chlorine, and butane. Carbon dioxide is in this category, but becomes a solid rather than a liquid.

3. Dissolved gases in common use such as acetylene dissolved in acetone which holds 35 times its own volume of acetylene.

Compressed gas cylinder users must maintain and refer to the specific Material Safety Data Sheets (MSDS) for the substances contained in the cylinder for more details. Note that OSHA has specific standards for some compressed gases such as acetylene, hydrogen, oxygen, etc.

C. **GENERAL REQUIREMENTS**

Improper use, handling, and storage of compressed air, gases, or related equipment can result in serious injury and property damage. University employees should be properly trained in the safe use and handling of such substances and equipment. Visual inspection of equipment, including portable cylinders is needed to ensure equipment is in safe operating condition prior to each use. Departments shall not utilize cylinders
without first obtaining the proper equipment to use, handle, or store them accordingly. Inspections, usage, handling and storage of compressed air, gases and related equipment should be in compliance with the applicable standards

D. **COMPRESSED AIR USED FOR CLEANING**

1. **Air Nozzles**

When used for cleaning, the compressed air equipment (air nozzle) must reduce the outlet (working) air pressure to less than 30 pounds square inch (psi) at the discharge tip. This reduction can be done with nozzles and tips designed for this purpose.

NOTE: Users must not remove, damage, cover (i.e., tape), replace or in any way alter the equipment provided for this purpose. Nozzles that have been altered or "home-made" are not approved and shall not be used.

2. **Chip Protection**

In-line chip protection shall be used when airlines are connected directly to a compressed air system. This does not mean that the supply air or line pressure be reduced to 30 psi as long as the static (dead head) pressure exiting the nozzle when restricted does not exceed the mandatory maximum 30psi.

3. **Personal Protective Equipment (PPE)** To prevent eye injury, employees using compressed air should, at a minimum, wear appropriate safety glasses with side shields at all times.

E. **AIR RECEIVERS (PORTABLE AIR TANKS AND AIR COMPRESSOR TANKS)**

1. **Installation**

Air receivers must be installed per the ASME Boiler and Pressure Vessel Code, Section VII. Air receivers must be installed to insure accessibility for maintenance and draining. Valves, indicating and controlling devices shall be constructed, located, and installed so that they cannot be readily rendered inoperable.
2. Drains

To provide for removal of accumulated water and oil, a drain pipe and valve must be installed at the lowest point of every air receiver. The drain valve must be opened frequently in order to drain the air receiver of accumulated water and oil.

3. Pressure Gauge and Safe Pressure Relief

Additionally, every air receiver must be equipped with a pressure gauge which is readily visible and with spring loaded safety valves which prevents the receiver from exceeding the maximum allowable working pressure by more than 10 percent.

4. Maintenance and Testing

All safety valves must be tested on a regular basis to ensure they are in good operating condition. This can be performed by an outside vendor if necessary and records should be maintained within the area.

F. **Compressed Gas Portable Cylinders**

Compressed gas cylinders require special handling, using, and storing procedures. This procedure describes how to handle and store compressed gas cylinders properly on the UNC Charlotte campus. This procedure is a general guideline and may not be applicable to all situations. Contact the Environmental Health and Safety Office at 704-687-1111 for additional information or assistance.

1. Approval

All portable cylinders used for the storage and shipment of compressed gases shall be constructed and maintained in accordance with the regulations of the U.S. Department of Transportation, 49 CFR Parts 171-179. This must be included as a requirement in any purchase or use agreement to ensure that the vendor is supplying approved cylinders.
2. Markings

Compressed gas cylinders shall be legibly marked, for the purpose of identifying the gas content, with either the chemical or the trade name of the gas. Such marking shall be by means of stenciling, stamping or labeling, and shall not be readily removable. Whenever practical, the marking shall be located on the shoulder of the cylinder. This method conforms to the American National Standard Method for Marking Portable Compressed Gas Containers to Identify the Material Contained, ANSI Z48.1-1954.

3. Connections

Compressed gas cylinders shall be equipped with connections complying with the American National Standard Compressed Gas Cylinder Valve Outlet and Inlet Connections, ANSI B57.1-1965.

4. Valve Covers

All cylinders with a water weight capacity of over 30 pounds (13.6 kg) shall be equipped with a means of connecting a valve protection cap or with a collar or recess to protect valve.

G. Handling of Compressed Gas Cylinders

1. All cylinders used on campus must be clearly labeled. The label must include contents, concentrations, hazard classifications, safety precautions and the manufacturer. The label can either be attached or stenciled onto the cylinder. Do not remove manufacturer applied labels or accept a cylinder if the contents are not clearly identified. Do not rely on color coding, because it is not a standardized labeling system.

2. All cylinders must be in good condition with an operable valve or regulator. Cylinders without valves and regulators should be capped.

3. All cylinders must be transported using a hand truck or cart equipped with a chain or belt for securing the cylinder. In certain situations, cylinders may be rolled on their bottom edge. Make sure the protective cap covers the cylinder.
valve. Never move a cylinder with the regulator attached. Do not move cylinders by rolling, carrying, sliding, or dragging them across floor. Do not transport oxygen and combustible gases at the same time.

4. Cylinders shall not be dropped or be allowed to strike each other violently.

5. Safety devices in valves or on cylinders shall not be tampered with.

6. Cylinders shall always be secured to prevent them falling over. Chains or a clamp-plus-strap assembly are the most common methods of keeping cylinders upright. Please ensure the chain or strap is attached high enough to prevent the cylinder from falling over.

7. Cylinders shall always be considered full and shall be handled carefully.

H. **Using Compressed Gas Cylinders**

1. Unless cylinder valve is protected by a recess in the head, the metal cap shall be kept in place to protect the valve when the cylinder is not connected for use. A blow on an unprotected valve might cause high pressure gas to escape.

2. The threads on a regulator shall be identical to those on the cylinder valve outlet. Connections that do not fit shall not be forced on.

3. Always inspect all parts of a compressed gas cylinder before use. A soapy water solution may be used to check for leaks.

4. Cylinder valves shall be opened slowly. Cylinders without hand wheel valves shall be opened with a spindle key, special wrench, or other tool provided or approved by the gas supplier.

5. Cylinders shall never be used without a pressure-reducing regulator attached to the cylinder valve except where cylinders are attached to a manifold – in which case the regulator shall be attached to the manifold header.

6. Before making connection to a cylinder valve outlet, the valve shall be slightly opened for an instant to clear the opening of particles of dust or dirt. The valve and opening shall always be pointed away from the body and not toward anyone
else. Fuel gas cylinder valves shall not be slightly opened for an instant near other welding work, sparks, open flames, or other possible sources of ignition.

7. Regulators and pressure gauges shall be used only with gases for which they are designed and intended. Do not attempt to repair or alter cylinders, valves, or attachments. This shall be done only by the manufacture.

8. Oil or grease shall never be used as a lubricant on valves or attachments of oxygen cylinders. Oxygen cylinders and fittings shall be kept away from oil and grease such cylinders or apparatus shall not be handled with oily hands, gloves, or clothing.

9. Never use oxygen as a substitute for compressed air in pneumatic tools, in oil pre-heating burners, to start internal combustion engines, or to dust clothing. It shall be used only for the purpose for which it is intended.

10. Cylinders shall never be brought into confined spaces or unventilated rooms.

11. DO NOT use or compress Acetylene in a free state at pressure higher than 15 pounds per square inch.

12. Cylinders shall never be filled or gases attempted to be mixed on campus.

13. Never completely empty the cylinder; always leave a residual gas pressure of 30psi.

14. Before a regulator is removed, the cylinder valve shall be closed and the gas released from the regulator.

15. Unless the cylinder valve has first been closed tightly, no attempt shall be made to stop a leak between the cylinder and the regulator by tightening the union nut.

16. If a leak occurs in a fuel gas cylinder it shall be taken out of use immediately and handled as follows:

17. The valve shall be closed and the cylinder taken outdoors well away from any ignition source. The cylinder shall be tagged (Do Not Use, No Smoking, No Ignition Source) and the supplier notified.
18. A regulator attached to the valve may be used temporarily to stop a leak through the valve seat.

19. If the gases are toxic, the cylinder should be removed to an isolated, well-ventilated area, but only if this is possible while maintaining personal safety. It may be necessary to call campus police for a general evacuation of the building and have the cylinder approached only by trained emergency response personnel wearing protective apparel and self-contained breathing apparatus (SCBA).

I. **Storing of Compressed Gas Cylinders**

1. Storage rooms for cylinders containing flammable gases shall be well ventilated to prevent the accumulation of explosive concentrations of gas; no source of ignition shall be permitted; smoking shall be prohibited.

2. Do not store incompatible gases together. Oxygen cylinders shall not be stored within 20 feet of gas cylinders or highly combustible materials. If closer, cylinders shall be separated by a fire-resistive partition at least 5 feet having a fire resistive rating of at least ½ hour.

3. Cylinders shall not be stored in temperatures above 125 degrees Fahrenheit or near sources of heat such as radiators/furnaces, or near highly flammable substance like gasoline, oil, or volatile liquids.

4. Acetylene and liquefied fuel gas cylinders shall be stored with the valve end up.

5. Cylinders shall not be stored near elevators, gangways, corridors, stairwells, or other places where they can be knocked down or damaged.

6. Cylinders stored in the open shall be protected from contact with the ground and against weather affects.

J. **Training**

Those employees who use gas cylinders as part of their job, should be trained in their proper use. This training should be provided before and employee is allowed to use gas cylinders and documentation forwarded to the Environmental Health and Safety Office.
APPENDIX I

REFERENCED STANDARDS

Reference standards for compressed gases include:

- OSHA Standards for General Industry 29 CFR 1910
  - 1910.101 Compressed Gases (General Requirements)
  - 1910.102 Acetylene
  - 1910.103 Hydrogen
  - 1910.104 Oxygen
  - 1910.105 Nitrous Oxide
  - 1910.242(b) Compressed Air, cleaning
  - 1910.169 Compressed Air, receiver
  - 1910.253 Oxygen-fuel Gas Welding and Cutting


- DOT Hazardous Materials Regulations 14 CFR 103

- Compressed Gas Association (CGA)

  Pamphlet No./ Description
  C-6-1968, Inspections
  C-8-1962, Inspections
  P-1-1965, In-plant Handling, Storage and Use
  S-1.1-1963 & 1965 addenda, Pressure Relief Devices
  8-1.2-1963, Pressure Relief Devices

- OSHA Construction Standards 29 CFR 1926

- ASME Boiler and Pressure Vessels Code Section VIII, III.

- AGA (American Gas Association)


Contact the Environmental Health and Safety Office for additional information.