

Safety and Health Policy and Procedure Manual

COMPRESSED AIR AND GASES Section 0200

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SECTION 0200

I. INTRODUCTION

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

- Permanent gases having boiling points of -150° F or lower and cannot be liquefied at room temperature no matter how high the pressure. Such gases include oxygen, nitrogen, and helium.
- Liquid gas which liquefy at temperatures of -130° 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.
- 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.

II. SCOPE

This UNCG safety procedure covers the proper use of compressed gases and compressed gas cylinders throughout the University to assure protection of employees and students working with or near compressed gases. Department Heads will insure that their employees follow these procedures.

III. 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 49 CFR 171-179

- 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)
- ANSI Z48.1 - 1954, 1965

Contact the Office of Safety for access to these reference documents.

IV. GENERAL REQUIREMENTS

Improper use, handling, and storage of compressed air, gases, or related equipment can result in fatal consequences. University employees should be properly trained in the safe use and handling of such substances and equipment. Visual inspections of equipment, including portable cylinders is needed to ensure equipment is in safe operating condition prior to each use. Departments shall not possess 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 listed above. For a listing of definitions see [Appendix A](#).

V. COMPRESSED AIR USED FOR CLEANING

When using compressed air for cleaning purposes, such as blowing off machinery, certain precautions must be taken to prevent the accidental injection of air into the blood stream. When used for cleaning, the compressed air equipment (air nozzle) must reduce the outlet (working) air pressure to less than 30 psi at the discharge tip. 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.

This reduction can be done with nozzles and tips designed for this purpose. For that reason, employees 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. Use of non-approved equipment shall be grounds for disciplinary actions against the employee using the device.

To prevent eye injury, employees using compressed air should wear appropriate safety glasses with side shields at all times.

VI. AIR RECEIVERS

Installation and Maintenance

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. 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.

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.

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.

Valves, indicated devices, and controlling devices shall be constructed, located, and installed so that they cannot be readily rendered inoperable.

VII. COMPRESSED GAS: PORTABLE CYLINDERS

A. Cylinders and Containers

1. Approval and marking. 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 insure that the vendor is supplying approved cylinders.

2. 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. 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. 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.

B. Transporting and Moving of Compressed Gas Cylinders

1. Valve protection caps, where cylinder is designed to accept a cap, shall always be in place and secure.
2. When transporting cylinders by a crane or derrick, a cradle, boat, or suitable platform shall be used. Slings or electric magnets shall not be used for this purpose.
3. Cylinders shall be moved by tilting and rolling them on their bottom edges. They shall not be intentionally dropped, struck, or permitted to strike each other violently.
4. When cylinders are transported by powered vehicles, they shall be secured in a vertical position.
5. Valve protection caps shall not be used for lifting cylinders from one vertical position to another. Bars shall not be used under valves or valve protection caps to pry cylinders loose when frozen. Warm, not boiling water, shall be used to thaw cylinders loose.
6. Unless cylinders are firmly secured on a special carrier intended for this purpose, regulators shall be removed and valve protection caps put in place before cylinders are moved.
7. A suitable cylinder truck, chain, or other steadying device shall be used to keep cylinders from being knocked over while in transit.
8. When cylinders are moved at any time, the cylinder valve shall be closed.
9. Compressed gas cylinders shall be secured in an upright position at all times except, if necessary, for short periods of time while cylinders are actually being hoisted or carried. **Acetylene cylinders must remain upright at all times.**

C. Storage

1. Cylinders shall be kept away from radiators and other sources of heat.
2. Inside of buildings, hydrogen cylinders shall be stored in a well-protected, well-ventilated, dry location, at least 20 feet (6.1m) from highly combustible materials. All cylinders should be stored in definitely assigned places away from elevators, stairs, or gangways. Assigned storage places shall be located where cylinders will not be knocked over or damaged by passing or falling objects, or subject to tampering by unauthorized persons. Cylinders shall not be kept in unventilated such as lockers and cupboards.
3. Empty cylinders shall have their valves closed and marked "MT".
4. Valve protection caps, where cylinder is designed to accept a cap, shall always be in place, hand-tight, except when cylinders are in use or connected for use.

5. Fuel-gas cylinders stored inside a building, except those in actual use or attached ready for use, shall be limited to a total cumulative gas capacity of 2,000 cubic feet (56 m³) or 300 pounds (135.9 kg) of liquefied petroleum gas.
6. Acetylene cylinders shall be stored valve end up.

7. Oxygen cylinders in storage shall be separated from fuel-gas cylinders or combustible materials (especially oil or grease), a minimum distance of 20 feet (6.1 m) or by a noncombustible barrier at least 5 feet (1.5m) high having a fire-resistance rating of at least one-half hour.

D. Operating Procedures

1. Cylinders, cylinder valves, couplings, regulators, hose, and apparatus shall be kept free from oily or greasy substances. Oxygen cylinders or apparatus shall not be handled with oily hands or gloves. A jet of oxygen must never be permitted to strike an oily surface, greasy clothes, or enter a fuel oil or other storage tank.

2. Cylinders shall not be dropped or struck or permitted to strike each other violently.

3. Cylinders not having fixed hand wheels shall have keys, handles, or non-adjustable wrenches on valves stems while these cylinders are in service. In multiple cylinder installations, only one key or handle is required for each manifold.

4. Cylinder valves shall be closed when work is finished.

5. Empty cylinders shall be closed and placed in appropriate designated storage locations as part of the change-out procedure.

6. Cylinders shall be kept far enough away from welding or cutting operations so that sparks, hot slag, or flame will not reach them, or fire-resistance shields shall be provided.

7. Cylinders shall not be placed where they might become part of an electric circuit. Cylinders shall be kept away from radiators, piping systems, layout tables, etc., that may be used for grounding electric circuits such as for arc welding machines. Any practice, such as the tapping of an electrode against a cylinder to strike an arc, shall be prohibited.

8. Cylinders shall never be used as rollers or supports, whether full or empty.

9. The numbers and markings stamped into cylinders shall not be tampered with.

10. No person, other than the gas supplier, shall attempt to mix gases in a cylinder. No one, except the owner of the cylinder or person authorized by him, shall refill a cylinder.

11. No one shall tamper with safety devices on cylinders or valves.

12. Unless connected to a manifold, oxygen from a cylinder shall not be used without first attaching an oxygen regulator to the cylinder valve. Before connecting the regulator

to the cylinder valve, the valve shall be opened slightly for an instant and then closed. Always stand to one side of the outlet when opening the cylinder valve.

13. A hammer or wrench shall not be used to open cylinder valves. If valves cannot be opened by hand, the supplier shall be notified.

14. Cylinder valves shall not be tampered with, nor should any attempt be made to repair them. If trouble is experienced, the supplier should be sent a report promptly.

15. Fuel gas cylinders shall be used with the valve stem up and liquefied gases stored and shipped with the valve end up.

16. Cylinders shall be handled carefully. Rough handling, knocks, or falls may damage the cylinders, valve, or safety devices and cause leakage.

VIII. TRAINING

Those employees who use gas cylinders as part of their job, should be trained in their proper use. This training should be included as part of the employees' Welding and Cutting, Chemical Hygiene, or Hazard Communication training. If this training must be provided separately, it should be documented using [Appendix B](#) and forwarded to the Office of Safety.

THE UNIVERSITY OF NORTH CAROLINA at GREENSBORO

DEFINITIONS

The following definitions relate to pressure, compressed gases, and compressed gas cylinders.

Air Receiver means an unfired pressure vessel used to store compressed air for various end uses which are constructed and maintained per the ASME Boiler and Pressure Vessel Code Section VIII.

Pressure, according to the American Gas Association (AGA), is a high-pressure gas distribution line that operates at a pressure of more than 2 psi (pounds per square inch). The ASME rates boilers which operate at more than 15 psi as high-pressure boilers. OSHA states that: "High-pressure cylinders mean those marked with a service pressure of 900 psi or greater." The term "high pressure" can therefore be any level prescribed for the equipment or system in use. For accident prevention purposes, any pressure system must be regarded as hazardous.

Safety Valves means frequently called "pop" valves because they pop full open when a preset pressure is exceeded.

Relief Valves do not "pop" but open slightly and then open further as pressure increases.

Frangible Disk is a thin piece of metal in a pressure system to relieve excessively high pressure.

Fusible Plugs are fittings with an alloy that melts at a predetermined temperature.

THE UNIVERSITY OF NORTH CAROLINA at GREENSBORO
COMPRESSED AIR and GAS TRAINING CHECKLIST

Dept: _____ Trainer: _____ Date: _____

- Installation and maintenance of cylinders
- Marking of cylinders and containers
- Transportation of cylinders
- Storage of cylinders
- Operating procedures

Trainees:

EMPLOYEE NAME	EMPLOYEE ID NUMBER	SIGNATURE

Copies to: Office of Safety