

**Compressed Gas Cylinder Handling and Storage
Guideline**

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EMUDPS-EHS-P009

Revision: 1

I. PURPOSE

The purpose of Eastern Michigan University's (EMU) Compressed Gas Cylinder Handling and Storage Guideline is to ensure employee and student health and safety and to familiarize compressed gas cylinder users with the hazards, proper handling and storage of these cylinders. This guideline also achieves compliance with Michigan Occupational Safety and Health Administration ([MIOSHA](#)), [General Industry Safety and Health Standard Part 69](#), Compressed Gases: Acetylene, Hydrogen, Oxygen and Nitrous Oxide. Compressed gas cylinders are used in many workplaces to store gases that vary from extremely flammable (acetylene) to extremely inert (helium). Many compressed gas cylinders have very high pressures (up to 2,500 pounds per square inch gauge or PSIG). A sudden release of these gases can cause a cylinder to become a missile-like projectile. Cylinders have been known to penetrate concrete-block walls. If handled properly compressed gas cylinders are safe. If handled improperly, the same cylinders can present a severe hazard.

II. SCOPE AND APPLICATION

This guideline applies to all Eastern Michigan University employees, students and contractors using, storing and/or handling compressed gas cylinders at the University.

III. DEFINITIONS

Compressed Gas – Gas that is stored under pressure in a cylinder. The primary types of compressed gases are liquefied gases, non-liquefied gases and dissolved gases.

Flammable Gas – Gas having any flammable range with air at 20 °C (68 °F) and a standard pressure of 101.3 kPa (14.7 psi). Examples include acetylene, methane and hydrogen.

Inert Gas – Gas that does not undergo a chemical reaction within given conditions. Inert gas is typically used to avoid unwanted chemical reactions. Examples include argon, carbon dioxide, helium and nitrogen.

Storage - The location of filled or empty cylinders not in use. An oxidizing and fuel gas cylinder or cylinders used as a unit are not considered to be in storage.

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IV. RESPONSIBILITIES

A. Forepersons and Project Managers

1. Forepersons and Project Managers must enforce compliance with this guideline.
2. Forepersons and Project Managers must promptly investigate and report to Risk Management and Environmental Health and Safety (EHS) all incidents and accidents.

B. Faculty, Staff and Supervisors

1. Must enforce compliance with this guideline.
2. Must promptly investigate and report to Risk Management and Environmental Health and Safety (EHS) all incidents and accidents.
3. Must instruct and evaluate their employees/students competence on the operation of pressurized cylinders/tanks such as oxygen or fuel-gas systems, including generators.
4. Must ensure rules and instructions covering the proper operation, handling and maintenance of pressurized cylinders/tank equipment, including generators and oxygen or fuel-gas distribution piping systems are readily available.

C. Employees and Students

1. Must comply with the requirements of this guideline.
2. Must read, understand and follow the markings on the cylinder, the label(s) on the cylinder and safety data sheets (SDS).
3. Must use the required personal protective equipment.
4. Must not tamper with safety devices. **Under no circumstances should any attempt be made to repair a cylinder or valve.**
5. An employee or student in charge of the operation of oxygen or fuel-gas systems, including generators, must be instructed and deemed competent for this work by the supervisor or faculty member prior to being left in charge.

V. PROCEDURES

A. General Requirements

1. Cylinders in service should be placed with the valve readily accessible at all times. The main cylinder valve should be closed as soon as the gas is no longer necessary (i.e., the valve should never be left open when the equipment is unattended or not operating).

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2. Connections should be checked for leaks using a soap solution.
3. Never use Teflon tape on compressed gas straight thread fittings where the seal is made by metal-to-metal contact.
4. Connections should be tightened using the proper fitting wrenches. Never use pliers, vise grips or similar tools to tighten fittings.
5. Cylinders should either be equipped with a hand wheel or stem valve.
 - a. For cylinders equipped with a stem valve, the valve spindle key must remain on the stem while the cylinder is in service.
 - b. For cylinders equipped with a hand wheel, the hand wheel must remain attached while the cylinder is in service.
 - c. Only cylinder wrenches or tools provided by the cylinder supplier should be used to open or close a valve.
 - d. At no time should pliers be used to open a cylinder valve or to tighten connections. Some valves may require "O" rings or washers; this should be checked before the regulator is fitted.
6. Cylinder valves should be opened slowly.
 - a. To avoid injury from gauges that may malfunction, cylinder users **should not** stand in front of the gauges while opening the valves.
 - b. Oxygen cylinder valves should be opened all the way, by initially opening the valve stem just a crack. Once the needle on the high pressure gauge has stopped, open the valve all the way.
 - c. Other cylinder valves should be opened just enough to indicate pressure on the regulator gauge (no more than one full turn).
 - d. When opening the valve on a cylinder containing an irritating or toxic gas, the user should position the cylinder with the valve pointing away from them and warn those working nearby.
7. Cylinders containing flammable gases, such as hydrogen or acetylene, **must not** be stored in close proximity to open flames, areas where electrical sparks are generated or where other sources of ignition may be present.
8. **Cylinders, especially those containing acetylene, must never be stored on their side.**
9. The following rules should always be followed in regards to piping:
 - a. Copper piping must not be used for acetylene.
 - b. Plastic piping must not be used for any portion of a high-pressure system.
 - c. Do not use cast iron pipe for chlorine.
 - d. Piping systems should be inspected for leaks on a regular basis.

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10. Special attention should be given to fittings as well as possible cracks that may have developed.
11. A cylinder should never be emptied to a pressure lower than 172 kPa (25 psi/in²).
12. When work involving a compressed gas is completed, turn off the cylinder and if possible, bleed the lines.
13. When the cylinder needs to be removed from service or is empty:
 - a. All valves must be closed in the reverse order used in opening them, the system bled, and the regulator removed.
 - b. The valve cap must be installed and the cylinder **clearly marked as "empty"**.
 - c. Return the cylinder to a separate storage area for pickup by the supplier.
14. A mixture of fuel gas with air or oxygen must not be permitted except when consumed at a burner or torch.
15. Only equipment designed for use with fuel gas or oxygen must be used for welding and cutting.
16. The total volume of acetylene used per hour must not exceed 1/7 of the total volume of the acetylene supply in the system.
17. Liquid acetylene must not be used.
18. A cylinder to which a regulator is attached must not be moved unless secured to a hand truck or powered truck designed or equipped for this purpose.
19. A cylinder valve must be closed in all of the following situations:
 - a. When the cylinder is moved.
 - b. When the work is finished or is left unattended during lunch, overnight, or for any prolonged period.
 - c. When the cylinder is empty.
 - d. When the regulator is removed.
20. Fuel gas should not flow from a cylinder or manifold through a torch or other device equipped with a shut off valve unless the pressure is reduced by a regulator attached to the cylinder or manifold.
21. An oxygen cylinder, cylinder valve, coupling regulator, hose and apparatus must be kept free from oily or greasy substances and must not be handled with oily hands or gloves. Precautions must be taken to prevent a jet of oxygen from striking an oily surface or greasy clothes or from entering a fuel, oil or other storage tanks.

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22. Oxygen must not be used as a substitute for compressed air or for any other use, except for welding, cutting or life support procedures.

B. Labeling

Compressed gas cylinders must be legibly marked to identify the gas content with either the chemical or the trade name of the gas. Such marking must be by means of stenciling, stamping or labeling and must not be readily removable. Whenever practical, the marking must be located on the shoulder of the cylinder. Rely on the vendor label for positive identification of a cylinder's contents.

1. A durable label should be provided that cannot be removed from the compressed gas cylinder.
2. A compressed gas cylinder that does not clearly identify its contents by name should not be accepted for use.
3. 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.
4. 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 must be contacted regarding appropriate procedures for removal.

C. Handling Cylinders

Serious accidents may result from the misuse, abuse or mishandling of compressed gas cylinders. Workers assigned to handle cylinders should be properly trained. Compressed gas cylinders should be handled as high-energy sources and therefore as potential explosives. Compliance with the following rules will reduce the hazards associated with the handling of compressed gas cylinders:

1. Always wear proper personal protective equipment (PPE), including eye protection, hard toed shoes and gloves at a minimum.
2. Always transport cylinders on wheeled cylinder carts with restraining straps or chains.
3. Secure cylinders in a bracket or by a chain to a fixed support to prevent them from falling over or being dropped.
4. Do not remove or change numbers or marks stamped on cylinders.
5. Cylinders should not be banged, dropped or permitted to strike each other or against other hard surfaces.
6. Never use compressed gas to dust off clothing. This could cause injury to the eyes or body and/or create a fire hazard.

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- Do not use the valve cover to lift cylinders; they could be damaged and become unattached causing the cylinder to drop on a hard surface, possibly resulting in an explosion.

D. Storage

The following rules will minimize hazards when storing compressed gas cylinders. Please see the pictures below for examples of proper compressed gas cylinder storage.

- Store all cylinders upright and secure them to a stationary building support (i.e. structural beam/lab bench) with a chain, strap or cable around the middle to top third of the cylinder's body.



- Caps used for valve protection should be kept on the cylinders at all times, except when the cylinder is actually being used or charged. Cylinder valves should remain closed.
- Liquefied flammable gas cylinders should be stored in an upright position, or such that the pressure relief valve is allowed to remain in the gas phase. Cylinders loaded with liquefied gas are not completely filled; a small vapor space is left to allow for expansion if the cylinder is heated.
- Use only approved containers to store and transport liquid nitrogen. Containers should have vented-lids to prevent spillage when carried.



- Keep oxygen cylinders a minimum of 20 feet away from fuel-gas cylinders, such as acetylene and combustible materials or separated by a non-combustible barrier (such as a wall) at least 5 feet high with a fire-resistance rating of at least one-half hour.
- Flammable gas cylinders should not be stored with oxygen or nitrous oxide cylinders or adjacent to oxygen charging facilities.

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7. Store cylinders in a dry, well-ventilated area away from flames, sparks and any other source of heat or ignition.
8. Mark the cylinder storage areas with proper precautionary signs, such as “Storage of flammable, oxidizer or toxic materials.”
9. Place cylinders in a location where they will not be subject to mechanical or physical damage, heat or electrical circuits to prevent possible explosion or fire.
10. Never plug, remove or tamper with any pressure relief device. Under normal conditions, these devices will periodically vent the product.
11. Do not expose cylinders to an open flame or to any temperature above 125 degrees Fahrenheit.
12. Corrosion may damage cylinders and cause the valve protection caps to stick. Do **not** expose cylinders to:
 - a. Continuous dampness,
 - b. Store near salt or
 - c. Store near other corrosive chemicals or fumes.
13. Segregate empty cylinders from full cylinders.
 - a. Empty cylinders must be chained and the caps placed on them.
 - b. Empty cylinders are to be marked “Empty” and returned to the vendor.

VI. REFERENCES

- [MIOSHA General Industry Safety and Health Standard Part 69. Compressed Gases: Acetylene, Hydrogen, Oxygen and Nitrous Oxide](#)
- [OSHA 1910.101](#) – Compressed Gases (general requirements)
- [OSHA 1910.102](#) – Acetylene
- [OSHA 1910.103](#) - Hydrogen
- [OSHA 1910.104](#) - Oxygen
- [OSHA 1910.105](#) – Nitrous Oxide
- [Compressed Gas Association](#) (safety publications)

VII. HISTORY

Revision	Date	Changes
0	1/31/2011	Initial release
1	10/8/2020	Updated to current practices, regulations and responsibilities. Addition of hyperlinks.