

CITY AND COUNTY OF DENVER

Compressed Gas Safety Policy		
<p>Occupational Safety and Health Management System No. 65.5.11</p> <p>This policy was developed and shall be implemented under the authority of Executive Order No. 65 and the Risk Management Office.</p>	<p>January 1, 2008</p>	<p>Prepared / Revised By:</p> <p>Risk Management – Safety Unit</p>

1.0 Introduction

This policy has been developed to protect all City and County of Denver employees and contractors from the danger of fire or explosion from compressed gases. It is also intended to prevent property damage associated with fire peril.

2.0 Scope

This policy is based on the Compressed Gas Association guidelines. In addition to the standards the Compressed Gas Association has developed guidelines for the receipt, transfer, storage and use of compressed gases and they also have audio-visual training programs for some of these areas. The latest issue of the following standards shall be used to establish the requirements:

- CGA C-1 “Methods for Hydrostatic Testing of Compressed Gas Cylinders.”
- CGA C-4 “Method of Making Portable Compressed Gas Cylinders to identify the Material Contained.” (Also ANSI/CGA C-4
- CGA C-6 “Standards for the Visual Inspection of Compressed Gas Cylinders.”
- CGA C-7 “Guide to the Preparation of Precautionary Labeling and Marking for Compressed Gas Cylinders”.
- CGA P-1 “Safe Handling of Compressed Gases in Containers.”
- CGA S-1.1 “Pressure Relief Device Standards-Part 1 Cylinders for Compressed Gases.”

Copies of these standards and information on standardization activities in the compressed gas industry can be obtained from:

COMPRESSED GAS ASSOCIATION, INC.
172 5 JEFFERSON DAVIS HIGHWAY
ARLINGTON, VA 22202-4100
703-413-4341

City and County employees are required to comply with the procedures outlined in this document. Individual departments / agencies who have an existing Compressed Gas Safety Policy or Program in place may continue to use that program if it provides the same degree of protection.

3.0 Definitions

A compressed gas is any material or mixture having in the container either an absolute pressure exceeding 276 kPa (40 psi) at 21.1°C (70°F) or an absolute pressure exceeding 717 kPa (104 psi) at 54.4°C (130°F), or both, or any liquid flammable material having a vapor pressure exceeding 276 kPa (40 psi) at 37.8°C (100°F).

4.0 Characteristics

Compressed gases have several properties not common to solids or liquids:

- a. Low Boiling Point – This permits rapid evaporation and pressure buildup. Cold compressed gases can cause severe frostbite to eyes and skin.
- b. Low Flash Point – Flammable gases have a flash point always below room temperature, allowing an explosive mixture (with air) to be formed quickly.
- c. Pressure – Each cylinder contains a large amount of stored energy. This energy, released properly, can result in serious injury. Explosive decompression at the cylinder head, for example, can cause the cylinder to act like an unguided missile.
- d. Leaks – Compressed gas leaks can result in explosive mixtures, toxic effects and asphyxiation in confined areas that do not have adequate ventilation.

5.0 Labeling

- a. Compressed gas cylinders must be legally marked with either the chemical or the trade name of the gas.
- b. All cylinders must display the appropriate Department of Transportation Label.

6.0 Safe Handling Practices

- a. Always use a cylinder hand truck for moving compressed gas cylinders from area to area.
- b. Cylinders must be firmly secured by a chain or nylon cylinder strap except when moved into place.
- c. Cylinders in use with a regulator in place shall be secured with a nylon cylinder strap.
- d. Keep valve cap on cylinder until the cylinder is secured and ready for use.
- e. Cylinders must be firmly secured in an upright position by an approved method during transport in vehicles.
- f. When cylinders are used in conjunction with electric welding, precautions must be taken to ensure the cylinder does not become part of the grounding system of the welding operation.

Also, never strike an arc or tap a welding electrode against a cylinder as this can weaken the cylinder by causing structural damage.

- g. Use cylinder only in upright position.
- h. Valves must be closed when cylinder is not in use.
- i. To blow out dust or dirt that otherwise might enter the regulator; “crack” the discharge valve on the cylinder by opening it slightly for an instant and then closing it. **(Exception: Do not use this procedure for corrosive, toxic or poisonous gases.)** On fuel gas cylinders, first see that no open flames or other sources of ignition are present.
- j. When using a crane to move cylinders, use a cradle or suitable platform, not a sling.
- k. Cleanliness – Oxidizing compressed gas containers, valves, joints, regulators and other apparatus shall be kept free from oil or grease and shall not be handled with oily hands or oily gloves. Pipe joints and fittings must be in accordance with specifications established by the Compressed Gas Association and the National Fire Codes.
- l. Lubricants – Only TEFLON® paste or tape lubricant recommended by the Compressed Gas Association shall be used for all compressed gas cylinders, except oxygen. Only TEFLON® tape is approved for use with oxygen.
- m. Handle all cylinders as if they were full.
- n. Discontinue using a high pressure cylinder when the gauge pressure approaches 210 kPa (30 psi).
- o. Clearly mark empty cylinders EMPTY (the abbreviation MT is permissible) and return to vendor as soon as possible.
- p. Before attaching regulator to cylinder, inspect the regulator and cylinder valve stem to be sure that they are free from dirt, oil, grease and other hydrocarbons.
- q. Incompatible gases whose concentration is such that a chemical reaction could occur shall not be vented to the same hood.

7.0 Misuse Of Cylinders

Cylinders must not be:

- a. Dragged, rolled or slid and must never be lifted by the cap.
- b. Dropped or permitted to strike against each other or against other surfaces violently.
- c. Used as rollers or for support purposes.

8.0 Regulators

- a. Use the regulator specified for the particular gas. Manual flow control valves are not substitute regulators and may not be used.
- b. Threads on regulator connections or other auxiliary equipment must be the same type as those on the cylinder valve outlet.
- c. Cylinder valves must be opened slowly, with the valve opening away from personnel. Never use wrenches or tools except those provided or approved by the gas manufacturer.
- d. Close the cylinder valve and release all pressure from the regulator before the regulator is removed from a cylinder.

9.0 Leaking Cylinders

- a. In case of leaking cylinders, follow the location procedure for reporting emergencies.
- b. Only soapy water or other approved leak-detecting liquids shall be used in leak checking.

10.0 Storage Locations

- a. Cylinders must be stored in a safe, dry, well-ventilated place prepared and reserved for this purpose.
- b. Storage conditions must prevent cylinders from being exposed to temperatures in excess of 38°C (100°F), heat sources, open flames, direct sunlight.
- c. Cylinder storage must be in the upright position and planned so that cylinders are generally used in the order in which they are received from the supplier.
- d. Store gases supporting combustion (O₂, Cl₂, etc.) at least 20 ft. from fuel gases, preferably in another gas storage area unless separated by a 5 ft. high fire barrier with a minimum fire resistance rating of one-half hour.
- e. Flammable gas cylinders must be stored at least 20 ft. from flammable liquids, combustible materials, open flames or other sources of ignition and 2 ft. from electrical boxes or arcing electrical equipment.
- f. No smoking is permitted within 25 feet of flammable gas storage locations.
- g. For outside storage requirements see Attachment Two.

11.0 Manifolds (Gas Systems)

- a. Manifolds must be substantial construction and material suitable for the particular gas and service. For construction and material details contact your Safety Representative and outside gas suppliers.

- b. Oxygen manifolds must be located away from highly flammable materials.
- c. Regulators are required to reduce and regulate the pressure of the gas flowing from the manifold.
- d. Where compressed gas containers are connected to a manifold, such a manifold and its related equipment, such as regulators, must be of proper design as defined by the Compressed Gas Association, OSHA or NFPA.
- e. Installation of gas systems must be supervised by personnel familiar with proper practices with reference to their construction and use. Personnel shall include the Safety Representative and outside the gas suppliers.
- f. Storage containers, piping, valves, regulating equipment and other accessories must be readily accessible and protected against physical damage.
- g. Regulators, gauges, hoses and other appliances provided for use with a particular gas or group of gases, must not be used on systems containing gases having different chemical properties unless information obtained from the supplier indicates that this can be done safely.
- h. System valves must be opened slowly. Valve outlets must be pointed away from the operator and other persons. On valves without hand wheels, the wrenches provided by, or recommended by, the gas supplier must be used.
- i. On valves with hand wheels, wrenches must not be used except when designed specifically for that purpose.
- j. For valves that are hard to open or frozen because of corrosion, the supplier must be contacted for instructions.

12.0 Flammable Gas Systems

- a. Provisions must be made to protect flammable gas systems from contact with oxygen or other oxidizing agents.
- b. Flammable systems must be separated from highly combustible materials, open flames, electrical equipment and other sources of ignition.
- c. “No Smoking” signs shall be posted within 25 ft. area of flammable gas systems.
- d. A flame must not be used for detection of flammable gas leaks. A flammable gas leak detector, soapy water or other suitable means are to be used.

13.0 Storage and Use of Compressed Gas Cylinders

This section provides guidelines for the safe handling, use, transfer and storage of compressed gas cylinders.

- A. Storing Compress Gas Cylinders

- Cylinders must be secured to prevent tipping.
- The cylinder must be labeled to identify its contents.
- Empty cylinders must be labeled “empty” and stored separately from all other cylinders.
- The protective valve cover must be used during storage.
- Store cylinders away from heat and in an upright position.
- Do not store incompatible gases together. For example: store oxygen at least 20 ft. away from other gases or separate with a five foot high fire wall with a fire rating of one half hour separating them.
- Designated areas where flammable/combustible liquids are stored in bulk containers or drums shall be posted with “Danger” signs free of potential ignition sources.

B. Handling and Use of Cylinders

- Open cylinder valves slowly.
- Close cylinder valves after use.
- Cylinders must be secured to prevent tipping.
- Never roll or drag a cylinder.
- Transport cylinders with the protective valve cover secured.
 - Compressed gas cylinders shall never be transferred on the forks of a powered industrial truck.
 - Compressed gas cylinders can only be transferred using a powered industrial truck if an approved compressed gas cylinder attachment is used.
- Never try to repair a damaged cylinder.

Attachment One

Inventory Form

Type of Material	Location	Flammable/ Explosive	Combustible	Oxidizer	Quantity	Approved Cabinets	Comments
Acetylene compressed gas							
Oxygen compressed gas							
Propane							

**CONTAINER AND PORTABLE TANK STORAGE
OUTSIDE BUILDINGS**

GAS-FLAMMMABLE CLASS	MAXIMUM STORAGE	DISTANCE FORM PROPERTY	DISTANCE FROM STREET, ALLEY, ECT
Propane - I A	2,200 gallons	50 feet	10 feet
Acetylene - I B	4,400 gallons	50 feet	10 feet
Argon - III B	44,000 gallons	10 feet	5 feet
Carbon Dioxide -III B	44,000 gallons	10 feet	5 feet
Oxygen - III B	44,000 gallons	10 feet	5 feet

GAS-FLAMMMABLE CLASS	MAXIMUM STORAGE	DISTANCE FORM PROPERTY	DISTANCE FROM STREET, ALLEY, ECT
Propane - I A	1,100 gallons	25 feet	5 feet
Acetylene - I B	2,200 gallons	25 feet	5 feet
Argon - III B	22,000 gallons	5 feet	3 feet
Carbon Dioxide -III B	22,000 gallons	5 feet	3 feet
Oxygen - III B	22,000 gallons	5 feet	3 feet