



City of New London

Compressed Gas

Cylinders Handling

Policy

May 21, 2003

**I. PURPOSE**

The purpose of this policy is to establish guidelines, which ensure that proper storage, handling and use of compressed gas cylinders are practiced and maintained by the employees of the City of New London. This policy will encompass all compressed gas cylinders to include, oxygen, liquid oxygen, nitrogen, argon, helium, carbon dioxide, liquid carbon dioxide, hydrogen, acetylene, Linde FG-2, ethylene oxide, sterilant mixtures, liquefied petroleum gas, (L.P. gas) ammonia, and specialty gases.

**II. AUTHORITY & PREFERENCE**

Occupational Safety and Health (OSHA)

- 29 CFR 1910.101 & .252 (General requirements)
- .102 (Acetylene)
- .103 (Hydrogen)
- .104 (Oxygen)
- .105 (Nitrous Oxide)

Industry, Labor and Human Relations (ILHR) 32.15 & 32.28

Compressed Gas Association (CGA) Safety Publications

The publications listed below are available from the:

Compressed Gas Association  
1235 Jefferson Davis Highway  
Arlington, Virginia 22202

Publications:

- G-1 "Acetylene"
- G-4 "Oxygen"
- G-5 "Hydrogen"
- G-6 "Carbon Dioxide"
- P-1 "Safe Handling of Compressed Gases"
- P-9 "The Inert Gases, Argon, Nitrogen, and Helium"
- P-12 "Safe Handling of Cryogenic Liquids"

**III. APPLICATION**

This policy applies to the storage, the handling and the use of compress gas cylinders.

#### **IV. RESPONSIBILITY FOR COMPLIANCE**

The Department Superintendent:

\*Will ensure that compressed gas cylinders are properly stored and comply with the required guidelines in this policy.

\*Will ensure that employees who use compressed gas cylinders are properly trained and understand safe work practices required by the guidelines in this policy.

\*Will ensure that employees using compressed gas cylinders are provided the proper personal protective equipment (PPE) when needed.

\*The Department Superintendent or his/her designee shall inspect all compressed gas cylinders twice a year to ensure that they are working properly and not damaged.

\*Will ensure that all compressed gas cylinders are properly labeled and have current Material Safety Data Sheet (MSDS) for each cylinder in accordance with Hazard Communication Standard and the State Employees Write To-Know-Law.

All employees using compressed gas cylinders must follow all safe work practices and use proper precautions required by the guidelines in this policy.

#### **V. DEFINITION OF COMPRESSED GAS CYLINDER**

A compressed gas cylinder is any cylinder specifically designed to contain gases under pressure of greater than one atmosphere, and having the capability of dispensing the gas at a point of operation.

#### **VI. TYPES OF GASES COMPRESSED INTO CYLINDERS**

A. Oxygen is a colorless, odorless, and tasteless gas. Oxygen will not burn, but it supports and can greatly accelerate combustion.

B. Liquid: Oxygen, Carbon Dioxide, Hydrogen  
Gases in liquid form are extremely cold and accidental contact with eyes or skin may cause severe frostbite.

C. Nitrogen, Argon, Helium and Carbon Dioxide  
Nitrogen, Argon, Helium, and Carbon Dioxide are inert, colorless and tasteless gases. These four gases can cause asphyxiation and death in confined, poorly ventilated areas.

- D. Hydrogen is a colorless, odorless and tasteless gas. Hydrogen is a flammable gas. A mixture of hydrogen with oxygen or air in a confined area will explode if ignited by spark, flame or other source of ignition. Hydrogen flames are virtually invisible.
- E. Acetylene and Linde FG-2  
Acetylene is a colorless gas with a distinctive garlic-like odor. Linde FG-2 is a colorless gas with a sweet ether-like odor. Acetylene and Linde FG-2 (propylene) are flammable gases. A mixture of acetylene or Linde FG-2 with oxygen or air in a confined area will explode when brought in contact with a flame or other source of ignition.
- F. Ethylene Oxide is colorless, flammable irritating liquid and gas. It liquefies at 7 p.s.i.g. at 70 degrees F. and is liquid in the cylinder or drum. Ethylene oxide is flammable. Ethylene oxide vapor will explode when exposed to common igniters. Ethylene oxide is toxic. The liquid will cause severe eye and skin injury and the gas will cause eye irritation. Ethylene oxide vapors should not be inhaled. Over exposure by inhalation may result in temporary paralysis and pulmonary irritation.
- G. Specialty Gases are special purpose liquids and gases and multi-component mixtures in any compatible combination. They include atmospheric and chemical gases and volatile liquids. Some specialty gases have flammable, toxic, corrosive, oxidizing, and other hazardous properties which can cause serious or fatal injury and property damage if proper safety precautions are not followed. Some toxic specialty gases can result in fatal injuries in very low concentrations. Other specialty gases can cause serious eye or skin injury upon bodily contact. Some specialty gases are flammable and can result in fire or explosions.
- H. Ammonia is a colorless, pungent gas,  $\text{NH}_3$  composed of nitrogen and hydrogen. Effects of overexposure: Eyes – can cause severe irritation, redness, tearing, blurred vision. Skin vapors can cause irritation of nasal and respiratory passages. Swallowing – results in severe damage to mucous membranes.

## **VII. STORAGE OF COMPRESSED GAS CYLINDERS**

- A. Cylinders stored inside of buildings shall be stored in a well-protected, well-ventilated, dry location at least twenty (20) feet from highly combustible materials such as oil or excelsior.
- B. Cylinders shall be stored only in assigned areas and secured to prevent tipping.

- C. Assigned storage spaces shall be located where cylinders will not be knocked over or damaged by passing or falling objects or subject to tampering by unauthorized persons.
- D. Empty cylinders shall have their valves closed.
- E. Acetylene cylinders shall be stored valve end up.
- F. Valve protection caps (where the cylinder is designed to accept a cap) shall always be in place, hand tight, except when cylinders are in use or connected for use.
- G. Fuel gas cylinder storage (LP gas) inside a building, except for those cylinders in actual use or attached ready for use, shall be limited to a total gas capacity of 2,000 cubic feet or 300 pounds of liquefied petroleum gas.
- H. Cylinders shall be kept away from radiators and other sources of heat.
- I. Full cylinders of oxygen and fuel gas should be used in rotation as received from the supplier.

#### **VIII. SAFETY PRECAUTIONS**

- A. Oxygen, nitrogen, argon, helium, carbon dioxide, hydrogen, acetylene, Linde FG-2, ethylene oxide, sterilant mixtures and specialty gases, have properties that can cause serious accidents, injuries, and even death if proper precautions are not followed. Therefore, be certain to use the applicable safety precautions described in this procedure during handling and use of these gases. Gas equipment manufacturers-operating instructions are to be as followed exactly.
  - 1. Read the label on all cylinders before use to identify the cylinder contents. If the label is not legible or is missing, do not assume that the cylinder contains a particular gas, but return the cylinder to the gas supplier. Observe all safety precautions set forth on the cylinder label.
  - 2. Secure all cylinders to suitable cylinder carts, benches, walls, posts or racks so that they cannot be knocked or pulled over accidentally.
  - 3. Cylinders containing liquid oxygen, nitrogen, argon, helium, or hydrogen must be kept in an upright position and secured in that position to prevent them from being knocked over.

4. Cylinders must not be tipped over or dropped and must be moved with a cylinder hand truck.
- B. The proper personal protective equipment (PPE), particularly for liquid oxygen, liquid carbon dioxide and liquid hydrogen, shall be worn by employees who handle and use compressed gas cylinders. Persons preparing cylinders for use shall wear gloves constructed of impervious materials, rubber aprons, safety glasses with side shields and if deemed necessary, a complete face shield.
- C. **Frostbite** – Liquid gases such as oxygen, hydrogen and carbon dioxide, may cause severe frostbite to the skin or eyes. Do not touch frosted pipes or valves. If accidental exposure to liquid gases occurs, the exposed person shall immediately consult a physician or occupational nurse. If a physician/nurse is not immediately available, warm the areas affected by frostbite with water that is near body temperature and then seek medical attention.

## IX. TRANSPORTATION AND HANDLING OF COMPRESSED GAS CYLINDERS

- A. Handling - General
1. 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. Valve protection caps (where cylinder is designed to accept a cap) shall always be in place.
  2. Cylinders should be moved by tilting and rolling them on their bottom edges. Dragging and sliding cylinders should be avoided. When cylinders are transported by vehicle, they must be secured in position. Cylinders shall not be dropped or struck or permitted to strike each other violently.
  3. 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 to the ground or otherwise fixed; the use of warm (not boiling) water is recommended. Valve protection caps are designed to protect cylinder valves from damage. Before raising cylinders provided with valve protection caps from a horizontal to a vertical position, the cap should be properly in place. The cap should be turned clockwise to insure that the cap is hand tight.

4. A suitable cylinder truck, chain or other steadying device shall be used to keep cylinders from being knocked over while in use.
5. Unless cylinders are secured on a special truck, regulators shall be removed and valve protection caps, when provided for, shall be put in place before cylinders are moved.
6. Cylinders not having fixed hand wheels shall have keys, handles or non-adjustable wrenches on valve stems while these cylinders are in service. In multiple cylinder installations, only one key or handle is required for each manifold.
7. Cylinder valves shall be closed before moving cylinders.
8. Cylinder valves shall be closed when work is finished.
9. Valves of empty cylinders shall be closed.
10. Cylinders shall be kept far enough away from welding or cutting operation so that sparks, hot slag or flames will not reach the cylinder. If this is possible, a fire resistant shield shall be provided.
11. Cylinders shall not be placed in an area where they might come in contact with or become part of an electric circuit. Contacts with third rails, trolley wires, etc. shall also be avoided. Cylinders shall be kept away from radiators, piping systems, layout tables, etc. that may be used for grounding electric circuits such as the tapping of an electrode against a cylinder to strike an arc.
12. Cylinders shall never be used as rollers or supports, whether full or empty.
13. The numbers and markings stamped into cylinders shall not be tampered with or changed.
14. Empty cylinders should be marked "Empty" or "MT" and segregated from full cylinders and promptly returned to the supplier with valve protection caps in place. All valves shall be closed.
15. 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(s) authorized the owner, shall refill a cylinder.

16. No one shall tamper with or remove cylinder or valve safety devices.

B. Use – Oxygen Cylinders

1. Cylinders shall not be dropped or otherwise roughly handled.
2. 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. Note: This action is generally termed “cracking” and is intended to clear the valve of dust or dirt that otherwise might enter the regulator.
3. A hammer or wrench shall not be used to open cylinder valves. If valves cannot be opened by hand, the supplier shall be notified.
4. Cylinder valves shall not be tampered with nor should any attempt be made to repair them. If a problem or potential safety hazard is experienced, the supplier should be called or sent a report promptly indicating the character of the problem/hazard and the cylinder’s serial number. The instructions given by the supplier as to the disposition of the cylinder shall be followed.
5. After a regulator is attached, an oxygen cylinder valve should be opened slightly at first so that the regulator cylinder pressure gage hand moves up slowly; then the valve can be opened all the way. If the high pressure is suddenly released, it is liable to damage the regulator pressure gages. Always stand to one side of the regulator (not in front of the glass covered gage faces) when opening the cylinder valve.
6. When the oxygen cylinder is in use, the valve should be opened fully in order to prevent leakage around the valve stem. Complete removal of the stem from a diaphragm type cylinder valve shall be avoided.

### C. Use – Fuel Gas Cylinders

1. Fuel gas cylinders shall be placed with valve end up whenever they are in use. Liquefied gases shall be stored and shipped with the valve end up.
2. Cylinders shall be handled carefully. Rough handling, knocks, or falls are liable to damage the cylinder, valve or safety devices and cause leakage.
3. Before connecting a regulator to a cylinder valve, the valve shall be opened slightly and closed immediately. This action is generally termed “cracking” and is intended to clear the valve of dust and dirt that otherwise might enter the regulator. The valve shall be opened while standing to one side of the outlet, never in front of the cylinder. Never crack a fuel gas cylinder valve near other welding work or near sparks, flame or other possible sources of ignition.
4. Before a regulator is removed from a cylinder valve, the cylinder valve shall be closed and the gas released from the regulator.
5. Nothing shall be placed on top of an acetylene cylinder when in use which may damage the safety device or interfere with the quick closing of the valve.
6. If the valve on a fuel gas cylinder is opened and there is found to be a leak around the valve stem, the valve should be closed and the gland nut tightened. If this does not stop the leak, the use of the cylinder should be discontinued. The cylinder should be removed to the outdoors, properly tagged and the supplier advised of the problem. In case the fuel gas should leak from the cylinder valve, and cannot be shut off with the valve stem, the cylinder should be removed to the outdoors, properly tagged and the supplier notified. A regulator may be attached to a cylinder valve to temporarily stop a leak through the valve seat.
7. If a leak should develop at a fuse plug or other safety device, the cylinder should be removed to the outdoors well away from any source of ignition. The cylinder valve

should be opened slightly and the fuel gas allowed to escape slowly.

8. A warning sign or tag shall be placed near cylinders having leaking safety devices and caution persons not to approach the area with an ignited cigarette or other source of ignition. The supplier shall be promptly notified and the tank returned according to the instructions given by the supplier.
9. Safety devices shall not be tampered with or removed.
10. Fuel gas shall never be used from cylinders through torched or other devices equipped with shut-off valves without reducing the pressure through a suitable regulator attached to the cylinder valve or manifold.
11. The cylinder valve shall always be opened slowly.
12. An acetylene cylinder valve shall not be opened more than 1 and ½ turns of the spindle and preferably no more than ¾'s of a turn.
13. Where a special T-wrench is required, the wrench shall be left in position on the stem of the valve while the cylinder is in use so that the fuel gas flow can be quickly turned off in case of emergency. In the case of manifold or coupled cylinders, at least one wrench shall always be available for immediate use.

## **X. CYLINDER MARKINGS AND INSPECTION**

- A. 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. These markings shall be by means of stenciling, stamping or labeling and shall not be readily removable. Whenever practical, the markings shall be located on the shoulder of the cylinder.
- B. Compressed gas cylinders will be inspected twice per calendar year in accordance with the following guidelines. Any cylinders failing to meet these guidelines will be removed from service.
  1. **Dents** – Dents are deformations caused by the cylinder coming in contact with a blunt object in such a way that the thickness of metal is not normally impaired. Only cylinders

that have major dents that do impair the metal wall will be removed from service.

2. **Cuts – gouges and digs** – These are deformations caused by contact with a sharp object in such a way as to cut into or upset the metal of the cylinder, decreasing the wall of thickness at that point. Cylinders that have cuts, gouges and digs that decrease the thickness of the metal wall will be removed from service.
  3. **Corrosion and pitting** – Cylinders that have corrosion and pitting in the wall cylinder involving the loss of wall thickness caused by a corrosive media will be removed from service.
  4. **Bulges** – Cylinders that have definite bulges will be removed from service.
  5. **Neck** – The cylinder neck will be examined for serious cracks, folds and flows. Neck cracks are determined by testing with a soap solution. Cylinders found to have a serious neck crack will be removed from service.
  6. **Foot-Ring and Head-Ring** – Cylinders will be removed from service when the head-ring and/or foot-ring becomes so distorted that they are no longer 1) maintain the cylinder in a normal upright position or 2) the head-ring becomes so distorted it no longer adequately protects the valve and the neck area of the cylinder.
- C. Cylinder valves, couplings, regulators, hoses and other apparatuses shall be kept free from oily or greasy substances.