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Section I

Introduction

Policy

The purpose of this safety policy and procedure is to establish guidelines and procedures through which Hilscher-Clarke Electric Co. employees receive the training and proper equipment needed to safely handle and use compressed gases.

Compressed gases are typically stored under pressure in metal cylinders. These cylinders are designed and constructed to withstand high pressures. Improper handling and use of compressed gases can result in devastating consequences.

This safety policy and procedure provides guidelines for the safe handling and use of compressed gases. It includes provisions for training and safe handling guidelines. It also includes:

- Training Requirements;
- Types;
- Uses;
- Inspection;
- Transportation;
- Storage Requirements;
- and, Marking Requirements

...of compressed gas cylinders.

This safety policy and procedure affects any employee who, as a result of his or her job duties, is exposed to or handles compressed gas cylinders.

This safety policy and procedure is established in accordance with Occupational Safety and Health Standards for General Industry (29 CFR 1910.101 -.104).

It is the policy of Hilscher-Clarke to provide a place of employment that is free from recognized hazards that cause or are likely to cause death or serious physical harm to employees or the public. Therefore, compressed gas cylinders will not be handled until employees have been trained concerning their use. When hazards exist that cannot be eliminated, then engineering practices, administrative practices, safe work practices, Personal Protective Equipment (PPE), and proper training regarding compressed Gas Cylinders will be implemented. These measures will be implemented to minimize those hazards to ensure the safety of employees and the public.

It is the responsibility of each Supervisor, Dispatcher and Employee to ensure implementation of Hilscher-Clarke's safety policy and procedure on Compressed Gas Cylinders. It is also the responsibility of each Hilscher-Clarke employee to report immediately any unsafe act or condition to the Safety Manager and/or Supervisor. Specific Responsibilities are found in Section II (General Program Management).

Section II

General

Program Management

Program Administration

The President is responsible for...

- ❑ Development, implementation, and overall administration of Hilscher-Clarke's Compressed Gas Cylinder policy.
- ❑ Reviewing, maintaining, and updating the Compressed Gas Cylinder written program annually and whenever necessary to include new or modified tasks, procedures, equipment, training and/or recordkeeping.
- ❑ Ensuring compliance through the auditing process as outlined in Hilscher-Clarke's Disciplinary Program.
- ❑ Work with the Controller to establish a procedure for record retention and maintenance.
- ❑ The President may delegate the responsibility of various aspects of the Compressed Gas Cylinder Program to a Qualified Organization. However, the President's ultimate responsibility for his/her aspects of the program cannot be delegated.

The Safety Manager is responsible for:

- ❑ Communicating and ensuring implementation of the Compressed Gas Cylinder program with all employees and subcontractors.
- ❑ Ensures a site specific work safety and health plan is submitted by any and all subcontractors for handling and storage of compressed gas cylinders.
- ❑ Ensuring that all newly purchased compressed gas cylinders equipment and supplies comply with current safety regulations and this safety policy and procedure.
- ❑ Employee Training - Obtaining and coordinating Compressed Gas Cylinder training programs for all Affected Employees.
- ❑ Ensuring that an inventory of related parts and supplies for compressed cylinders is maintained and readily available during all operational hours.
- ❑ Ensures that all requirements of Hilscher-Clarke's Compressed Gas Cylinder program are being met and adhered to by all affected employees.
- ❑ Monitors implementation and assesses overall effectiveness of the Compressed Gas Cylinder program.
- ❑ Preparing and maintaining an Employee Education and Training Record (*see Appendix A*) upon completion of training and any retraining. These documents will include, but not be limited to;
 - Names or other identities of employees trained;
 - Signature of the person receiving the training;
 - Date of the training;
 - Date of retraining;
 - Specific topics addressed during the training session;
 - Specific topic(s) addressed during the retraining session;
 - Signature of the person, or company, conducting the training;
 - Signature of the person, or company, conducting the retraining.
- ❑ Making the written Compressed Gas Cylinder program available to employees, OSHA & Customer representatives.
- ❑ With the approval of the President the Safety Manager may delegate the responsibility of various aspects of the Compressed Gas Cylinder program to another Competent Person, or Qualified Organization (as approved by the President). However, the Safety Manager's ultimate responsibility for his/her aspects of the program cannot be delegated.

Program Administration (cont.)

Supervisory Personnel (of all levels) are responsible for:

- ❑ Implementation of the Compressed Gas Cylinder program at their work site.
- ❑ Ensuring the safe handling and storage of compressed gas cylinders at their worksite.
- ❑ Will not allow any employee who has not received the required training to handle any compressed gas cylinders.
- ❑ Ensuring the general safety and fire prevention practices are in place for the storage of compressed gas cylinders, as outlined in this policy and procedure, at their job site.
- ❑ Ensuring that all compressed gas cylinders (and attachments) are in good working condition. If any indication of damaged cylinders or attachments is present the supervisor will immediately have the cylinder(s) and/or equipment removed from service and repaired or replaced.
- ❑ Ensuring that only ANSI approved personal protective equipment (PPE) is worn and is properly maintained and stored as outlined in Hilscher-Clarke's Personal Protective Equipment program.
- ❑ With the approval of the Safety Manager the Supervisor may delegate the responsibility of various aspects of the Compressed Gas Cylinder program to another Qualified Person, Competent Person or Qualified Organization (as approved by the Safety Manager). However, the Supervisor's ultimate responsibility for his/her aspects of the program cannot be delegated.

Employees shall:

- ❑ Shall comply with all applicable guidelines contained in this safety policy and procedure.
- ❑ Conduct work in accordance with applicable work plans (i.e., welding & torch cutting, respiratory, PPE, fire safety, etc...).
- ❑ Be familiar with the hazards of the gases they are using and the controls for those hazards.
- ❑ Report any problems or malfunction with compressed gas cylinders to the Supervisor immediately.
- ❑ Ensuring that all PPE's worn properly for the specific hazard involved and that all equipment is in good working condition, cleaned and stored properly when not in use.
- ❑ Each employee is responsible for bringing hazards to the attention of his or her immediate supervisor for correction as soon as the hazard is recognized.

Section III

Definitions

General Plan Definitions

Compressed Gas (Nonliquified) – A gas, other than a gas in solution, which under the charging pressure is entirely gaseous at a temperature of 70°F.

Cylinder – A portable compressed gas container, fabricated to or authorized for use by the U.S. Department of Transportation (DOT), or fabricated to Transport Canada (TC) or the “Rules for the Construction of Unfired Pressure Vessels,” Section VIII, ASME *Boiler & Pressure Vessel Code*.

Flammable Gas – A gas that is flammable in a mixture of 13 percent or less (by volume) with air, or the flammable range with air is wider than 12 percent regardless of the lower limit, at atmospheric temperature and pressure.

Handling – Moving, connecting, or disconnecting a compressed or liquefied gas cylinder.

Inside Diameter (I.D.) – Inside cylinder diameter.

Liquefied Gas – A gas, which under charging pressure, is partially liquid at a temperature of 20°C (70°F).

Nonflammable Gas – A gas that does not meet the definition of a flammable gas.

Outside Diameter (O.D.) – Outside cylinder diameter.

Oxidizing Gas – A gas that can support and accelerate combustion of other materials.

Safety Relief Device – A device intended to prevent rupture on a cylinder under certain conditions of exposure.

Standard Cubic Foot (SCF) – One cubic foot of gas at 70°F (21°C) and 14.7 psia (an absolute pressure of 101 kilo pascals [kPa]).

Storage – An inventory of compressed or liquefied gases in containers that are not in the process of being examined, serviced, refilled, loaded, or unloaded.

Toxic Gas – A gas having a health hazard rating of 3 or 4 defined in NFPA 704, *Standard System for the Identification of the Fire Hazards of Materials*.

Use – The consumption of a compressed or liquefied gas in a nonrecoverable manner.

User – An individual, group, or organization who utilizes the compressed or liquefied gas in a nonrecoverable manner.

Valve Protection Device – A device attached to the neck ring or body of the cylinder for the purpose of protecting the cylinder valve from being struck or damaged from impact resulting from a fall or an object striking the cylinder.

Valve Protective Cap – A rigid, removable cover provided for compressed gas container valve protection.

Section IV

Policy & Procedure

1.0 General Training Requirements

- 1.1** All employees who use and handle compressed gas cylinders will be trained in:
- General safe handling guidelines;
 - Types;
 - Use;
 - Inspection;
 - Marking;
 - Transportation;
 - Storage;
 - Cylinder Protection;
 - Service
- 1.2** *Outside Personnel (sub-contractors, vendors, etc.)* – Will be trained as a Hilscher-Clarke Affected Employee or Designated Employee (level of training and qualification to be determined by the Safety Manager and/or Supervisory Personnel) as deemed appropriate to the individual situation(s). A Hilscher-Clarke Authorized/Designated Employee (as outlined in this plan) may be assigned to oversee all activities of Outside Personnel to ensure compliance with the scope and applicability of this plan.
- 1.2.1** Hilscher-Clarke, reserves the right to render final judgment on any and all outside personnel as to their status, and as a result any additional required training and/or retraining, before assigning status on an individual as an “Authorized/Designated Employee” with respect to the scope and requirements of this plan. An individual will not be allowed to commence with any activity, on the worksite, until his or her status has been established to the satisfaction of the Safety Manager and/or Site Supervisor.
- 1.3** *Retraining* – may be required for an employee to maintain their “Authorized/Designated” status. Retraining reauthorization may be required when:
- An Authorized/Designated employee’s job changes or he or she is reassigned;
 - A Supervisor has reason to believe that an employee has inadequate knowledge of Compressed Gas Cylinder inspection guidelines, usage, maintenance and/or storage requirements;
 - An accident/incident investigation shows a deficiency in the Authorized/Designated employee’s ability to perform their duties in accordance with the procedures outlined in this plan.

2.0 General Safe Handling Guidelines

Hilscher-Clarke uses compressed gases mainly in the welding and/or cutting process. Mishandled cylinders may rupture violently, release their hazardous contents or become dangerous projectiles. If a neck of a pressurized cylinder should be accidentally broken off, the energy released would be sufficient to propel the cylinder to over three-quarters of a mile in height.

2.1 Figure 1 presents the typical components of a compressed gas cylinder:

Compressed gas cylinders are used for a variety of gases.

These gas cylinders fall into the following categories:

- Flammable
- Toxic and Poison
- Liquid

The flammable gas cylinder predominantly used at Schmid Plumbing & Heating is acetylene. Acetylene is used in torch heating, welding, and ferrous metal cutting operations.

Toxic and poison gas cylinders are used in a variety of applications. These cylinders should be clearly marked with a poison gas label. Further requirements on labeling are addressed within this policy.

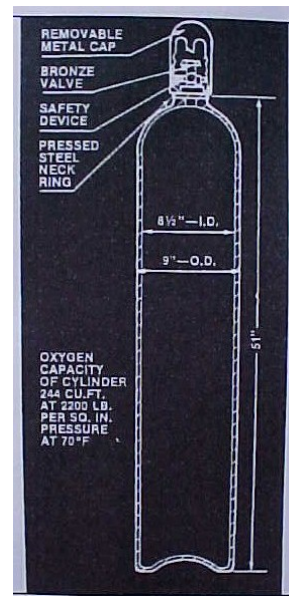


Figure 1

- 2.2 Accept only cylinders approved for use in interstate commerce for transportation of compressed gasses.
- 2.3 Do not remove or change the marks and numbers stamped on the cylinders.
- 2.4 Cylinders must never be dragged, pushed, or pulled across the floor.
- 2.5 Transport cylinders weighing more than a total of 40 pounds (18.2 kg) on a hand or motorized truck, securing them from falling.
- 2.6 Keep the cylinders clean and protect them from cuts or abrasions.
- 2.7 Do not lift compressed gas cylinders with an electromagnet. Where cylinders must be handled by a crane or derrick, as on construction jobs, carry them in a cradle or suitable platform and take extreme care that they are not dropped or bumped. Do not use slings.
- 2.8 Do not drop cylinders or allow them to strike each other violently.
- 2.9 Do not use cylinders for rollers, supports, or any purpose other than to contain gas.
- 2.10 Do not tamper with safety devices in valves or on cylinders.
- 2.11 Consult the supplier of the gas when in doubt about the proper handling of a compressed gas cylinder or its contents.
- 2.12 Clearly write "EMPTY" in chalk on empty cylinders that are to be returned to the vendor.
- 2.13 Close cylinder valves and replace valve protection caps, if the cylinder is designed to accept a cap.
- 2.14 Load cylinders to be transported to allow as little movement as possible. Secure them to prevent violent contact or upsetting.
- 2.15 Always consider cylinders to be full and handle them with corresponding care.

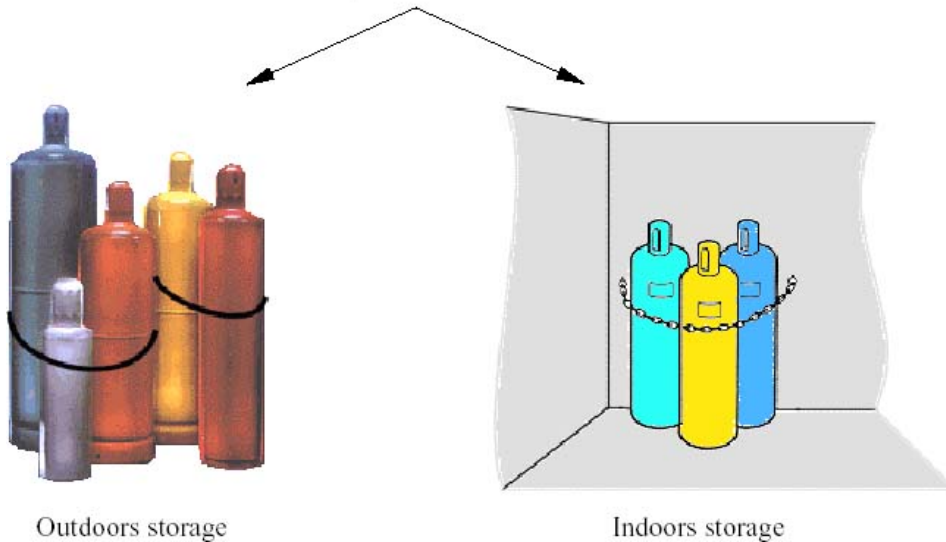
2.0 General Safe Handling Guidelines (cont.)

2.16 Securely support compressed gas cylinders at all times. Cylinders must not be left “free-standing” at anytime.

2.16.1 Cylinders unloaded from truck to loading dock must be secured until placed on a hand truck for delivery within the building.

2.17 Compressed gas cylinders should never be subjected to a temperature above 125°F.

Ambient air temperature not to exceed 52°C



2.18 Never place cylinders where they might become part of an electrical circuit.

2.19 Do not re-paint cylinders.

2.20 Never use flame to detect flammable gas leaks. Always use soapy water.

2.21 Never carry a cylinder by the valve.

2.22 Never leave an open cylinder unattended.

2.23 Never attempt to remove a stuck cap by using a lever in the cap ports. The lever may accidentally open the valve when the cap turns.

2.24 Never force improper attachments on to the wrong cylinder.

2.25 Never grease or oil the regulator, valve or fittings of an oxygen cylinder.

2.26 Never refill a cylinder, always send cylinders back to the supplier to be filled.

2.27 Never attempt to mix gases in a cylinder.

2.28 Never discard pressurized cylinders in the normal trash.

3.0 Cylinder Use & Inspection

- 3.1 Compressed gas cylinders should be visually inspected daily for leaks, cracks, etc. This visual inspection will include the cylinder, safety relief devices, valves, protection caps and stems.
 - 3.1.1 If a cylinder is thought to be defective, it should be returned to the supplier for replacement.
 - 3.1.2 Under no circumstances should employees attempt to repair defective cylinders.
 - 3.1.3 Gauges should be checked to ensure that the gas under pressure is not left in hoses when not in use.
- 3.2 Be sure all connections are tight. Use soapy water to locate leaks.
- 3.3 Keep cylinders valves, regulators, couplings, hose and apparatus clean and free of oil and gas.
- 3.4 Keep cylinders away from open flames and sources of heat.
- 3.5 Safety devices and valves shall not be tampered with, nor repairs attempted.
- 3.6 Use flashback arresters and reverse-flow check valves to prevent flashback when using oxy-fuel system.
- 3.7 Regulators shall be removed when moving cylinders, when work is completed, and when cylinders are empty.
- 3.8 Cylinders shall be used and stored in an upright position.
- 3.9 The cylinder valve should always be opened slowly. Always stand away from the face and back of the gauge when opening the cylinder valve.
- 3.10 When a special wrench is required to open a cylinder or manifold valve, the wrench shall be left in place on the valve stem when in use; this precaution is taken so the gas supply can be shut off quickly in case of an emergency;
 - 3.10.1 Nothing shall be placed on top of a cylinder that may damage the safety device or interfere with the quick closing of the valve.
- 3.11 Fire extinguishing equipment should be readily available when combustible materials can be exposed to welding or cutting operations using compressed cylinder gases.
- 3.12 **Cylinder Markings** – Cylinders must be properly labeled, including the gas identity and appropriate hazards (i.e., health, flammability, reactivity).
 - 3.12.1 Cylinders have several stamped markings. The top mark is either a DOT or an ICC marking indicating pertinent regulations for that cylinder.
 - 3.12.2 The second mark is the serial number.
 - 3.12.3 Under the serial number is the symbol of the manufacturer, user, or purchaser.
 - 3.12.4 The remaining marks represent the date of manufacture, and retest date (month and year). A (+) sign indicates the cylinder may be 10% overcharged, and a star indicates a ten year test interval.

4.0 Cylinder Storage & Moving

- 4.1 Keep oxygen cylinders a minimum of twenty (20) feet away from flammable gas cylinders or combustible materials. If this cannot be done, separation by a non-combustible barrier at least 5 feet high having a fire rating of at least 30 minutes is required.
- 4.2 Cylinders should be stored in compatible groups:
 - Flammables from oxidizers;
 - Corrosives from flammables;
 - Full cylinders from empties;
 - All cylinders from corrosive vapors.
- 4.3 All cylinder storage areas must be prominently marked with the hazard class or the name of the gasses to be stored (i.e., Flammable Gas Storage Areas), and No Smoking signs posted where necessary.
- 4.4 Where gases of different types are stored at the same location, cylinders (empty or full) should be grouped by the type of gas (i.e., flammable, oxidizer or corrosive). Inert gases can be stored with any other type of gas.
- 4.5 Full cylinders should be stored separately from empty cylinders. Cylinders should be used by the “first in, first out” guideline.
 - 4.5.1 Mark empty cylinders EMPTY or MT.
 - 4.5.2 Keep valves closed on empty cylinders.
- 4.6 Secure empty and full cylinders in an upright position, to a fixed support by use of chains, or other substantial restraining devices.
- 4.7 Cylinders should be stored in a well-ventilated area away from sparks, flames or any source of heat or ignition. Cylinder Cylinders may be stored outside on a slab, however, where extreme temperatures prevail, cylinders should be stored so that they are protected from the direct rays of the sun. Do not expose cylinders to temperatures above 125°F.
- 4.8 Cylinders should not be exposed to continuous dampness, stored near salt or other corrosive chemicals or fumes. Corrosion may damage cylinders and cause their valve protection caps to stick. Cylinders containing corrosive chemicals should be periodically checked to ensure that the valve has not corroded.
- 4.9 Keep valve protective caps in place when the cylinder is not in use.
- 4.10 Cylinders must be kept away from electrical wiring where the cylinder could become part of the circuit.
- 4.11 When moving or transporting cylinders, always use a suitable hand truck or similar device.
 - 4.11.1 The cylinder must be firmly secured for transporting and unloading.
 - 4.11.2 **Do Not** roll or drag a cylinder to move it or allow cylinders to strike each other or any other surface violently.
- 4.12 Protective valve caps must be secured when moving cylinders. **Do Not** lift or move the cylinder by the cap.
- 4.13 Ropes or slings should not be used to suspend cylinders unless the vendor has made provisions for such lifting and attachment points are provided on the cylinder.
- 4.14 Unless cylinders are secured on a special car, regulators shall be removed, valves closed and protective valve caps in place before cylinders are moved.
- 4.15 Always wear appropriate PPE when engaged in moving or transporting cylinders (i.e., protective footwear, heavy gloves, safety glasses).

5.0 Transportation

Transporting gas cylinders requires careful consideration and appropriate precautions. These considerations and precautions include, but are not limited to:

- 5.1 *Motor vehicle transport of cylinders*** shall only be done with vehicles equipped with racks or other means of securing the cylinders.
 - 5.1.1** Cylinders containing liquefied hydrogen or toxic gases shall be transported in open body vehicles.
- 5.2 *Flammable gas and oxidizer cylinders transport*** must not be done together nor with poisons or corrosives.
 - 5.2.1** However, oxygen and acetylene cylinder joint transport is allowed if:
 - The cylinders are transported in the rear truck bed below the cab level;
 - A roll bar is installed over the rear truck bed to prevent the cylinders from falling out of the truck bed in the event of the vehicle overturning.

Appendix

Compressed Gas Cylinder Safety

OSHA 29 CFR 1910.101

Mishandled cylinders may rupture violently, release their hazardous contents or become dangerous projectiles. If a neck of a pressurized cylinder should be accidentally broken off, the energy released would be sufficient to propel the cylinder to over three-quarters of a mile in height. A standard 250 cubic foot cylinder pressurized to 2,500 PSIG can become a rocket attaining a speed of over 30 miles per hour in a fraction of a second after venting from the broken cylinder connection

Basic Safety

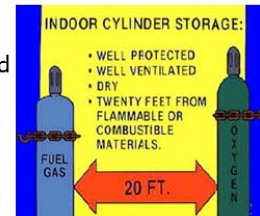
- Select the least hazardous gases that will work.
- Purchase only the necessary quantities.
- When receiving gas cylinders:
 - Visually inspect the cylinder for damage.
 - Ensure the valve cover and shipping cap is on.
 - Check for proper labeling.
- If a cylinder is damaged, in poor condition, leaking, or the contents unknown, contact your cylinder vendor. Have the vendor return the damaged cylinder.
- Wear appropriate foot protection when moving or transporting cylinders.
- Always have the Material Safety Data Sheet (MSDS) available and be familiar with the health, flammability and reactivity hazards of the particular gas.
- Transport cylinders on specially built hand carts or trolleys. All transport devices must have some way of securing cylinders to prevent them falling.

Cylinder Markings

- Cylinders must be properly labeled, including the gas identity and appropriate hazards.
- Cylinders have several stamped markings. These shall not be tampered with:
 - The top mark is either a DOT or International Code Council (ICC) marking indicating pertinent regulations for that cylinder.
 - The second mark is the serial number.
 - Under the serial number is the symbol of the manufacturer, user, or purchaser.
 - Of the remaining marks the numbers represent the date of manufacture and retest date (month & year).
 - A + sign indicates the cylinder may be 10% overcharged, and a star (*) indicates a ten-year test interval.

Cylinder Storage

- Cylinders should be stored in compatible groups.
 - Fuel or flammable gases (i.e., acetylene, propane, hydrogen) from oxidizing gases (i.e., fluorine, nitrogen oxide, toxic gases, oxygen) at a minimum of 20 feet or separated with an approved fire wall.
 - Full cylinders from empties. Empty cylinders should be clearly marked and stored as carefully as those that are full because residual gas may be present.
 - Mark empty cylinders EMPTY or MT.
- Flammable gas cylinders whether full or empty must not be located near an exit or any location which could block an exit (i.e., NFPA)
- Store cylinders 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 of the cylinder is heated.
- Compressed gas cylinders must be firmly secured at all times to prevent cylinders from tipping or falling. An appropriate clamp, belt or chain should be used for this purpose.
- Compressed gas cylinders should only be handled, used or stored in locations where they are well ventilated, not exposed to heat or direct pressures, corrosive substances or dampness. Do not use a cylinder as an electrical ground connection.
- Signs should be conspicuously posted in areas where toxic or flammable compressed gases are stored, identifying the substances and appropriate precautions (i.e., Flammable Gas, No Smoking, No Open Flames).
- The cylinder valve cap must be secured on the head of a cylinder whenever it is not in use. Never use a valve cap to lift cylinders.



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Safety Training

The Sleeping Giant

Many of us are surrounded by compressed gas cylinders. Here is a reminder of just what respect they command.

GET TO KNOW ME

I can contain very high pressure.
I wear a label to identify the gas I am holding.
My color does not tell you what gas I contain.
I am only one piece of a two-part system. Without a correct regulator or manifold I cannot function safely.

KNOW HOW TO USE ME

Know how to safely install and remove me from your system.
Make sure I am properly secured when in use and when stored.
Open my valve slowly when I am to be used.
Close my valve when you are done.
Know the dangers of my contents, read the MSDS, and follow proper procedures when using me.

WHEN THINGS GO WRONG

If my valve or regulator snaps off, all my power is unleashed through an opening no larger than a pencil.
I will jet away faster than any dragster.
I will smash through brick walls.
I will spin, ricochet, crash and splash through anything in my path.

TO BE MY MASTER REMEMBER

Secure me,
Cap me, and
Always follow recommended safety procedures.

TREAT ME
WITH
RESPECT,
I AM A
SLEEPING
GIANT

Acetylene Cylinder Safety Practices

- Never use a leaking cylinder.
- Always store acetylene cylinders vertically. Acetylene cylinders are packed with porous rock that is saturated with acetone.
- Use a leak detection fluid to check fittings and connections for leaks.
- Never attempt to store or inject acetylene gas into any type of vessel, tank, or enclosure.
- Acetylene gas regulators should not exceed a setting of 15 psig.
- Flame arresters and check valves should be installed at both the torch base hose connections and at the regulator hose connections.
- Close cylinder valve before shutting off the regulator to bleed gas from the regulator.
- If cylinders are not used for a period of time, remove the gauges and regulators and cap the cylinders.