



## Cylinders: Safe Storage, Handling, and Use

### INTRODUCTION

To use compressed gas cylinders safely, it is important that they are stored properly, handled correctly, used with the correct equipment, and that the properties of the gases they contain are fully understood.

### OVERVIEW OF CYLINDER PHYSICAL HAZARDS

**Physical Damage:** Cylinders, with their high internal pressure [up to 2,500 pounds per square inch gauge (psig)], are very hazardous when exposed to damage from falling over or tipping, heat, electric circuits, motion, or vibration – anything that can cause a weakness or crack in the cylinder wall or shell. Such damage can cause the cylinder to rupture and explode sending sharp metal pieces, like shrapnel, blasting through the area.

**Valve Hazard:** The CGA (in Pamphlet V-1) has established a 0.300 inch (7.62 mm) maximum valve inlet diameter as a requirement to minimize the propulsion effect in case the valve is severed. This standard has the exception of valves used in liquefied gas services and fire control systems. Special design requirements and unique applications such as fire control systems, which require a “high blow down flow”, may dictate greater diameters. The actual outcome of a broken off valve depends on the design and pressure of the valve and cylinder. If the valve is broken off and the valve inlet opening meets the

Compressed Gas Association (CGA) requirements, the cylinder will rapidly release all its gas (which could be a health and/or flammability concern), cause a whistling sound, and possibly spin uncontrollably. If the valve inlet opening is different from the standard hole size used in most welding gases, such as those used for propane or butane and fire protection system cylinders, the cylinders may take off and become airborne. You can check this size matter by being sure the cylinder meets all V-1 requirements.

**Tipping and Falling:** The most common major hazard is having a cylinder tip over or fall on you or another nearby worker. Since cylinders are heavy and awkward to handle, they require special care and equipment in handling and securing so they don't fall or tip over and cause injury.

**Valve Leakage:** Cylinder valves can leak, causing their contents to discharge. To minimize hazards from leaks, use proper ventilation and storage.

### OVERVIEW OF CYLINDER CONTENTS HAZARDS

Read, understand, and follow the markings on the cylinder, the label(s) on the cylinder, and the material safety data sheet (MSDS). Each compressed gas cylinder has unique hazards based on contents. Some are filled with inert gases – especially those used in arc welding. Many gases are flammable, explosive, toxic, or a combin-

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ation. Common compressed gases include acetylene, carbon dioxide, argon, hydrogen, nitrogen, air, propane, and oxygen.

## HOW TO STORE CYLINDERS

- Store cylinders upright and secure them with a chain, strap, or cable to a stationary building support or to a proper cylinder cart to prevent them from tipping or falling.
- Completely close the valves, and keep the valve protection devices, such as caps or guards, securely in place.
- Store cylinders in a dry, well-ventilated area at least 20 feet from combustible materials. Do not keep cylinders in lockers. If they leak, a buildup of flammable or other types of gases can occur inside the locker.
- Mark the storage area with proper precautionary signs, such as flammable, oxidizer, or toxic.
- Place them in a location where they will not be subject to mechanical or physical damage, heat, or electrical circuits to prevent possible explosion or fire. Keep cylinders away from vehicle traffic.
- Store empty cylinders separate from full ones.
- Keep oxygen cylinders 20 feet away from fuel-gas cylinders, such as acetylene, or separate them with a non-combustible barrier (such as a wall) at least 5 feet high with a fire-resistance rating of at least one-half hour.

## HOW TO TRANSPORT CYLINDERS

- Most accidents or injuries involving cylinders happen when moving or handling the gas cylinders.
- Use the right equipment, correct procedures, and sufficient number of persons to lift and move cylinders to avoid personal injury and cylinder damage.
- Wear protective footwear, safety glasses, and heavy gloves.
- Securely install the valve protection devices, such as caps or guards.
- Secure cylinders upright to a proper hand truck or cylinder cart designed for the purpose.
- Don't drag or roll them – use a properly designed cart or hand truck.
- When using a crane, be sure to use proper cradles, nets, boats, or special platforms designed for this purpose to prevent cylinders from falling.
- Prevent damage – handle carefully – avoid dropping or banging them.
- Do not lift by the protective cap/guard or use magnets or slings to lift or move them since valves may be damaged or sheared off.

## HOW TO USE CYLINDERS

- Follow the instructions in the Compressed Gas Association (CGA) publication P-1, "Safe Handling of Compressed Gases in Cylinders." (The phone number and web site of the CGA are located at the end of this sheet in the Information Sources Section.) Don't tamper with safety devices.

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- Keep cylinders upright and away from heat, sparks, fire, physical damage, or electrical circuits to avoid rupture.
- Use in a well-ventilated area to avoid gas accumulation.
- Do not bring cylinders into a confined space to avoid inhaling the gas and possible suffocation from the accumulation of flammable, toxic, or reactive gases.
- Read, understand, and follow all cylinder markings and labels to avoid misuse.
- Before connecting a regulator, stand to one side, and momentarily open the valve and then close it immediately. This procedure, called “cracking” the valve, is done to clear the valve of dust or dirt that could enter the regulator.
- Open valves slowly by hand to avoid gauge damage. If a specific tool is required to open the valve, leave it in position so that the flow of gas can be stopped quickly in an emergency.
- Lift and move cylinders properly.
- Close the gas cylinder valves when not in use such as during breaks, lunch, or end-of-shift to avoid leaks.
- Avoid getting any oil or grease on the cylinders or regulators/gauges, particularly those containing oxygen, to avoid fire or explosion.
- Storage is not required for single cylinders of fuel gas and oxygen ready for use with regulators attached secured to a proper cart.

## HOW TO MAINTAIN THEM

- Protect the markings on cylinders that identify the contents, and mark the full/empty status on cylinders (do not use color to identify contents). Mark all empty cylinders (some companies use "MT").
- Don't use the recessed top of the cylinder as a storage area for tools or material.
- If cylinders are leaking, isolate them outdoors and away from sparks or heat. Call your gas supplier to send qualified people to take care of the problem – don't try any repairs yourself. Tag leaking cylinders.
- Never mix gases in a cylinder or try to refill a cylinder – always contact your gas supplier.

## SUMMARY

Even though high-pressure, compressed gas cylinders are near or part of most welding and cutting operations, they are used safely everyday by many people throughout the world. To prevent injury, always store, handle, use, and maintain them properly. Treat them with the respect they deserve.

## INFORMATION SOURCES

American National Standards Institute (ANSI). *Safety in Welding, Cutting, and Allied Processes* (ANSI Z49.1), published by the American Welding Society, 550 NW LeJeune Road, Miami, FL 33126 (telephone: 800-443-9353; web site: [www.aws.org](http://www.aws.org)).

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Occupational Safety and Health Administration (OSHA). *Code of Federal Regulations*, Title 29 Labor, Parts 1910.1 to 1910.1450 and 1919.332, available from the U.S. Government Printing Office, , 732 North Capitol Street NW, Washington, DC 20401 (telephone: 800-321-6742; web site: [www.osha.gov](http://www.osha.gov)).

Compressed Gas Association (CGA). *Safe Handling of Compressed Gases in Cylinders*, CGA Pamphlet P-1 (and V-1), from Compressed Gas Association, 1735 Jefferson Davis Highway, Suite 1004, Arlington, VA 22202-4102 (telephone: 703-412-0900, web site: [www.cganet.com](http://www.cganet.com)).

National Fire Protection Association (NFPA). *Standard for Fire Prevention During Welding, Cutting and Other Hot Work* (NFPA 51B), available from National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02269-9101 (telephone: 800-344-3555; website: [www.nfpa.org](http://www.nfpa.org)).

Barlen, Bill. "The Significance of the Zero Point Three Hundred Hole." *Specialty Gas Report*, Vol. 6, No. 2, Second Quarter 2003. (Web site: [www.specgasreport.com](http://www.specgasreport.com)).

Barlen, Bill. "Follow-up on the Linde Hole. Plus, Where Did the Three Pounds Go?" *Specialty Gas Report*, Vol. 6, No. 3, Third Quarter 2003. ([www.specgasreport.com](http://www.specgasreport.com)).