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 compressed gas can have a high internal pressure, up to 4,000 pounds per square inch gauge (psig), are 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 through the area, like shrapnel.

Valve Hazard: The CGA (in Pamphlet V-1) has established a 0.3 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 an exception for 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”, can require 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 can take off and become airborne. You can check this size matter by being sure the cylinder meets all CGA V-1 requirements.

Tipping and Falling: The most common 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 safety data sheet (SDS) for the

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compressed gas contained in the cylinder. 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 combination. Common compressed gases include acetylene, carbon dioxide, argon, hydrogen, nitrogen, air, propane, and oxygen.

HOW TO STORE CYLINDERS

- Store cylinders in accordance with all local, state and federal regulations and in accordance with appropriate standards of the Compressed Gas Association and the National Fire Protection Association.

- 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

- Transport cylinders in accordance with all local, state and federal regulations and in accordance with appropriate standards of the Compressed Gas Association.

- Commercial transport is regulated by the Department of Transportation (DOT) where the movement is taking place. Check with the DOT in your State for specific requirements. Most accidents or injuries involving cylinders happen when moving or handling the gas cylinders.

- Do not transport cylinders in unsuitable or enclosed vehicles.

- 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 gloves.

- Securely install the valve protection devices, such as caps or guards

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- Secure cylinders upright to a proper hand truck or cylinder cart designed for the purpose.

- Don't drag or roll cylinders – 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 cylinders.

- Do not lift by the protective cap/guard or use magnets or slings to lift or move them since valves can 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.

- 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 slightly 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 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 CYLINDERS

- Protect the markings on cylinders that identify the contents.

- Mark the full/empty status on cylinders. Some companies use "MT" to designate empty cylinders.

- Don't use the top of the cylinder as a storage area for tools or material.

- If cylinders are leaking, the appropriate response measure is to isolate them outdoors, 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

High-pressure, compressed gas cylinders are part of most welding and cutting operations, and they are used safely everyday by many people throughout the world. To prevent injury, always store, handle, use, and maintain cylinders properly.

INFORMATION SOURCES

ANSI Z49.1, *Safety in Welding, Cutting, and Allied Processes*, American National Standards Institute, <www.aws.org>.

Barlen, Bill. "The Significance of the Zero Point Three Hundred Hole." Second Quarter 2003, Specialty Gas Report 6(2), <www.specgasreport.com>.

Barlen, Bill. "Follow-up on the Linde Hole. Plus, Where Did the Three Pounds Go?" Third Quarter 2003, Specialty Gas Report 6(3), <www.specgasreport.com>.

CGA Position Statement PS-7*, Position Statement on the Safe Transportation of Cylinders in Vehicles*, Compressed Gas Association, <www.cganet. com>.

CGA Pamphlet P-1 (and V-1), *Safe Handling of Compressed Gases in Cylinders*, Compressed Gas Association, <www.cganet. com>.

NFPA 51B, *Standard for Fire Prevention During Welding, Cutting and Other Hot Work,* National Fire Protection Association, <www.nfpa.org>.

OSHA, Part 1910, Title 29 Labor, Occupational Safety and Health Administration (OSHA). Code of Federal Regulations, <www.osha.gov>.

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