Laboratory Safety Bulletin

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Location: Essex Hall / B-37 • Hours: 8:30 am to 4:30 pm (M-F)

Compressed Gas Cylinders Safety

Compressed gas cylinders expose users to both **chemical and physical hazards**. The gases contained in cylinders can be toxic, flammable, oxidizing, corrosive, inert, or some combination. Since the chemicals contained in these cylinders are in gaseous form and are pressurized, they can quickly contaminate a large area due to leaks in the cylinder, regulator or any other part of the system. For this reason, it is necessary to be familiar with the chemical hazards of the gases being used. In addition to the chemical hazard, there are also physical hazards involved from the pressures of the gas as well as the physical weight of the cylinders. Breakage of the head valve or rupture of the cylinder can cause the cylinder to become a rocket or fragmentation bomb.

Storage

Secured: All gas cylinders, empty or full, must be properly secured using an appropriate material, such as a chain, plastic coated wire cable, commercial straps etc., to secure cylinders. In labs, they must be secured to either a bench, a wall, or to the floor.

- Gas cylinders cannot be stored in public hallways, or other unsecured area. Cylinders should be protected against tampering by unauthorized individuals.

Protected: They must be adequately protected from damage. Always place valve protectors on gas cylinders when the cylinders are not connected for use. Do not store cylinders near elevators or gangways, or in locations where heavy-moving objects may strike or fall on them.

- Store cylinder out of direct sunlight and away from sources of heat and ignition; temperatures must not exceed 51°C.
- Storage areas must be well-ventilated, cool, dry, and free from corrosive materials.

Segregated: Cylinders must be segregated based by hazard classes while in storage. Oxidizers must be separated from flammable gases, and empty cylinders should be isolated from full cylinders. Cylinders that contain toxic gases should be placed within ventilated storage cabinets.

Handling

Identification: Contents of the gas cylinder should be clearly identified. Color coding is not a reliable means of identification. Do not deface or remove any markings, tags, used for identification attached by the gas vendor. Cylinders that do not bear a legibly written identification of the contents should not be used.

Best Practices:

- If necessary, cylinders may be rolled on their bottom edge while in a nearly vertical position, but never dragged.
- Avoid dropping cylinders or allowing them to strike violently against other cylinders.
- Do not tamper with safety devices contained within valves or on cylinders.
- Never refill a cylinder. The practice of transferring compressed gases from one commercial cylinder to another is not permitted.
- If an outlet valve becomes clogged with ice or frozen, apply warm water (not boiling) to the valve only if gas is not water reactive. Do not thaw by using an open flame.
- Ensure the tubing and the apparatus downstream from the regulator is designed to withstand the pressure intended to be delivered. The tubing and other components should also be chemically resistant to the gas being used.
- Never use PTFE (Teflon) tape, other lubricants or sealant when installing a regulator. The recommendation of commercial gas suppliers is that the regulator fittings are in good condition and do not require additional sealants.
- Compressed gas cylinders have a finite shelf life. Ensure that cylinders are regularly inspected. Any cylinder which is corroded or has damaged valve components should be returned to the supplier. All cylinders older than ten years should be returned to the manufacturer.

The primary safety rule for handling compressed gas cylinders is that an empty cylinder is never truly empty and therefore should be treated as full.

Use and Operation

Personal Protective Equipment: Always use safety glasses (preferably a face shield) when handling and using compressed gases, especially when connecting and disconnecting compressed gas regulators and associated supply lines. Never direct gases toward the body. Employ care to avoid injury to hands or feet. It is highly recommended to use safety shoes and heavy gloves.

Regulators: Always use the appropriate regulator that is recommended by the gas provider for the type of cylinder and gas being used.

- Reduce the pressure of a compressed gas through a **manufacturer's specified regulato**r attached to the cylinder valve. (Figure 1)
- Ensure the threads on a regulator correspond with those on the cylinder valve outlet. Do not force mismatched connections. The regulator should be inspected each time before use (for grease, oil, dirt and solvent), as recommended by the manufacturer.
- Attach the regulator securely before opening the valve wide. Always use a cylinder wrench or another tightly fitting wrench to tighten the regulator nut and hose connections.
- Oxygen cylinder regulators shall not be oiled or greased. The combination of friction, fuel, and an oxygen source can cause ignition.
- Before you detach a regulator from the cylinder ensure that the cylinder valve is closed.

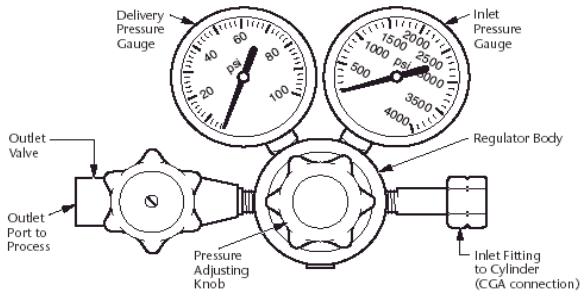

Figure 1, Front View – Typical Cylinder Pressure Regulator

Leak Testing: Check all connections for leaks with either soap or approved leak-test solution. Never use an open flame to check for leaks. If leaks occur in cylinders of noxious or combustible gases, close the valve and check all fittings. If you are unable to identify the leak contact the Chemical Control Centre's Hazardous Materials Acquisition and Stockroom Services group (ext. 3523).

- Purge oxygen and acetylene lines before lighting.
- Open cylinder valves slowly. Stand with the cylinder between yourself and the regulator (cylinder valve outlet facing away).

Best Practices:

- Do not use recessed top of the tank cylinders for the storage of tools or other equipment.
- Do not force open or close cylinder valves.
- Close the main cylinder valve as soon as it is no longer necessary to have it open. Remove all pressure from regulators not currently used (by opening equipment valves downstream **after** the regulators are closed).
- Place a trap between the regulator valve and the reactor vessel to prevent contamination when carrying out chemical reactions using pressurized gas.
- Do not use unnecessarily long hoses. If a long hose must be used, make sure it is free from kinks, and away from high traffic areas. Examine hoses periodically for leaks by submersing sections in water and looking for bubbling.
- Turn off the cylinder valve and then the regulator, when your work is finished. The pressure gauges should be brought back to zero.

Transportation

- Use a suitable hand cart or dolly for transporting cylinders. Cylinders must be secured to the cart or dolly by an appropriate method, such as held in place by either a chain or commercial strap. Lift platforms must be used to move cylinders from one level to another. When cylinders must be handled by a crane or derrick, carry them in a cradle or on a suitable platform and take extreme care that they are not dropped or bumped. Do not use slings.
- Cylinders must be kept upright, secured, and with the valve cap in placed during transportation. If space does not allow, cylinders may be laid down and secured and space should be well ventilated.
- Be careful not to drop cylinders or strike them against each other or against other surfaces violently.
- Never use the valve cover to lift cylinders; they can become damaged and come unattached. If the cylinder is dropped on a hard surface it can cause an explosion.

The information contained above is extracted from the University of Windsor's Laboratory Safety Manual.
Section: 7 Compressed Gases

For more information on laboratory safety, please contact:
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