By Jerome Spear, CSP, CIH

Compressed Gas Cylinder Safety

Compressed gases pose a unique hazard. Depending on the particular gas, there is potential exposure to both physical and mechanical hazards associated with high pressure, as well as chemical hazards associated with the gas itself.

As a result, gas cylinders require special storage and handling precautions. Compressed gas and equipment is addressed in specific Occupational Safety and Health Administration standards for both the general industry and the construction industry. Other relevant standards are established by the Compressed Gas Association, which is dedicated to the development and promotion of safety standards and safe practices in the industrial gas industry.

Associated Hazards

Hundreds of different types of materials may be stored in a compressed gas cylinder. Oxygen, fuel, refrigerants, inert gases, and poison gases, among others. The compressed gases used most commonly in well drilling are acetylene and oxygen. Acetylene is highly flammable. Although oxygen is not a flammable gas, it supports combustion by making fires burn more intensely. And oxygen, as well as acetylene and other compressed gases, can cause a cylinder to become a missile-like projectile if suddenly released.

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Proper Storage and Handling

Serious accidents may result from the misuse or mishandling of compressed gas cylinders. Only trained employees should be assigned to handle cylinders under pressure.

Acetylene cylinders must be separated from incompatible cylinders. Flammable cylinders must be segregated from oxygen cylinders by at least 20 feet when not in use or by a 5-foot-high partition with at least a one-half hour fire rating, according to OSHA standards. The cylinders should be stored with the valve end up—this is especially true for acetylene. Chains or other restraints can also be used to prevent cylinders from falling or being knocked over.

The storage area should be dry and well ventilated as leaks may cause oxygen to be displaced, creating a flammable atmosphere or a toxic environment, depending on the contents of the cylinder. Cylinders are not designed for temperatures in excess of 130°F, so they should not be stored near sources of heat such as radiators or furnaces. Acetylene storage rooms ought to have no other occupancy and contain no oxidizing agents or sources of ignition. Fire extinguishers must be readily available throughout the storage area, and smoking of course should not be allowed. Oxygen cylinders should not be stored near combustible or flammable products, including hydrocarbon fuels or petroleum products.

Always consider cylinders as full and handle and store them with appropriate care. Accidents have happened when containers under partial pressure were thought to be empty. If the contents are emptied, the valve should not be left open, as contaminants can get inside the cylinder. Instead, maintain positive pressure inside the cylinder to prevent contaminants from entering the cylinder.

Because of their shape, smooth surface, and weight, cylinders are difficult to carry by hand, but they must never be rolled or dragged. They can be transported on a hand or motorized truck and secured to keep them from falling. When they must be transported longer distances, the cylinders should be properly secured with special attention paid to protecting the valve stem from damage. Valve protection caps should be in place during storage and transport.

Don't lift cylinders by the cap and don't transport them with the regulator attached. Safe transport includes making sure truck cabs are properly ventilated. Cylinders cannot be lifted using magnetic devices. Where cylinders must be handled by a crane or derrick, they may be carried in a cradle or suitable platform and extreme care taken not to drop or bump them.

Using Cylinders Safely

The training requirements for gas cylinder usage fall under OSHA's hazard communication training requirements and it is essential to know and understand the properties, uses, and safety precautions of the gas before using the cylinder. This will also ensure the appropriate Material Safety Data System is nearby.

Always use the proper regulator for the gas in the cylinder and check the regulator before attaching it to a cylinder. If the connections do not fit together, the wrong regulator is being used. Regulators are threaded differently by type and standardized by the Com-

pressed Gas Association to prevent accidents. Don't use lubricants or allow oil or grease to come in contact with the cylinder or their valves as they may be incompatible with the cylinder contents.

Attach the regulator securely before opening the cylinder valve and always use a cylinder wrench to tighten the regulator nut and hose connection. Open cylinder valves slowly. A cylinder without a hand wheel valve should be opened only with a tool provided or approved by the gas supplier.

Before making a connection to a cylinder valve outlet, crack the valve for an instant to clear the opening of any debris, and then adjust the pressure. Don't open an acetylene valve all the way—just a quarter turn in case you have to turn off the fuel source quickly in case of a fire.

Oxygen valves, on the other hand, should be opened all the way because there is a back-seating valve on the oxygen cylinder that prevents the high-pressure gas from leaking out through the threaded stem. Open the valves from the side, and always point the valve and opening away from yourself and away from anyone else in case there's a failure to the regulator and the valve stem on the regulator fails and blows out.

Always make sure the cylinder is set to the correct pressure indicated for that gas. If you're using the right regulator, there are indicators on the gauge with an operation range indicating where the pressure ought to be set. Acetylene is not stable above a gauge pressure of 15 pounds per square inch. The gauge pressure must be kept below this setting.

Before a regulator is removed from a cylinder valve, close the cylinder valve and release the gas from the regulator. Cylinder valves should be closed when work is finished, even if the contents are empty.

Leak Procedures

Always inspect cylinders, regulators, and hoses before use. If you suspect a leak, you can lightly spray a soap and water solution around the fittings, hoses, and other suspect leak areas. If the area "bubbles up," a leak is present. Cylinders, regulators, hoses, and fittings that develop leaks should be removed from service and properly tagged. Cylinders that develop leaks should be moved to a well-ventilated area and the supplier notified.

Other Safety Precautions

Never use oxygen in place of compressed air in pneumatic tools, oil preheating burners, or to start internal combustion engines. And don't use compressed air or oxygen or any compressed gas to blow off clothing. Oxygen-saturated clothing can become a torch if contact is made with a lit cigarette or an accidental spark.

Finally, respect the high pressure of compressed gas cylinders. A sudden release of pressure, such as from damage or failure to the valve stem, can gain enough momentum to break through a cinder block wall 200 feet away! *WWJ*