

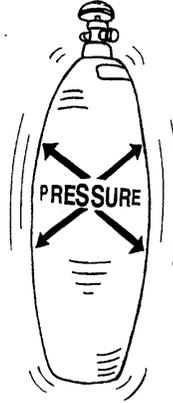
COMPRESSED
GAS CYLINDERS

Compressing Gas Puts It Under A Lot Of Pressure

Compressed gas is used in many environments, for a number of purposes.

- Refrigeration.
- Welding.
- Medical procedures.
- In laboratory experiments.

When gas is put into cylinders, it is "squeezed down" significantly. For example, 260 cubic feet of acetylene fits in a normal sized cylinder.



While this is what makes compressed gas easy to transport and use, this severe pressure can lead to dangerous situations.

When using compressed gases, there are two types of hazards that you need to watch out for:

- The hazards that any compressed gas has, just because of the pressure that it is under.
- The specific hazards of the compressed gases you are working with.

To get information about these hazards, you need to look at the labels and warning signs that are affixed to the gas cylinders. You can also consult the Material Safety Data Sheet (MSDS) for the gas you are working with.

A Small Leak Can Cause Major Problems

One thing to remember about working with compressed gas cylinders is that with many gases a small leak can cause major problems.

For example, with even a tiny leak in a cylinder full of compressed flammable gas, the intense pressure will force gas out of the cylinder continuously.

Because most flammable gases are lighter than air, the gas can spread over great distances... often very quickly.

As the gas spreads, it can pass over ignition sources such as:

- Electrical equipment.
- Sparks from operating machinery.
- Open flames.
- Heating elements.

... all of which could cause a fire or explosion.



In a situation like this, there are three major things that are occurring:

- A leak in the compressed gas system.
- The spread of the gas due to high pressure.
- Exposure to the specific hazards of the gas itself.

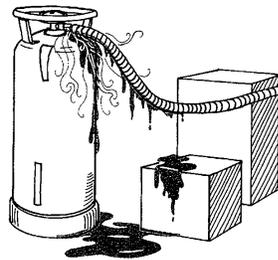
Some Compressed Gases Have Special Hazards

Some types of compressed gases have additional hazards. A good example is "cryogenic" materials, which have several unique hazards.

Cryogenics usually become liquids when they are compressed. This is especially dangerous, because they produce a lot of gas when released into the atmosphere. Cryogenics also produce extremely low temperatures.

These characteristics can create special hazards:

- Valves and washers can become brittle and easy to break.
- The steel gas cylinder itself can get brittle and can rupture on impact.
- Contact can cause severe burns to the skin (even frostbite).



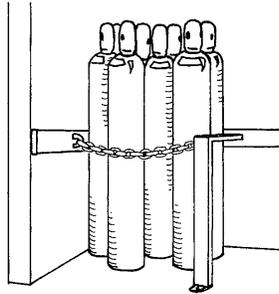
Once cryogenic materials become gaseous, they can present other problems. If the gas is oxygen, it can make it much easier for a fire or explosion to occur. Other cryogenic gasses may push breathable oxygen out of the room, and actually cause asphyxiation.

With hazards such as cryogenics, wearing personal protective equipment is especially important. Goggles, gloves and even body suits are often needed.

Take Special Care When Storing Compressed Gas Cylinders

Compressed gas cylinders can be very sensitive to a number of conditions. So you should always take special care when storing cylinders.

Specific storage information can usually be found on a cylinder's label. You can also consult the MSDS for the gas in question.



No matter what compressed gas you are dealing with, there are several general storage rules to follow:

- Keep cylinders in a cool, dry, well-ventilated space.
- Secure them firmly in an upright position (loosely draped chains are not adequate).
- Keep them out of direct sunlight.

Several types of compressed gases need to be kept away from other hazards, or even each other.

- Separate "flammable gases" and "oxidizers" (keep them at least 20 feet apart).
- Keep oxidizers and flammables away from live electrical equipment and other ignition sources.
- Do not permit smoking in any storage area.

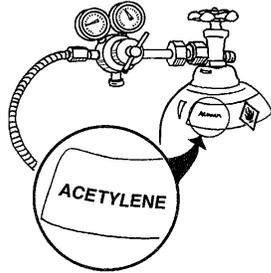
Some states have more rigorous storage laws than others. Ask your supervisor or your facility's Safety Manager if you have any questions.

Know What Is Inside Any Cylinder You Work With

It is essential that you know what material is inside any compressed gas cylinder. Without that knowledge you will not be able to take appropriate precautions. You may even find yourself trying to hook the wrong cylinder into a gas system, which could have disastrous results.

You can't assume that the color of the cylinder will tell you what gas is inside.

- Cylinder colors are chosen by the owner of the cylinder.
- Each owner may have a different "color-coding" system.
- There is no standard color-coding used on cylinders.



The easiest way to tell what is in a cylinder is by reading the labels on the cylinder itself. You should pay special attention to any "warning labels".

Many cylinders are "stenciled" with the name of the gas they contain. If there is a stencil on the cylinder, but not a label, consult the gas's MSDS. It will provide you with information about the gas's characteristics and potential hazards.

Never tamper with a cylinder's identifying labels or stencils. Everyone who comes into contact with the cylinder needs to easily determine what it contains.

Be Very Careful When Handling Cylinders

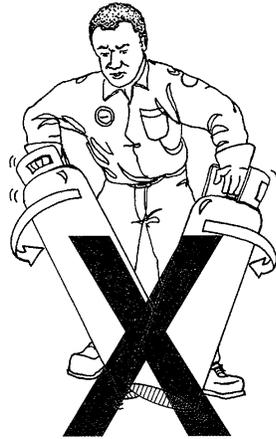
You need to be extremely careful whenever you are physically handling compressed gas cylinders. There are a number of simple, yet important rules to follow:

- Never drag a cylinder across the floor (it can damage the cylinder, especially the base).
- Don't hand roll cylinders for more than a few feet (it is difficult to control them).
- Make sure a cylinder's "safety cap" is on whenever it is moved.

In most situations, compressed gas cylinders should be moved with a "cylinder handtruck". These hand trucks have curved braces that conform to a cylinder's shape, as well as "security chains" for added safety.

If a compressed gas cylinder falls, don't try to catch it! More people are injured while trying to catch falling cylinders than by any other compressed gas hazard.

Always wear safety shoes (with steel toes) to protect your feet when handling cylinders. That way if they do fall, you can escape with your toes intact!

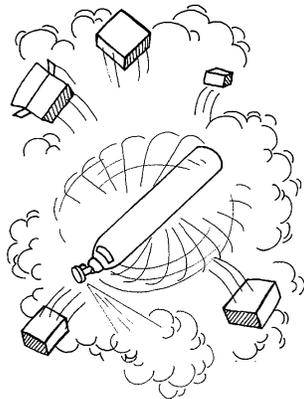


Damaged Cylinders Can Cause Serious Problems

Damaged cylinders can cause a multitude of serious problems, depending on how they have been damaged. If the cylinder's base has been bent from rolling or dragging it across the floor, the cylinder will often be unstable when it is set up. This not only creates a "falling hazard", but can lead to leaks and even breaks in gas lines.

Damaged cylinder valves can also be very dangerous. If a significant rupture occurs, or the valve breaks off completely, the rapid release of gas can turn a cylinder into a virtual "rocket".

Cylinders have also been known to spin around at very high speeds, propelled by the escaping gas... wiping out everything in their path. Faulty cylinders or hook-ups can cause many other problems as well.



If you spot a leaking cylinder, remove it from service (if you are authorized), or report the cylinder to your supervisor.

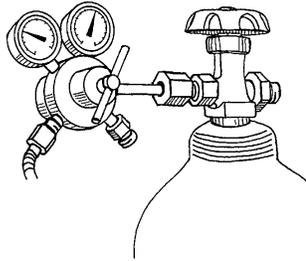
You should also remove any rusty or corroded cylinders, since they could develop leaks at any time.

Be Familiar With Hook-Up Equipment, Such As Regulators

Before "hooking up" a gas cylinder, there are several types of equipment you should know about.

Three different pieces of equipment are used on most cylinders:

- Regulators.
- CGA fittings.
- Pressure relief devices.



It is important to be familiar with each of these, as well as to know how they relate to each other. Some of this equipment comes in various sizes and models.

It is particularly critical to know how to differentiate between them. These differences are one of the things that helps to prevent you from hooking up an incorrect gas cylinder to an existing system.

The first piece of equipment that you need to know about is a "regulator". Regulators control the speed at which a gas comes out of a cylinder.

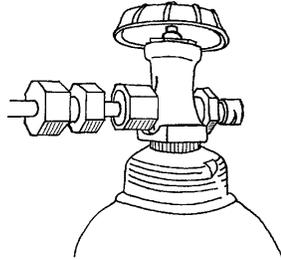
A regulator is essential to the safe use of compressed gas, since without it there would be no way to use the gas at the rate that it is needed. Regulators attach to a cylinder by using a CGA fitting.

CGA Fittings Are Different, Depending On The Gas

The second device that you need to be familiar with if you are going to be installing compressed gas cylinders is the "CGA fitting". It connects directly to the cylinder valve and allows the gas to leave the cylinder.

The size and design of CGA fittings vary, depending upon the gas. This creates one of several safeguards that are built into the mechanisms attached to cylinders.

Because of the differing sizes of the CGA's, it is difficult to install the wrong gas into a compressed gas system. Never attempt to force a CGA fitting onto a cylinder valve. If it isn't fitting correctly, something is probably wrong.



In most cases the CGA fitting should be permanently attached to the cylinder's regulator.

Never try to do without a CGA and install a regulator directly to the cylinder valve. Regulators aren't built to stand up to the same pressure that CGA's can handle.

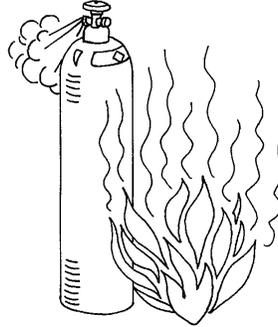
Also, if you didn't use a CGA fitting with your cylinder you would miss the "safety check" that having different CGA's for specific gases provides.

Pressure Relief Devices Act As A "Safety Valve"

The third piece of equipment that you need to know about if you are involved in installing compressed gas cylinders is the "pressure relief device" (PRD). These devices are designed to prevent ruptures or violent pressure releases that could occur if cylinders are exposed to extreme heat.

To do this the pressure relief device allows a "controlled release" of the compressed material in the cylinder.

This release prevents pressure from building up in the cylinder, which could cause the cylinder to explode.

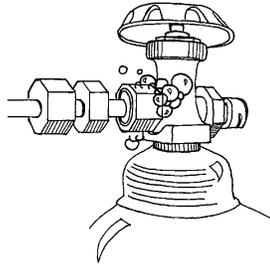


Pressure relief devices are especially important in emergency situations, such as fires. They enable firefighters to enter burning buildings that contain compressed gas cylinders without the fear of having the cylinders explode while they are battling the blaze.

There are no pressure relief devices on cylinders of toxic or poisonous gases. With these gases, the dangers that are created by releasing the gas itself are felt to be greater than the possibility of the cylinder exploding.

Always Check Fittings And Valves For Leaks

Once you have hooked up a compressed gas cylinder you need to check for leaks. An easy way to do this is to cover the surfaces with a diluted soap solution. Any sign of bubbles will indicate that there is a leak.



If you have difficulty pinpointing the leak:

- Wipe down the general area.
- Reapply the soap solution to small segments of the area, wiping off the solution each time.

Often, leaking valves can be repaired by just tightening them. You will need to have a correctly sized wrench or other "tightening tool" available.

If you suspect that a cylinder is leaking and you can't fix it, there are several things that you should do. First, alert other employees in the vicinity. They may need to evacuate the area.

If flammable gases are involved, you may need to unplug potential sources of ignition. If this is necessary, you should be very careful, since the act of removing a plug from an outlet can itself sometimes cause sparks.

If Repairing A Leaking Cylinder, Take Special Precautions

If you are qualified, and are called upon to repair a compressed gas cylinder that is known to be leaking, you need to be extremely careful. It is often difficult to determine what type of problems you may encounter.

The first thing you should do is obtain the MSDS for the gas involved. Make sure that you know the gas's characteristics, and the potential hazards that it has.

Some of the hazards are not particularly obvious. It's easy to determine that a flammable gas might ignite and cause an explosion. It is not as easy to recognize a gas that might push breathable oxygen from the room.

For these reasons, you should take special precautions when you are repairing a cylinder:

- Wear a self-contained breathing apparatus (SCBA)... you must be trained on its use.
- If needed, have back-up personnel in place to assist you.

If a problem does occur while you are working on a cylinder, take action according to your facility's emergency plan.



Remember . . .

- The material in a compressed gas cylinder is under tremendous pressure, and can be dangerous.
- Know the properties and hazards of the gases that you come into contact with.
- If a cylinder's label or MSDS indicates a need for personal protective equipment, use it!
- Use proper equipment whenever you are handling or transporting cylinders.
- Know the storage requirements for the compressed gases that you work with.
- Follow your facility's "standard operating procedures" when hooking up and operating cylinders.
- Always check valves and fittings for leaks after a cylinder has been installed.

Compressed gas cylinders can be dangerous... and should be handled very carefully. But you can work with them safely if you have learned to follow correct handling procedures... and use proper precautions!



QUIZ

1. True or False... Once a gas is forced into a cylinder, the gas is no longer under pressure?
 True False
2. Which of the following are good sources of information regarding the contents of a gas cylinder?
 - The gas's MSDS.
 - Labels on the cylinder.
 - Tags attached to the cylinder valve.
3. True or False... A "cryogenic" material is one that can produce extremely low temperatures?
 True False
4. True or False... Flammable gases and oxidizers can be safely stored next to each other?
 True False
5. True or False... You can tell what gas is in a cylinder by the cylinder's color?
 True False
6. Which of these pieces of equipment is important when using a compressed gas cylinder?
 - Regulator.
 - SCBA fitting.
 - Pressure relief device (PRD).