Compressed Gas/Air – Stats and Facts

DID YOU KNOW?

The Occupational Safety and Health Administration is one of the best sources for work safety laws, regulations, and information on accidents. In fact, since the early 2000s, OSHA has been documenting accidents regarding a very specific accident type, those that stem from compressed gases. In **some of these accidents**, employee's fingers became amputated, injured in explosions, and even killed. For instance, one worker in 2007 was killed when he was refueling his van. The employee walked to the back of the van and knelt down by the tank and, when he did, the tank exploded and ripped the bodywork and metal bumper off the van. The employee was struck and was thrown approximately 40 feet across the tarmac, where he sustained massive trauma and died.

Compressed gas accidents are particularly serious in nature. Not only are these accidents usually preventable, but many people fail to take into consideration the great danger posed by compressed gas accidents. Experienced construction industry workers are well aware of the significant danger presented by pressurized gas cylinders. These accidents are so common that the United States Bureau of Labor Statistics reports that 20 deaths and 6,000 injuries occur due to compressed gas accidents each year. This article will review some safety precautions that all individuals should take when working near compressed gas.

It comes as no surprise that safety should always be a top concern when using compressed gases. What may be most surprising to learn, however, is that almost all accidents involving compressed gases initially result from not following established methods for the safe handling and transportation of compressed gas cylinders.

The average compressed gas cylinder is 4 feet tall and weighs between 75 and 80 pounds with contents pressured up to 2,200

pounds per square inch (psi). While this may not sound particularly heavy, serious injury can occur if these cumbersome objects are moved incorrectly or fall on an employee. Abrasions, contusions, fractures and broken bones, asphyxiation, musculoskeletal disorders, spinal cord injuries, poisoning and even death can occur if there is an accident with a compressed gas cylinder.

The most common injuries related to cylinder handling result from falling cylinders. The most prevalent are contusions and fractures in the lower extremities, including breaks in the phalanges, metatarsal, tibia and fibula bones. The second-most common injuries include sprains, strains and spinal cord injuries in the lower lumbar spine, such as herniated or bulged discs (L1-L5) in workers who attempt to catch or stop falling cylinders.

Another misstep when handling cylinders is when a worker attempts to move or lift the cylinder by pulling on the cap instead of using a cylinder cart. Often, this results in the cap disconnecting from the cylinder and forcefully projecting up into the worker’s face, leading to injuries such as lost or broken teeth or other facial injuries. Bruises and fractures, especially around the eye socket, are other common injuries. When a cap is broken off or becomes damaged in a fall, the valve easily can become compromised, exposing the worker to flammable or toxic environments and burns, smoke inhalation or asphyxiation and gas poisoning.

The handling miscues mentioned above are all too common in the workplace and hundreds of cylinder handling-related injuries are reported to OSHA each year. By keeping in mind these safe handling and transportation tips, injuries related to compressed gases can become more of a rarity on site:

Always wear the proper personal protective equipment (PPE), including safety glasses, gloves and hard-toed shoes when working around or with compressed gas cylinders. Remember that the gas comes out of the cylinder pressurized up to 2,200 psi and anything near the valve could become a harmful projectile. Falling cylinders can land or roll on your foot, leaving you with several

broken bones.

Never try to catch a cylinder that is falling, no matter how confident you may be in your ability to stop it. It often is a natural reflex to attempt the save, but the risk of injury far outweighs the potential damage to the equipment.

Do not move a cylinder by its attached regulator or attempt to drag it by the cap. Besides losing your grip, you also could strain your back or fall. It also is unwise to move cylinders by laying them down and rolling them, as this subjects the cylinder to side-wall damage. Instead, move the cylinder using an approved cylinder cart and ensure that the cylinder is strapped on securely.

Secure cylinders upright so that they cannot move, even when traveling in a truck. Chains are the best way to do this, as straps and table clamps often fail due to improper use and set-up. Clamps generally are not kept tight and are placed on articles that are not secure, such as movable desks, tables, etc. Straps can be buckled incorrectly and provide little to no restraint. Instead, fasten restraints on the upper half of the cylinder, above the center of gravity, as well as the bottom approximately 8 inches to 1 foot from the base.

Never heat a cylinder. If a cylinder is stuck in ice, use hand tools to carefully chip away at the ice, making sure the hand tools never come in direct contact with the frozen cylinder. If the cylinder contents have stratified in a mixture such as CO_2 and $N0_x$, bring the cylinder into a safe building to slowly warm up while it is chained to the wall before rolling it to mix the contents.

When inspecting compressed gas cylinders, look for burn marks, dents or corrosion, and check to see if the valve cap is attached and that the contents are properly labeled by name. It is the receiver’s responsibility to do this inspection as noted in CFR 29 1910.101. Be sure to log this inspection to help guard against a hefty lawsuit.

Securely attach protective valve caps on cylinders when idle or in transport. Many cylinders contain pressures in excess of 2,000 psi. A broken valve resulting from a falling cylinder is all it takes for the cylinder to become an unguided missile. Any uncontrolled release of gas under pressure can create a dangerous environment.

Once the cylinder cap is removed, always inspect the valve for odors, visible plumes or hissing sounds. If you detect any of these, take the cylinder outside to a well-ventilated area and have your vendor pick it up.

When moving cylinders, do not move them with oily hands or gloves. This is very important when moving oxidizers, as they could react violently with the oil or grease if it comes into direct contact with the valve.

Store cylinders in a fire-resistant area that is well ventilated, cool (less than 125 F) and dry. A fire extinguisher should be available where compressed gases are stored, and have an emergency response and evacuation plan in place in the event of a fire.

Cylinders should not be stored in areas where they can come into contact with objects of extreme temperature, such as a furnace or cryogenic liquid, as these conditions will weaken containers or cause a gas release. They also should be kept a safe distance of at least 20 feet from electrical sources including electrical switches, outlets and extension cords, as they could become part of an electrical circuit. The contents of each cylinder should be clearly marked and the full cylinders separated from empty ones.

When moving cylinders on an elevator, place the cylinder chained securely to the cart in the middle of the elevator with the cart handgrip Do not attempt to ride in an elevator with a compressed gas cylinder. This is a confined space that would be impossible to escape from if there were an accidental release of gases.

Check the purchase order to ensure that you are not receiving cylinders that contain incorrect contents. The distributor should

collect any incorrect cylinders immediately. Finally, never force a cylinder valve open. Only use your gloved hands to open and close the valve on the regulator.

Compressed gas cylinders are a common tool for manufacturing and construction jobs, and their hidden dangers easily are addressed with proper equipment and handling. Follow these tips to ensure that all tasks involving compressed gas cylinders are completed efficiently and safely.

KEEP IN MIND

Compressed air is air kept under a pressure that is greater than atmospheric pressure. Compressed air is an important medium for transfer of energy in industrial processes, and is used for power tools such as air hammers, drills, wrenches and others, as well as to atomize paint, to operate air cylinders for automation, and can also be used to propel vehicles. Brakes applied by compressed air made large railway trains safer and more efficient to operate. Compressed air brakes are also found on large highway vehicles.

Compressed air is used as a breathing gas by underwater divers. It may be carried by the diver in a high pressure diving cylinder, or supplied from the surface at lower pressure through an air line or diver’s umbilical. Similar arrangements are used in breathing apparatus used by firefighters, mine rescue workers and industrial workers in hazardous atmospheres.

At Air Source Industries, we follow the comprehensive safety requirements needed to provide you with top-quality compressed gas for your business. Air Source Industries prioritizes the safety of our customers and employees. Our team conducts ongoing safety training throughout the year. Our dedication to safety extends to making sure your compressed cylinders at your business are delivered and stored safely.

There are numerous safety considerations when you are working with compressed gas cylinders. You need to be aware of safety in all industries and conditions.

We'll review the common types of compressed gas, how gas standards are set by the government, and common hazards that can be avoided through proper safety.

What Are The Major Compressed Gas Classifications?

Compressed gases are grouped into 3 major categories based on the states of gases:

1. Liquid (carbon dioxide and nitrous oxide)
2. Non-liquified gases (oxygen, nitrogen, and helium)
3. Dissolved gases (acetylene)

You've likely aware of liquid and non-liquid gases before but may not have heard of dissolved gases. Dissolved gases like acetylene are chemically unstable by themselves. Acetylene can explode at normal atmospheric pressure. Dissolved gases can be safely stored in cylinders when porous filler material and solvent like acetone are added.

OSHA Sets The Standards

The US government has strict compressed gas regulations to help reduce the risk of dangerous hazards and combustion. The Occupational Safety and Health Administration (**OSHA**) is the US government agency tasked with setting safety standards to protect workers and avoid hazardous conditions.

OSHA has set specific standards (rules) around labeling, storing, transporting, and operating compressed gas cylinders. The OSHA website has the complete rules enumerated for the different types of compressed gases and they are very detailed regulations. As an example, there are specific regulations around oxygen fuel gas used for welding and cutting.

OSHA is also very concerned about worker health and safety and advocates on their behalf. The agency informs employees on their rights and investigates any reported workplace violations

seriously. Workers can file a complaint when they see any potential safety issues to bring it to the agency’s attention to investigate.

Common Compressed Gas Hazards

Hazards can range in severity from minor to major including serious injury and death. Being aware of the potential hazards when operating cylinders will help you stay safe. Following OSHA safety standards, reading the Safety Data Sheets (SDS), and testing cylinders regularly can help reduce the risk of hazards.

Common compressed gas hazards include:

Pressure (Too Much or Little)

A cylinder under too much pressure may rupture. Cylinders that are under-pressurized may not operate correctly and also cause risks like the gas flowing back into the cylinder.

Cylinder Damage

There are also situations where damaged cylinders under high pressure can take off like a rocket that can cause bodily injury to people nearby or property damage. Keeping cylinders securely strapped in their storage areas reduces the risk of damage.

Leaks

Compressed gas leaks are hazardous. Depending on the gas, a leak could cause inert gas to collect in high concentrations and cause asphyxiation without people being aware of the leak.

Health Effects

Direct exposure to certain gases can have long-term health consequences. Some gases are toxic to people if they are exposed and it also depends on the concentration and other factors.

Fire and Explosion Hazards

Compressed gases are classified as flammable when they pose a fire or explosion hazard. You can identify cylinders containing gases classified as flammable by looking at the label. Flammable gases like acetylene are classified as Hazmat Class 2 with a red diamond symbol and flame icon.

A way to reduce the risk of combustion is by keeping cylinders in approved storage areas away from heat sources like open flames and high-temperature environments. Reading the cylinder label allows you to identify the specific flammable gas and follow the necessary safety guidelines from the Safety Data Sheets (**SDS**).

Flashback

A flashback occurs where a gas trail is ignited and the fire flows back to the cylinder. A flashback event is extremely dangerous and can be avoided.

Regularly check the cylinder regulators, valves and the cylinder wall for leaks or flow issues. Storing the cylinders in well-ventilated areas helps prevent gases from pooling in high concentrations if there is an unnoticed leak.

Another safety measure is using a flashback arrestor that acts to stop the gas from returning into the cylinder. A flashback arrestor is commonly used in welding to prevent the reverse flow of gas or flame from going into the cylinder.

Oxidizing Gases

There is also fire and explosion concern for oxidizing gases, gases that are a higher percentage of oxygen than air (>23.5% oxygen) that can combust with materials in the outside environment. Types of materials that can react with oxidizing gases are organic substances containing carbon, certain metals, and other oxidizable substances.

Oxidizing gases react very quickly with oxygen-rich environments

and fire can spread quickly. It may be difficult to extinguish an oxidizing gas fire once it starts. Having CO2 extinguishers or dry chemicals on hand can be used to help reduce the initial fire spread.

Recognize How Compressed Gas Accidents Occur

There are a variety of ways in which workers and people in the proximity of compressed gas can be harmed. Some of these situations involve:

- **Asphyxiation–** Sometimes, compressed gas escapes its container, which can happen suddenly and quickly turn overwhelming.
- **Chemical Burns –**In many cases, compressed gas is corrosive and can result in substantial skin damage.
- **Explosions and Fires** – Compressed gas can be ignited by contact with a flame or spark of electricity.
- **High-Pressure Accidents –**Various injuries can be caused by the substantial amount of pressure that builds up inside a container and can cause objects to be released with great pressure.

Know What Gases Can Be Deadly

There are several types of compressed gases that can cause accidents that lead to very serious injuries. Some of these gases include:

- Acetylene
- Argon
- Butane
- Ethylene
- Helium
- Hydrogen
- Methylamine
- Nitrogen

- Oxygen
- Vinyl chloride

Always Wear Proper Safety Gear

Workers must make sure to always wear the appropriate protective clothing when working around compressed gas. This clothing at a minimum should include safety glasses to protect against projectile accidents, gloves to protect a person from potential burns, and hard-toed shoes to protect against objects that might fall on a person’s foot. In many cases, it is also a good idea for workers to wear masks to protect against any chemical leaks that might come from the compressed gas container.

Properly Store Compressed Gas

Compressed gas containers must always be stored in a fire-resistant, well ventilated area that is both cool and dry. These conditions greatly reduce the risk that the container will explode and seriously harm or kill individuals. Also, a fire extinguisher should be kept in the proximity of this container in case an accident or unexpected event occurs. Workers should also create an emergency response plan in case a fire occurs.

Handle the Compressed Gas Container Correctly

There are several important steps that workers should take when handling compressed gas. Wherever the gas container is placed, it must be properly secured. A gas cylinder should also never be heated, which greatly increases the chances that an explosion will occur. Workers should also always inspect compressed gas containers for any signs of corrosion or dents that suggest the container might be unsafe.

Speak to a New Jersey Injury Attorney

These pieces of advice are just some of the most important steps that a worker should take when working with compressed gas. Even if all of these pieces of advice are followed, compressed gas accidents are still known to occur. Contact a knowledgeable lawyer at Ferrara Law if you or a loved one is harmed in a compressed gas accident.

Proper Safety Measures

How can compressed gas accidents be avoided? Here are some of the **safety precautions that can be taken** to avoid accidents and injuries:

- A worker should always wear personal protective equipment that may include safety glasses, gloves, and hard-toed shoes when working around or with compressed gas cylinders. Aside from the fact that the cylinder could become a projectile, falling cylinders could also land or roll on your foot, which can cause broken bones.
- Always secure cylinders upright so that they cannot move, even when you are traveling in a truck.
- Never heat a cylinder or allow hand tools to come into direct contact with the frozen cylinder.
- You should always inspect compressed gas cylinders by looking for burn marks, dents, or corrosion. Also check to see if the valve cap is attached and contents are properly labeled.
- Once the cylinder cap is removed, you should always inspect for odors, visible plumes, or hissing sounds.
- Make sure that cylinders are stored in a fire-resistant area that is well ventilated and cool as well as dry. Wherever the storage is, a fire extinguisher should be kept and there should be an emergency response plan in place of a fire event.

Compressed gas cylinders are very common in the construction workplace but can actually pose many dangers. To avoid burns,

explosions, and more, proper precautions should always be taken. However, even so, many accidents will continue to happen in workplaces over the next year and so forth. If you have become injured as a result of compressed gas, you may have a case.

Conclusion

We care about the safety of our customers and employees when using compressed gases. Our staff undergoes safety training throughout the year to stay up the date on the latest safety requirements. Our well-trained Air Source technicians will set up and secure your business gas cylinders for you.