Compressed Gases Safety – Compliance Game Plan

The 7 steps to take to prevent compressed gas injuries, incidents and OHS violations

Gases kept compressed in storage cylinders are commonly used at many workplaces. While great for welding, powering mobile equipment, lab operations and other work functions, compressed gases pose significant work hazards. Pressure inside compressed gas cylinders typically range between 2,000 to 3,000 pounds per square inch (psi) but can reach as high as 6,000 psi; for point of reference, car tire pressure is generally between 30 and 45 psi. Damage to the cylinder can Damage to the cylinder valve can cause a rapid release of the gas and propel the heavy metal cylinder like a rocket. Other compressed gases hazards include:

- Flammable gases like acetylene, propane and hydrogen may burn or explode under certain conditions;
- Some compressed gases are toxic and can cause serious health damage;
- Corrosive gases can burn the skin, eyes or lungs and eat away at metals; and
- Inert gases like helium, argon and nitrogen can reduce oxygen levels if they leak into the atmosphere resulting in asphyxiation.

That's why OHS laws require employers to take measures to ensure safe storage and handling of compressed gas cylinders. In addition to serious and even fatal injury, failure to comply with OHS requirements can also lead to fines, stop-work orders and other enforcement actions. Here's a 7-step Game Plan to ensure this doesn't happen to you.

The 4 Types of Compressed Gases

Compressed gas is the general name for a wide variety of gases that are kept at extremely high pressures inside metal-walled cylinders. There are 4 basic kinds of compressed gases:

- **Liquefied Gases** evaporate to replace gas removed from the cylinder, thus keeping the cylinder pressure constant for as long as liquid is present. Common examples: ammonia, chlorine, propane, nitrous oxide, carbon dioxide;

- **Non-Liquefied Gases** don’t turn into liquid at room temperature. Common examples: oxygen, nitrogen, helium, argon;
- **Dissolved Gases** in a liquid solvent at pressures of 29 psi or higher that are very unstable and apt to explode. Common example: acetylene; and
- **Cryogenic Gases:** gases cooled to a liquid state below 150 Kelvin (-123øC) that are extremely cold and can cause intense burns. Common examples: liquid nitrogen, liquid helium, liquid argon.

7-Step Compressed Gases Compliance Game Plan

There are 7 basic measures you must take to minimize risk of compressed gas injuries and OHS violations.

1. Inspect Cylinders Before Putting Them into Use

The safety effort begins when you first accept cylinders from a manufacturer or supplier. Before putting the cylinder into use, have a qualified person read the cylinder label to confirm the gas received is the gas purchased and do an inspection to verify that:

- The name of the gas and rated pressure are clearly marked on the cylinder;
- The Transport Canada/Department of Transportation (TC/DOT) cylinder markings confirm the pressures contained in the cylinder;
- There’s a proper WHMIS Safety Data Sheet (SDS) for the cylinder’s contents;
- The cylinder is free of obvious damage such as cuts, gouges, burn marks, corrosion and dents; and
- Any valve, regulator or fitting connected is a standard fitting, designed and manufactured for the type of cylinder and compressed gas for which it’s used and isn’t bent or damaged.

If any of these items doesn’t check out, return the cylinder to the manufacturer or supplier for a satisfactory replacement.

2. Ensure Cylinders Are Stored in a Safe Location

The next 3 items are designed to ensure safe storage of compressed gas cylinders in accordance with OHS and Fire Code requirements. Start by choosing an appropriate storage location, one that’s dry, well-ventilated, not exposed to sources of heat, sunlight and corrosion and kept at a temperature that never tops 52øC/125.6øF. Don’t store compressed gas cylinders:

- Near ignition sources;
- In elevators, stairways, exits or exit routes;
- Closer than 1 metre/3 feet from exit doors;
- Under external staircases, emergency stairs, ramps or other access points; or
- Longer than one year without using them.

3. Keep Compressed Gas Cylinders Segregated

The juxtaposition of cylinders containing different kinds of compressed gases is of crucial importance. In general:

- Flammable gases must be stored away from oxidizer gases;

- Inert gases may be stored with flammable or oxidizer gases; and
- Propane must be located at least 1 metre/3 feet away of any flammable compressed gas and at least 6 metres/20 feet away from containers of flammable, combustible, oxidizing, corrosive or toxic liquids.

Use this table to ensure safe storage arrangements:

Segregation of Incompatible Gases

Classes	Flammable	Inert	Toxic	Corrosive	Oxidizer
Flammable		Compatible	Incompatible: Don't store together	Incompatible: Don't store together	Incompatible: Don't store together
Inert	Compatible		Compatible	Compatible	Compatible
Toxic	Incompatible: don't store together	Compatible		Incompatible: store 1m away	Incompatible: store 1m away
Corrosive	Incompatible: don't store together	Compatible	Incompatible: store 1m away		Incompatible: store 1m away
Oxidizer	Incompatible: don't store together	Compatible	Incompatible: store 1m away	Incompatible: store 1m away	

4. Use Safe Storage Methods

Ensure that compressed gas cylinders are secured to a wall or rack, stored in an upright position and protected from falling objects. The valve must be closed and all protective devices must be in place during storage. Clearly mark empty compressed gas cylinders as 'empty' and store them in a separate location designed for such use.

5. Post Appropriate Signage

Areas where compressed gas cylinders are used or stored must be marked with prominently posted notices listing the name of the gases stored or used and signs banning smoking.

> **Ontario Construction Project Compressed Gases Signage Rules**
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> In Ontario, construction projects areas where compressed gases are stored or used must be marked by signs that contain the word 'DANGER' written in legible letters at least 150 mm in height and state that entry by any unauthorized person to the area where the hazard exists is forbidden. Signs must be posted adjacent to a hoisting area, under a boatswain's chair or a suspended work platform, at the outlet from a chute, at a means of access to a place where there may be a noxious gas, vapour, dust or fume, noxious substance or a lack of oxygen, and where there's a potential hazard from an energized overhead electrical conductor at more than 750 volts.

6. Ensure Safe Handling

Ensure compressed gas cylinders are handled safely and in accordance with manufacturer's specifications by implementing written safety policies and work procedures requiring, at a minimum, that:

- Compressed gas equipment designed for use with a specific gas is used only with that gas;
- The cylinder valve is shut off and pressure in the hose is released when the cylinder is empty or not in use;
- Sparks, flames or other sources of ignition aren't allowed to contact the cylinders;
- Nobody uses a hammer, wrench or other tool to open a cylinder valve, unless that's the method specified by the manufacturer's instructions;
- Nobody inserts or removes a compressed gas cylinder from a storage compartment by holding the valve or valve protection cap;
- Nobody stands directly in front of a regulator attached to a compressed gas cylinder when the cylinder valve is being opened
- Nobody uses compressed gases or air to clean clothing or working surfaces; and
- Cylinders aren't rolled on their sides, subjected to rough handling or moved with a lifting magnet.

7. Ensure Workers Use Required PPE

Ensure that workers wear appropriate PPE when operating or working near a grinding wheel, including:

- Safety glasses with side shields, full-face shields or other protection shielding the worker's eyes and face;
- Respiratory protective equipment;
- Gloves or other suitable hand protection;
- Boots or other suitable foot protection; and
- Fireproof clothing.