














## Guidelines for Working with Compressed Gas Cylinders and Gas Regulators at the University of Ottawa

### Definitions

1. A compressed gas is a contained mixture or material having either an absolute pressure exceeding 275.8 kPa at 21 °C or an absolute pressure exceeding 717 kPa at 54 °C, or both. (Ontario Fide Code 1997)

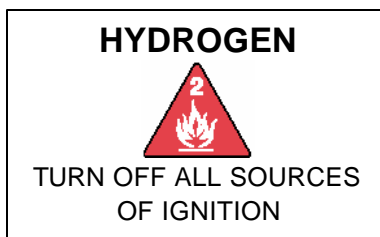
### Classes of Compressed Gases

Gas Type	Characteristics	WHMIS (lab) Label	Workplace Signage	TDG Label (during transport)
Non-Flammable	Gases that will not fuel a fire or ignite.		 *	
Flammable	gases that can fuel a fire or can ignite when exposed to a spark.	Cylinder Symbol + 	 * Any Flammable Gas  * Oxygen	
Corrosive	gases that will corrode unprotected metal or surfaces.	Cylinder Symbol + 	 *	
Toxic	gases that are poisonous	Cylinder Symbol + 	 *	

\*The workplace signs and symbols follow a University of Ottawa signage policy.

## Signage

1. Laboratory doors must have signage indicating the names of gases being stored as well as the type and nature of the gas(es).
2. Cylinder storage rooms and outdoor cages must have signage with the names of gases being stored as well as the type and nature of the gas(es).
3. The labels on the cylinder shoulders must not be defaced.



**Example:  
Signage outside of  
laboratory area**

Physical Resources and EHSS will determine the workplace signage required for the type of compressed gas in use.

## Storage

There are two (2) decision factors that will define how compressed gas cylinders are to be stored:

- Is the mass of flammable gas over 25 kg, or the mass of non-flammable gas over 150 kg?
- Are the cylinders to be stored indoors or outdoors?

This document does not address storage areas for larger quantities, corrosive, or poisonous compressed gas cylinders. These require special venting, fire separation that meets fire resistance ratings under the *Fire Code*, and other special construction elements.

### Storage Density of Cylinders

Gas Type	Quantity of Cylinders per 10 m <sup>2</sup> area	Action
Non-Flammables	>4	Contact the Building Administrator and EHSS.
	<4	Follow Guidelines for Working with Compressed Gas Cylinders and Gas Regulators
Flammable	>2	Contact the Building Administrator and EHSS.
	<2	Follow Guidelines for Working with Compressed Gas Cylinders and Gas Regulators
Corrosive	1 or more	Contact the Building Administrator and EHSS.
Poisonous	1 or more	Contact the Building Administrator and EHSS.

10 m<sup>2</sup> is roughly equivalent to a 10 x 10 ft room.

If storage over these limits of compressed gas cylinders is required in one area, please contact Environmental Health and Safety Service (EHSS) so an evaluation against the *Fire Code* requirements can be done.

**Laboratory Handling and Use of Compressed Gases**

(< 25 kg flammable and < 150 kg non-flammable)

1. The number of cylinders of flammable gases is limited to one (1) cylinder in use and one (1) spare 10 m<sup>2</sup> of floor area.
2. The number of cylinders of non-flammable gases is limited to two (2) cylinders in use and one (1) spare per gas type per 10 m<sup>2</sup> of floor area.
3. All cylinders containing flammable gases must be grounded.
4. Only metal tubing is to be used when connecting these gases to equipment.
5. NEVER expose cylinders to temperatures higher than 52 degrees Centigrade (~120 °F).
6. Cylinders must be firmly secured at all times to a bench, by a wall mounted clamp or chain, or to a floor bracket with accompanying wall chain.



**Examples:  
Required  
Signage**

7. Pressure-relief devices protecting equipment should be vented to a fume hood if the gas in use is flammable, toxic, or corrosive. Regulators with vented bonnets are required when toxic or corrosive gases are used, unless used inside fume hoods.
8. Empty cylinders shall be marked "MT," and returned to the storage area and the gas vendor shall be contacted by the faculty or University representative.
9. Do not store empty and full cylinders together under one chain.
10. The contents of a cylinder must be known by people working in its vicinity. These people must be familiar with the properties of the gas.
11. Cylinders that cannot be positively identified shall not be used.
12. Cylinders of compressed gases must be handled carefully. Cylinder valves should be opened slowly and never opened quickly (cracked). It is safe practice to open the main valve only to the extent necessary.
13. Pressure safety devices are built into gas cylinders. Three types exist: rupture disks, pop valves and fusible metal plugs. The type and location of the relief devices on any cylinder brought into the lab shall be known to users.
14. Cylinders should not be placed near radiators of heat or in any location where they may become overheated and vent. Fusible metal plug safety devices can melt when the temperature is too high.
15. The safety cap shall be attached when moving cylinders.
16. Cylinders shall be transported between locations by using a wheeled cart specifically designed for gas cylinders.
17. Equipment using compressed gas cylinders should be checked for proper pressure relief by a competent person. The cylinder regulator maximum discharge pressure should not exceed the pressure rating of downstream equipment. All downstream equipment should be at zero gauge pressure before disassembly.

18. Only cylinders with matched connectors and proper regulators shall be used. Cylinder adapters on a regulator shall not be used. Teflon tape or grease lubricants must NEVER be used on fittings.
19. Leak-test all connections to a cylinder with a soap solution.
20. Transporting compressed gas cylinders on the elevator should be done cautiously. Sudden release of gas can cause asphyxiation and death in extreme cases.

When transporting a cylinder in the elevator, either use the buddy system or send the cylinder unescorted and take the stairs to meet the cylinder. Persons who see an unaccompanied compressed gas cylinder on the elevator must not enter the elevator until the person transporting the cylinder removes it.

### Regulators

1. All regulators used with toxic or corrosive gases require a bonnet vent connected to a fume hood or an exhaust duct.
2. All gas regulators shall be inspected before use. Regulators that show gauge pressure discrepancies, bubbles upon leak testing or other abnormal characteristics shall not be used and shall be marked as damaged.
3. Left handed threads are found on cylinders containing flammable gases.
4. Oxygen tank regulators shall not be oiled or greased. The combination of friction, fuel, and an oxygen source can cause ignition.



O<sub>2</sub> Tank

+ Oil/Grease =



5. Interchanging regulators between gas cylinders with different contents is not permitted. Cross contamination and even incompatibilities between trace amounts of gases can occur.
6. The pressure-reducing valve shall be closed before allowing gas to enter the connected regulator. Gas must not be permitted to suddenly enter the regulator.
7. The cylinder valve shall be closed first when removing a regulator from a cylinder. It is then safe to open the pressure release valve on the regulator.
8. When not in use, the regulators on cylinders shall be depressurized. If the cylinder is not to be used for a long time, the regulator must be removed and the valve cover screwed into place.
9. Never use a regulator to make fine adjustments in pressure. A needle valve, or equivalent device, is to be used as is designed to safely control small gas flow rates.