

**LOCAL JOINT HEALTH AND SAFETY COMMITTEE
DEPARTMENT OF BIOMEDICAL SCIENCES
STANDARD OPERATING PROCEDURE**

1. HANDLING, USE AND STORAGE OF COMPRESSED GAS CYLINDERS

Effective Date: May 2002

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Purpose: To promote the safe handling, use and storage of compressed gas cylinders in the lab.

Approvals Required: Faculty Supervisor, Local JHSC, EHS

2. DEFINITIONS:

3. REQUIREMENTS:

OHSA Sections 25(1)(a), 25(2)(h), 27(2)(c), 42

Ontario Fire Code, O. Reg. 213/07, section 5.6

Transportation of Dangerous Goods (TDG) Act

All persons must have WHMIS training and have completed departmental safety orientation.

Persons handling compressed gas cylinders must wear closed top shoes.

4. HAZARDS:

Mechanical:

Compressed gas cylinders are sleeping giants - a full standard size cylinder at a pressure of ~200 atm contains the kinetic energy equivalent to a small anti-tank weapon. Cylinders whose valves were accidentally broken off have been known to fly in excess of 500 m and penetrate reinforced concrete walls.

Breaking off a valve from a full cylinder is the ultimate accident and all operations should aim at absolutely avoiding this incident.

Compressed gas cylinders are heavy - especially when full! Fingers and hands can be crushed by improperly handled cylinders.

Compressed gas cylinders typically come with brass valves and regulators with brass fittings. Brass is a relatively soft metal and can be easily damaged with potentially disastrous consequences if the metal-to-metal seals (threads) are damaged and fittings are not gas tight.

Cylinder Content:

Asphyxiation: All gases available in compressed gas cylinders (except breathable air) can lead to death by asphyxiation if their concentration within any enclosed space, such as a laboratory, exceeds certain levels. A particular hazard may arise from "simulated air", i.e. Cylinders that contain an 80:20 mixture of N₂ and O₂, but not CO₂. Breathing is controlled by the CO₂ concentration in the blood and asphyxiation can occur even though "air" is present. **Ignition and/or Explosion**

Hazard from Flammable Gases: Small leaks, improperly installed gas-valves or otherwise compromised cylinders can lead to a build-up of flammable or explosive gas mixtures within enclosed spaces. *Examples of flammable gases are OXYGEN, HYDROGEN and ACETYLENE.*

Poisoning: A variety of gases available in compressed gas cylinders are highly toxic (e.g. Carbon Monoxide and Hydrogen Sulphide).

5. **TASK:**

- a) **Any gas cylinder that is moved must have a safety cap screwed over the valve on top of the cylinder.** This rule applies irrespective of the content and status (full or empty) of the cylinder.
- b) Cylinders should be moved or transported using a cylinder cart and secured with a chain if the distance is greater than 2 meters.
- c) All cylinders must be stored in an upright position and secured to a table, lab bench, or wall using an appropriate strap or chain holder.
- d) The number of gas cylinders stored in a lab should be kept to a minimum. If cylinders are empty or not in use for extended periods of time they should be returned to the company from where they were purchased.
- e) **WARNING: Never use adaptors when attaching regulators.** If the fittings on the regulator do not fit the valve on the tank, then it is the wrong regulator. Also check that the regulator has the correct pressure output range for the intended application.
- f) Make sure that the threads on both the regulator and the cylinder valve are clean and in good condition. Do not use teflon tape on the threads to enhance the fit; it is unnecessary.
- g) After removing the safety cap and before attaching the regulator, open the valve on the cylinder very slightly to blow any contaminants out of the orifice, then close it again.
- h) Hold the regulator fitting up to the outlet valve of the cylinder and align them so that the nut can be tightened easily by hand. Remember, cylinders containing flammable gases have reverse threads. While supporting the regulator with one hand tighten the nut hand-tight. Then, using a wrench, tighten the connection with a maximum of one turn. **Do not over tighten.**
- i) Make sure the handle on the front of the regulator is slack (no pressure on diaphragm) then open the valve on the top of the cylinder. Slowly turn the handle on the front of the regulator clockwise until the outlet pressure gauge is at the correct reading. If necessary, also adjust the small brass valve located just before the outlet hose to fine-tune the gas release. **Check for leaks at the regulator cylinder junction by applying a product named SNOOP which is contained in a spray bottle. Never use soapy water which may penetrate the cylinder and contaminate the gas.**
- j) To remove a regulator, turn the cylinder valve off and drain any remaining pressure on the regulator until both pressure gauges read zero. Open the handle on the front of the regulator by turning it counter-clockwise until there is no pressure on the handle. Using a wrench, very slowly loosen the nut attaching the regulator to the cylinder. There should be little or no release of gas. Support the regulator with one hand and carefully unfasten the nut the remainder of the way. Always replace the safety cap on the cylinder valve when the regulator is not attached!
- k) Use a piece of lab tape and label the cylinder with the date that it is put into service. Make sure empty tanks are properly labelled (MT) so that they are not mistaken for full ones.

6. **CONTINGENCY PLAN AND REPORTING:**

- a) In the event that there is a flammable gas leak, **immediately** institute fire alarm procedures. Evacuate the area and pull the fire alarm! Inform the Fire Dept. of the hazard upon their arrival.
- b) If the leak is a non-flammable, non-toxic gas then the area should be well ventilated to avoid the chance of asphyxiation before the leak is repaired unless it is very minor. Always have a "co-worker" on hand under such circumstances. The "co-worker" should

always have the person repairing the leak in sight but be removed from the immediate threat so that if help is needed they will be able to initiate a response. The "co-worker" should never enter the area without notifying authorities of the situation.

- c) If a leak of a toxic gas occurs, evacuate the area and call the emergency number **x52000** from a remote location.
- d) If a cylinder rolls over or traps a hand or foot, then appropriate first aid measures should be initiated including filling out an Injury/Incident Report form.

7. WASTE MANAGEMENT:

University of Guelph Safety Policy requires that compressed gases shall be purchased only in cylinders that are returnable to the supplier.

8. REFERENCES:

[University of Guelph Safety Policies & Programs](#)
[Department of Chemistry Compressed Gas SOP](#)

9. DISTRIBUTION OF COPIES:

Technicians, Graduate Students, Project Students, other University of Guelph employees working in the lab.

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Authorization: Faculty Supervisor

Date: