Safe Work Instruction

Emergency Procedures for situations with Gas Cylinders

When handling gases and gas cylinders:

- **Compressed Gases**
  - Pressure Hazard
  - Explosive Risk if contents leak and ignite

- **Potential Asphyxiant**
  - in case of leak

- **Flammable Gas**
  - May be present

- **Oxidizing Gas**
  - May be present

- **Toxic or Corrosive Gas**
  - May be present

- **No Naked Flames**
- **Authorised Personnel only**
- **No Oil, Grease or combustible materials**

- **Enclosed Footwear**
  - Required to prevent crush injuries to feet

- **Safety glasses**
  - Recommended to protect against sudden release of gas from cylinder valve and over-pressure safety valves

- **Leather gloves**
  - Required to protect:
    - Fingers from crush injuries and cuts from metal damage on cylinder
    - Fingers and hands from sudden release of gas from cylinder valve

- **Hearing Protection**
  - On Hand for operating cylinder valve
  - To protect from loud noise due to sudden release of gas from valves

**Gas Monitor Alarm:**

**DO NOT ENTER** room while alarm is sounding.

**Warning Alarm (flashing lights):**

- Shut off gas supply (close gas cylinder valve or valve at gas system outlet point) if safe and possible to do so.
- Press the Emergency Stop Button to turn off all equipment in laboratory if the gas is flammable or oxidizing.
- Evacuate the laboratory/workroom.

**Once outside the laboratory:**

- Monitor the gas levels on the gas monitor display outside the room.
- Contact the Technical/Laboratory Manager.

To re-enter the laboratory, the gas monitor display must show that gas levels have returned to an acceptable range for:

- Asphyxiant gases – oxygen concentration must be in the normal range: 19.5 to 23%.
- Oxidizing gases - oxygen concentration must be in the normal range: 19.5 to 23%.
- Carbon Dioxide – less than 0.5%.
- Flammable gases – gas/vapour content is less than 20% of lower explosion limit (LEL on SDS).
- Toxic gases – toxic gas concentration is less than the time weighted average (TWA in SDS).

If these conditions are not met **ONLY** Emergency service personnel can enter the space.

**Emergency Alarm (lights and siren):**

- Evacuate the room immediately.
- Press the Emergency Stop Button on the way out.

**Once outside the laboratory:**

- Monitor the gas levels on the gas monitor display outside the room.
• Contact Security (9850 9999) and the Technical/Laboratory Manager.
• If an unconscious person is in the room – DO NOT ENTER THE AREA. Inform Emergency Services. Only Emergency Services who are trained in and wearing SCBA with an emergency gas monitor can enter the space.
• If the gas is reticulated from an unaffected storage area and safe to access, go to the storage area and close the cylinder valve.
• Consult the safety data sheet for the hazards of the gas involved.
• Ask the Laboratory Manager to contact Property (ext. 7145) to:
  o arrange for electricity to the area to be cut if the gas is flammable or oxidizing.
  o turn off air conditioning (where air is recycled to other locations).

To re-enter the laboratory, the gas monitor display must show that gas levels have returned to an acceptable range:

  • Asphyxiant gases – oxygen concentration must be in the normal range: 19.5 to 23%.
  • Oxidizing gases - oxygen concentration must be in the normal range: 19.5 to 23%.
  • Carbon Dioxide – less than 0.5%.
  • Flammable gases – gas/vapour content is less than 20% of lower explosion limit (LEL on SDS).
  • Toxic gases – toxic gas concentration is less than the time weighted average (TWA in SDS).

If these conditions are not met ONLY Emergency service personnel can enter the space.

Control of Gas Leak in laboratory space/workroom:

The following are general procedures for the management of leak and should only be attempted by people who are trained, wearing appropriate PPE, understand the hazards and characteristics of the gas involved and when there is no undue risk. Further consideration needs to be taken where the ventilation is poor.

Small Leak:

• If it is safe and possible to do so, close the cylinder valve, back off the regulator and shut off any downstream valves.
• For flammable and oxidizing gases remove or isolate any ignition sources
• Ventilate the area.
  If gas is flammable, do not use electric fans/mechanical ventilation unless designed for use with flammable gas (flameproof and designed not to produce electrical sparks).
• Turn off any air conditioning system to prevent spreading the hazard.
• If needed contact Laboratory Manager and Security (9850 9999).
• Consult the safety data sheet for the hazards of the gas involved.

For a small leak that cannot be stopped by closing the cylinder valve:

Wearing appropriate PPE, approach the cylinder from an upwind direction and attempt to locate the leak using leak detection fluid suited to the gas. If the leak is:

• From the cylinder valve or safety valves do not attempt to repair or tighten.
• Through the valve seat outlet, close the cylinder valve and fit either a regulator (which has been backed off) or the gas outlet cap or plug if gas tight.
• If the gas is flammable remove all sources of ignition and shut down the electricity in the area.
• If liquefiable gas, position the cylinder so the leak point is in the vapour space to prevent a liquid leak.
• Once the leak is controlled and it is safe to do so, move the cylinder to a safe well-ventilated area where the leaking gas can dissipate safely. Mark the cylinder as faulty and contact the supplier to arrange collection.

Large Leak:

• Evacuate the area after providing maximum ventilation if it is possible and safe to do so.
• If the gas is reticulated from an unaffected storage area and safe to access, go to the storage area and close the cylinder valve

For flammable and oxidizing gases:

• Do not use electric fans/mechanical ventilation unless designed for use with flammable gas (flameproof and designed not to produce electrical sparks).
• Remove or isolate any ignition sources if safe to do so.
• Call the Laboratory Manager and Security (9850 9999).
• Consult the safety data sheet for the hazards of the gas involved.
• Do not re-enter the affected space until it is possible to determine if the atmosphere is safe.
• If ignition occurs for flammable and oxidizing gases follow the procedure for Gas cylinders in fires.
Emergency Procedures for Situations with Gas Cylinders

Gas and Gas Cylinders in Fires:
- Evacuate the area (minimum 100m radius).
- Isolate the supply of any flammable or oxidizing gases if safe to do so e.g. if reticulated from an unaffected storage area and safe to access, go to the storage area and close the cylinder valve.
- Call Security (9850 9999), the laboratory manager and consult the gas supply company.
- Advise people in the vicinity of 100-300 m to take cover.
- When the fire brigade arrive inform them of the location and the number of gas cylinders and the gases they contain that are directly involved in the fire.
- Refer to the gas SDS Section 5 Firefighting Measures for specific advice.
- Be aware that hot cylinders might explode and that cylinders take a significant time to cool down and may explode unexpectedly after the fire is out.
- KEEP AWAY- do not approach or move or operate the valve of a cylinder directly involved in the fire.
- Cylinders that are not directly involved in the fire and have not become heated should be moved as quickly as possible to a safe place – provided this can be done without undue risk.
- If cylinders cannot be moved, keep them cool from a safe place with water spray if it is safe to do so.

Where cylinders of flammable gas are on fire: do not extinguish the flammable gas fire unless the leak can be stopped. Attempt to close the cylinder valve if this can be done without undue risk. If not possible to stop the leak, let the contents of the cylinder burn while cooling the surrounding cylinders with water.

Where oxidizing gases such as oxygen are feeding a fire, attempt to stop the leak if this can be done without undue risk by closing the cylinder valve slowly.

NOTE: Hydrogen burns with an almost invisible flame. Burning Hydrogen can be detected in 3 ways: the feel of heat, heat shimmer in the air and falling droplets of water.

Do not use any cylinder that has been exposed to fire or heated. Label cylinder accordingly and arrange for disposal see SWI Disposal of waste gas and of gas cylinders.

First Aid:
- The local First Aiders’ contact details will be listed on or near the First Aid Kit.
- If there has been exposure to a toxic or corrosive gas call Security (9850 9999).
- General first aid treatment for exposure where there are adverse effects to the:
  - Eye – Immediately flush with tepid water or saline solution for 15 minutes. Seek medical attention.
  - Inhalation – Move from contaminated area to fresh air- ONLY ENTER SPACE IF gas levels are in the acceptable range specified in Gas Alarm section. Otherwise call Security (9850 9999) for Emergency Services.
  - Skin – Apply room temperature water to contaminated clothing and remove, gently flush affected area with water for 15 minutes. Do not apply heat.
- Apply the first aid measures outlined in Section 4 of the SDS.

Emergency Contact Details:
- In an emergency contact Security on ext. 9999 or 9850 9999. Security will guide the Emergency Services to the location.
- The local Building Warden, Fire Warden and First Aiders contact details can be found on the Emergency Contacts Posters in your laboratory area.
- Contact the Technical Team Manager and Laboratory Manager for your area.

Reporting Procedures:
- Report the incident to your manager or supervisor and the relevant Lab Supervisor if applicable. This should occur as soon as possible after the injury/incident.
- Submit a report via MQ online reporting form: https://staff.mq.edu.au/support/other-resources/online-systems/roar as soon as possible, within 24 hours.
Other related procedures and supporting documents

Flowchart Gas cylinder requisition, installation, use, maintenance & disposal
Risk Assessment Compressed gas cylinder use
Guideline Evaluation of atmospheric risk from gases in enclosed workspaces
Atmospheric risk analysis tool
SOP Infrastructure requirements for compressed gas cylinders
SWI Transport of gas cylinders
SWI Installation, use and disconnection of compressed gas cylinders
SWI Safety inspection and maintenance for compressed gas cylinders and lab infrastructure
SWI Waste gas and of gas cylinder disposal
SWI Emergency procedures for situations involving gas cylinders
Checklist Installation of gas cylinders

AS4332-2009 (Amt 1 2016) The storage and handling of gases in cylinders
BOC Australia Guidelines for Gas Cylinder Safety, viewed 24 October 2018
British Compressed Gas Association ‘Code of Practice 47: The safe use of individual portable or mobile gas cylinders supply equipment’ 2016, viewed 6 December 2018
http://www.bcga.co.uk/pages/index.cfm?page_id=6&title=publications

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