

# *lechyd a Diogelwch – Health and Safety*

## **LABORATORY SAFETY – SAFE HANDLING AND USE OF COMPRESSED GAS CYLINDERS**

**(excludes liquefied gases and gases used solely for the purpose of Diving)**

This Information Sheet provides guidance on eliminating or reducing the risks associated with gas cylinders. It is aimed at anyone who purchases, transports or uses compressed gases in laboratories.

### **General Information**

Compressed gas cylinders are a convenient way to transport and store gases under pressure. A variety of gases are used in laboratories across the University for a range of scientific purposes. But remember, hazards are not just from the gas itself but also as a result of how the gas is stored -under pressure.

Compressed gas cylinders may pose a particular hazard during a fire, and the Emergency Services often require information as to the location of gas cylinders in order to protect themselves and others.

### **General Hazards**

- Impact from falling cylinders.
- Impact as a result of a gas cylinder explosion.
- Impact as a result of a rapid release of compressed gas.
- Injection of gas under high pressure.
- Asphyxiation.
- Manual handling.
- Fire / explosion due to the escape of flammable gas.

### **Main causes of Accidents**

- Inadequate training, poor handling and storage.
- Faulty equipment.
- Inadequate ventilation of workplaces.



Effects of exploding gas cylinder on the hull of a lifeboat

## Before Handling and Using Gas Cylinders

You should always have training before handling / using cylinders as detailed below:

| LOCAL TRAINING BY A COMPETENT PERSON  | RECOGNISED EXTERNAL TRAINING SCHEME OR SIMILAR   |
|---|--|
| <ul style="list-style-type: none"><li>• Move cylinders around the workplace <b>EXCEPT</b> acetylene</li><li>• Changing the regulator from an empty gas cylinder to a full cylinder of the same gas type</li></ul> | <ul style="list-style-type: none"><li>• Moving acetylene cylinders</li><li>• Selection of suitable regulators</li><li>• Connecting pipework or equipment to gas cylinders / regulators</li></ul> <p><i><b>NOTE:</b> Contact Health and Safety Services or your College Health and Safety Officer for information on training</i></p> |



You must always consult with the person in charge of the laboratory before:

- Introducing a new type of compressed gas to a laboratory for the first time.
- Increasing the total amount of compressed gas used in the laboratory.

This will ensure essential information about increased hazards is passed on to the appropriate person(s) and that:

- If necessary alarm systems to warn of leaking gases are installed.
- The cylinders are placed on the appropriate database.

## Transporting Compressed Gas Cylinders in Vehicles



- **NEVER** transport acetylene, hydrogen, oxygen or any other explosive or flammable gas in a vehicle without a proper risk assessment and approval.
- **ALWAYS** consult with your College Safety Officer before transporting any other compressed gases in vehicles and ensure a risk assessment is undertaken.
- **ALWAYS** transport compressed gases capable of causing asphyxiation eg nitrogen, carbon dioxide, helium etc in a part of the vehicle that is completely separate from vehicle occupants eg on a flatbed truck but never in the boot of a car.



Results of a gas cylinder explosion in a car

## HANDLING AND USING GAS CYLINDERS

### a) Moving Gas Cylinders

- Visually check the cylinder to ensure there is no damage eg dents, cracks, scorch marks or corrosion.
- Ensure two people are present when moving large cylinders eg above 75kg or when acetylene cylinders are being moved.
- Wear safety shoes.
- Disconnect regulators and fit protective valve caps when possible.
- Use an appropriate trolley.
- Ensure the chain / restraining device is in place.
- Use a stair climbing trolley if no lift is available.



Safety chain not in place,  
regulator still connected



Both safety chains in place,  
regulator removed



### b) Positioning Cylinders

- Ensure the cylinder is vertical (unless designed to be used otherwise).
- Ensure the cylinder is stored away from sources of ignition.
- Restrain the cylinder to stop it falling (see below).



### c) Connecting Regulators

- Check the gas cylinder is the correct type for the intended use.
- Check the regulator is suitable for the type of gas and the pressure of the cylinder.
- Check the regulator has been tested in the last 5 years.



This shows the regulator is capable of producing an outlet pressure of between 0 – 3.5 bar

This shows the regulator is suitable for Air and Nitrogen

This shows the regulator is suitable for a maximum cylinder pressure of 250bar

- Check the associated pipe work is suitable for the gas and pressure and that a flashback arrestor is fitted when using flammable or explosive gases eg hydrogen, oxygen, acetylene.



Flashback arrestor fitted to acetylene cylinder

d) **Good Cylinder Management**

- Store full cylinders vertically in the designated external gas store until needed.
- Remove empty cylinders from the laboratory immediately and store in the external gas store.
- Ensure all cylinders are properly secured with the chain across.



- Never smoke when handling gas cylinders.



- A list of emergency contact details must always be displayed wherever gas cylinders are stored / used.

## EMERGENCY PROCEDURES (excluding acetylene)

If you drop a cylinder take the following action:

| <b>IF YOU CAN HEAR GAS ESCAPING</b>  |  |   |
|--|--|---|
| <b>TYPE OF CYLINDER</b>  | <b>INDOORS</b>   | <b>OUTDOORS</b>   |
| Nitrogen<br>Carbon Dioxide<br>Air<br>Helium<br>Argon<br>Other inert gases        | <ul style="list-style-type: none"> <li>• Evacuate the area</li> <li>• Ventilate if possible, but <b>do not</b> put yourself at risk</li> <li>• <b>Contact Security on 01248 382795 / 333 and request Fire Service</b></li> </ul>   | <ul style="list-style-type: none"> <li>• Keep people clear</li> <li>• <b>Contact Security on 01248 382795 / 333 and request Fire Service</b></li> </ul>   |
| Oxygen<br>Hydrogen<br>Other flammable gases<br><b><u>EXCLUDING</u></b> acetylene | <ul style="list-style-type: none"> <li>• Extinguish all ignition sources</li> <li>• Evacuate the area</li> <li>• Ventilate if possible, but <b>do not</b> put yourself at risk</li> <li>• Sound the fire alarm if the gas ignites</li> <li>• <b>Contact Security on 01248 382795 / 333 and request Fire Service</b></li> </ul> | <ul style="list-style-type: none"> <li>• Keep people clear</li> <li>• Ensure no smoking or use of naked flames</li> <li>• <b>Contact Security on 01248 382795 / 333 and request Fire Service</b></li> </ul> |

| <b>IF YOU CANNOT HEAR GAS ESCAPING</b>          |  |   |
|---|--|---|
| <b>TYPE OF CYLINDER</b>                         | <b>INDOORS</b>   | <b>OUTDOORS</b>   |
| All cylinders <b><u>EXCLUDING</u></b> acetylene | <ul style="list-style-type: none"> <li>• Check cylinder and valves for signs of damage</li> <li>• If there is <b>damage</b> contact appropriate person</li> <li>• If there is <b>no damage</b> and enough space attempt to upright the cylinder using a minimum of two people</li> </ul> | <ul style="list-style-type: none"> <li>• Check cylinder and valves for signs of damage</li> <li>• If there is damage contact appropriate person</li> <li>• If there is no damage and enough space attempt to upright the cylinder using a minimum of <b>two people</b></li> </ul> |

## EMERGENCY PROCEDURES - ACETYLENE

If you drop a cylinder take the following action:

| <b>IF YOU CAN HEAR GAS ESCAPING</b>  |  |
|--|--|
| <b>INDOORS</b>   | <b>OUTDOORS</b>  |
| <ul style="list-style-type: none"><li>• Extinguish all sources of ignition</li><li>• Ventilate the area but <b>do not</b> put yourself at risk</li><li>• Evacuate all buildings within 150m of the gas escape and activate the fire alarm</li><li>• <b>Contact Security on 01248 382795 / 333 and request Fire Service</b></li></ul> | <ul style="list-style-type: none"><li>• Keep people clear at least 150m</li><li>• Evacuate all buildings within 150m of the gas escape and activate the fire alarm</li><li>• Ensure nobody smokes in the area</li><li>• <b>Contact Security on 01248 382795 / 333 and request Fire Service</b></li></ul> |

| <b>IF YOU CANNOT HEAR GAS ESCAPING</b>   |  |
|--|--|
| <b>INDOORS</b>   | <b>OUTDOORS</b>  |
| <ul style="list-style-type: none"><li>• Carefully examine the cylinder using the back of your hand to check if there are any signs of heating</li><li>• If the cylinder <b>shows signs of heating</b> evacuate immediately. <b>Activate the fire alarm and contact Security on 01248 382795 / 333 and request Fire Service</b></li><li>• If the cylinder shows <b>no signs of heating</b> check cylinder and valves for signs of damage</li><li>• If there is <b>damage</b> contact BOC immediately for advice:<br/><b>0800 111333</b></li><li>• If there is <b>no damage</b> and enough space attempt to upright the cylinder using a minimum of two people</li><li>• <b>Do not use the cylinder, contact BOC on 0800 111333</b> to arrange for a replacement and in the interim monitor regularly for signs of heating</li></ul> | <ul style="list-style-type: none"><li>• Carefully examine the cylinder using the back of your hand to check if there are any signs of heating</li><li>• If the cylinder is heating up clear the area immediately</li><li>• Ensure nobody smokes in the area</li><li>• If the cylinder <b>shows signs of heating</b> evacuate immediately. <b>Contact Security on 01248 382795 / 333 and request Fire Service</b></li><li>• If the cylinder shows <b>no signs of heating</b> check cylinder and valves for signs of damage</li><li>• If there is <b>damage</b> contact BOC immediately for advice:<br/><b>0800 111333</b></li><li>• If there is <b>no damage</b> and enough space attempt to upright the cylinder using a minimum of two people</li><li>• <b>Do not use the cylinder, contact BOC on 0800 111333</b> to arrange for a replacement and in the interim monitor regularly for signs of heating</li></ul> |