COMPRESSED GAS SAFETY

1. Before Commencing Work with Compressed Gas

Before the work commences anyone working with compressed gas of any sort must ensure that they:

- Have undertaken suitable training.
- Understand the hazards associated with working with compressed gas.
- Know what precautions should be taken.
- Have written and approved risk assessments.
- Have suitable and sufficient controls in place.

2. Main Hazards of Compressed Gas

All users must understand the hazardous properties (e.g., flammability, toxicity) of the compressed gases being used. The mishandling of cylinders can present a severe hazard that can result in serious injury or death.

The main hazards associated with cylinders of compressed gas are:

- The mass of the cylinder. Cylinders are heavy - up to 80 kg - and can inflict injury or damage if they fall over.
- The explosive release of energy stored in a cylinder in the event of an uncontrolled discharge (cylinders can become jet propelled).
- Fire resulting from the escape of flammable gases (e.g., hydrogen).
- The properties of the gas stored in the cylinder (e.g., asphyxiating, toxic, corrosive, oxidant).

Acetylene gas poses an additional hazard to other flammable gases as it is also reactive.

Under certain conditions, even in the absence of any air or oxygen, it can decompose explosively into its constituent elements, carbon and hydrogen.

Acetylene is normally combined with oxygen and used in welding and cutting.

The HSE has produce guidance INDG327 Working safely with acetylene.
The SDS for acetylene is at Acetylene (boconline.co.uk).

3. Common Accidents from Working with Compressed Gas

Common causes of accidents are:

- Inadequate training.
- Poor installation and maintenance.
- Incorrect handling and storage.
- Faulty equipment.
- Inadequately ventilated working conditions.

Damage may result from a cylinder falling over, tipping, being exposed to heat, electricity, motion, or vibration. This damage may or may not be visible but can cause a weakness or crack in the cylinder wall.

Cylinders that have been exposed to an event that could cause such weakness **must be taken out of service**, labelled and returned to the supplier with information about the event.

Cylinders have an expiry date after which they should be returned to the supplier who will conduct necessary testing and inspection.

To prevent harm, the handling, storage and transport of compressed gas cylinders should only be undertaken by those with appropriate training (a list of trained persons can be found on the school health and safety web pages and in laboratories housing cylinders).

Anyone requiring the use of compressed gas must attend training and demonstrate competence. If you need a cylinder moved or a regulator fitted contact a technician to arrange for assistance.

A cylinder request from must be completed, along with a risk assessment, whenever a cylinder needs to be introduced/removed from a laboratory.

4. Storage of Cylinders

All cylinders not in use (i.e. not connected to equipment) must be stored outside the building in an approved storage facility. Nothing other than cylinders are permitted to be stored in the facility. The store must be kept locked and access controlled. Cylinders should only be taken in and out of the storage facility by trained and authorised persons.

Cylinders in the store must be correctly secured in a vertical position and segregated according to industry guidelines (to limit the consequences of a leak of gas or fire). Stock should be periodically rotated so that oldest stock gets used first.

Cylinders containing the same gas should be stored in a segregated group; empty cylinders should be segregated from full cylinders. Flammable gas cylinders should not be stored with oxygen, oxidisers or toxic gases. Oxygen cylinders should be kept a minimum of 3 metres away from cylinders of flammable gas (unless these are on a trolley for oxy/acetylene cutting & welding, etc.) and combustible materials, or separated by a suitable fire break. More information on proper segregation can be found in the British Compressed Gas Associations Code of Practice 44.

Acetylene must not be stored horizontally. If a cylinder of acetylene has been stored or transported horizontally it must be set upright and left for a **minimum** of one hour before use. This will allow the acetone within the cylinder to evenly distribute so that the acetone is not carried to the nozzle.

5. Labelling and Signage

DO NOT accept or use a gas cylinder if the label is unclear or missing. If the labelling on the gas cylinder becomes unclear and the contents cannot be identified, the cylinder should be marked “contents unknown” and the manufacturer contacted regarding removal of the cylinder.

All gas cylinders must be clearly labelled to show what they contain, and the hazards associated with their contents. The label is the only sure means of identifying the gas inside the cylinder. It may also give the pressure the gas is stored at and outline basic safety requirements in accordance with legislation. The label should be complete and be attached to the cylinder.

DO NOT rely on the colour of the cylinder for identification: cylinder colours vary from supplier to supplier.

6. Room Assessment/Location

Before gases are permitted to be introduced into a laboratory, an assessment must be made as to the suitability of the room. This assessment should take into consideration the risks associated with a full bottle expulsion and a slow leak of bottle contents.

Calculations should be done and attached to the relevant risk assessment. These calculations are used to determine if:

- The room size sufficient to safely absorb the entire bottle contents?
- There is suitable ventilation (air change rate)?
- There is a need for gas monitors and that appropriate monitors are either in place or available for use?

Calculations must be completed and provided along with a risk assessment before any compressed gas cylinders are permitted in the proposed area.

In addition to risk assessing the outcome of an expulsion or leak, the following factors should also be considered when determining room suitability.

- **What other gases are already in the room?** If other gases are already present, this should be factored into the calculations for risk assessment. i.e. if three compressed gas bottles are present, what would the outcome be if all three had a slow leak?
- **What are the hazards of the gas?** Any gas that displaces oxygen in the atmosphere presents an asphyxiant risk, additionally other risks may be present dependant on the

properties of the gas. For example, flammable and toxic gases would require specialist gas monitors. Warning signs may need to be put in place.

- **Are the appropriate gas monitors in place for the gas type?** The space may have previously been set up for use with a different gas type, not all monitors are suitable for all gases. See table 1 for examples of common gases and their monitor requirements. Further information on workplace exposure limits for toxic gases (WEL'S) can be found here.
- **Is there space for sufficient segregation?** Flammables must be segregated by a minimum of 3m or a physical barrier from oxidisers. If these gases are both present in the laboratory, is there sufficient space to allow this?
- **Is the room spacious enough to safely contain a compressed gas cylinder?** The cylinders should not block passage around the room, in particular it should not be stored near or obstructing an exit route. The shut of valve should be easily accessible and any pipework coming from the cylinder should not be angled at extremes or crushed up against a wall.

Gas type	Associated Hazard	Monitor type required
Nitrogen	Asphyxiant	Oxygen
Helium	Asphyxiant	Oxygen
Argon	Asphyxiant	Oxygen
Carbon Dioxide	Toxic and Asphyxiant	CO2 and Oxygen
Carbon Monoxide	Toxic and Asphyxiant	CO and Oxygen
Hydrogen	Flammable	Flammable gas
Oxygen	Oxygen Enrichment	Oxygen
Methane	Flammable	Methane/Natural gas

Table 1

If a room has been assessed and is deemed suitable for the use of compressed gases, correct signage must be displayed clearly outside the entrance to the laboratory. This signage should include the standard warning sign that compressed gas is in use (see example). Additionally, the gas type and number of cylinders present must be displayed.

6.1 Experiments running unattended outside of normal working hours (i.e. overnight or at weekends)

Any experiments involving the use of gas whether from a cylinder, a mains gas tap or generated by an experimental process should be restricted to normal working hours (Mon-Fri 0800 to 1800) operations only.

Only in exceptional circumstance will an experimental process involving gas be permitted to run overnight or at weekends and will require additional controls to be in place together with approvals at School level. Any work involving overnight running with flammable gas will not be permitted.

In planning experiments intended to run overnight and involving gas a detailed risk assessment must be prepared in the early planning stages which demonstrates how gas will be safely managed (e.g. generated, collected, used and extracted) and the additional controls (e.g. detection and alarms). The risk assessment will then be considered by the School and will normally involve the local safety coordinator, the technicians with relevant knowledge of compressed gases and the relevant laboratory coordinator. If necessary it will be referred to the Head of School for a final decision. Only after these approvals and controls are in place can work be permitted to commence.

Additional controls **must include** the placement of additional signage on doors and restricting access to Estates personnel such as cleaners or security staff. Notification to Estates will be undertaken by the Local Safety Coordinator who will retain records.

6.2 Provision of Controls

It should be noted that the School has facilities for the control of compressed gas including extraction, detection and alarm systems. However, these are limited to designated areas and are in high demand, therefore in planning new a new research activity involving compressed gas users must:

- Identify the resources they intend to use.
- Ensure they are suitable for intended use.
- Ensure they are available.

Where facilities are not available the source of funding for provision and installation of the required controls must be identified by the researcher.

7. Moving and Handling

Only staff who have been trained in cylinder handling should work with or move cylinders. A list of trained persons can be found within the laboratory or on the School Health and Safety Web page.

If you require a cylinder to be moved to or from a laboratory you must first complete a cylinder request form, available from the School's health and safety web page and forward it to eng-gas@abdn.ac.uk.

- Cylinders must be transported secured vertically in a cylinder trolley (see example image).
- Within the cylinder store/laboratory, cylinders should be 'milk churned' into position. Cylinders must never be rolled along the ground.
- The pressure regulator should be removed during transport.

- While moving cylinders from the store or within the laboratory, keep unsecured vertical cylinders under direct control. Never turn your back on a free-standing cylinder. The consequences of falling cylinders can be severe.
- Wear protective footwear, eye protection and industrial gloves when handling gas cylinders.

If transporting a cylinder of acetylene, it must be kept upright. If allowed to go horizontal leave it for a **minimum** of one hour before use. This will allow the acetone within the cylinder to evenly distribute so that the acetone is not carried to the nozzle.

7.1 Lifts (Elevators)

In lifts, all cylinders must be secured but unaccompanied - full or empty. A two-person team should be used if necessary:

- A leak from a full/partially full cylinder can quickly make air in a lift car unbreathable. If the lift stops between floors the consequences may quickly be fatal.
- This also avoids injury from cylinders falling in transit, or confusion/misconceptions over procedures.
- Place barrier across the inside of the entrance to the lift to prevent anyone using the lift. A sign must be placed on the chain and visible to people wanting to use the lift.

8. Safe Use

8.1 Cylinder Labels

Before working on any compressed gas cylinder **ALWAYS CHECK THE LABEL**. The label should be complete and be attached to the cylinder.

8.2 Cylinder Positioning

All cylinders must be mounted vertically on a purpose-built stand/cabinet or secured to a bench or wall.

8.3 Cylinder Valve Operation

- Before operating any cylinder valve, ensure appropriate eye protection is worn at all times.
- Open cylinder valves slowly using the correct spindle key or the handwheel fitted on some cylinders.
- Soft seat, spindle key operated cylinder valves should not be subjected to excessive torque.
- An opened valve should never be left against the backstop but should be turned back half a turn to avoid seizure in an open position.
- To shut the valve turn it clockwise just enough to stop the gas completely - never use force.
- If you stop work for more than a few moments, close the cylinder valve.
- The cylinder valve key should remain in place throughout the work.

Non-flammable gases such as oxygen, nitrogen, argon and air all have conventional right-hand threads.

Flammable gases such as acetylene, hydrogen, propane and mixtures containing fuel gas all have left-hand threads.

After use, always shut off the gas at the cylinder valve, and release the pressure in the gauges before finally shutting all valves. **Do not** rely on the regulator to stop the gas flow for more than brief periods.

If grit, dirt, oil or water enters the cylinder valve then safety and/or quality may be compromised, and gas leakage may occur.

Before assembling regulators and fittings, it is extremely important to ensure there are no particles of dirt in the cylinder outlet.

If a supply of clean compressed air or nitrogen is available this should be used to blow out any loose particles of dirt from the valve sockets.

Never use oil or grease on any part of a valve or regulator. They can explode under pressure. **Do not use PTFE** to connect regulators to cylinders. If a gas tight seal cannot be obtained, change the fittings.

Check your equipment regularly for leaks. Always use the proprietary liquids that are intended for detecting leaks.

Do not use soap and water. Some soaps contain fats that react violently with oxygen.

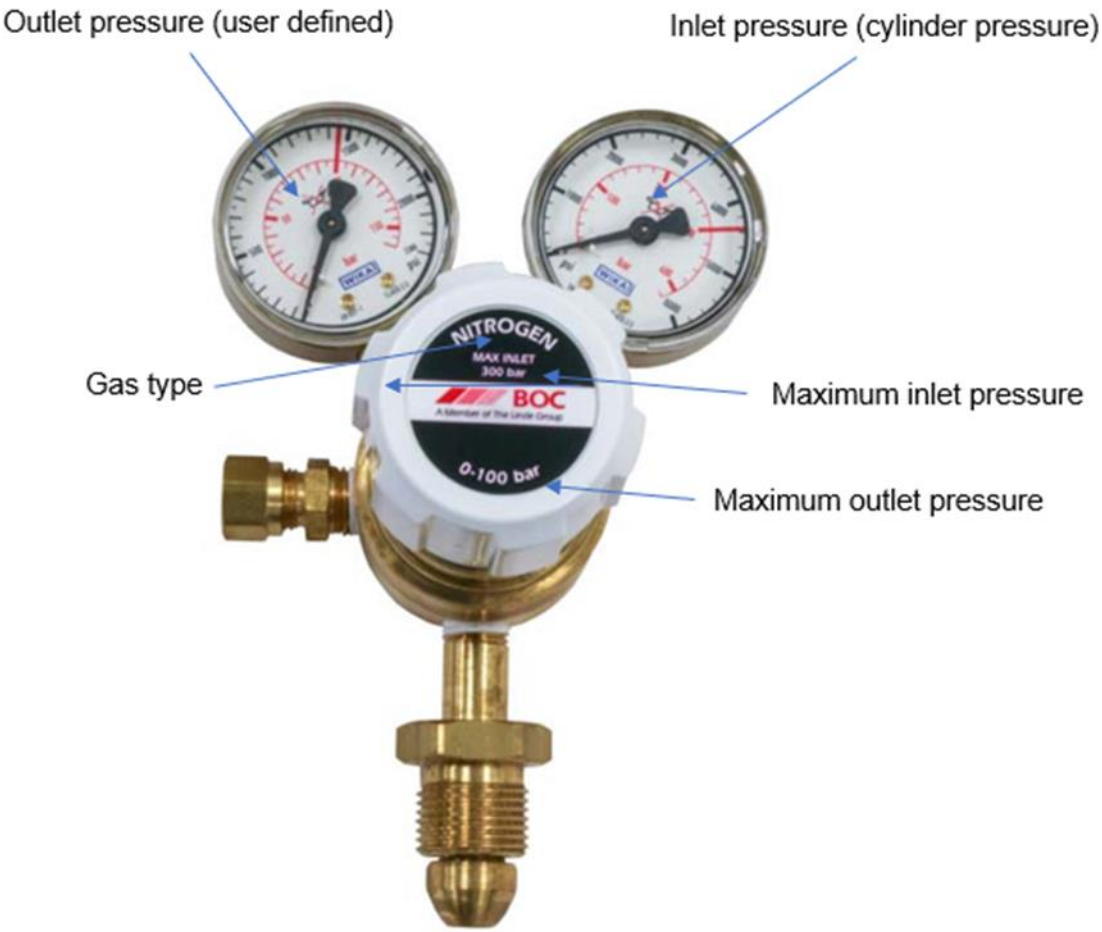
8.4 Regulators

Check the regulator is of the appropriate type (e.g. it is unsafe to fit a nitrogen regulator to an oxygen cylinder), and suitable for both the cylinder pressure and the outlet pressure required.

Regulators must only be fitted and removed by trained personnel.

If the valve outlet shows evidence of oil, then **do not** attempt to use the cylinder; it must be returned to BOC.

Flashback arrestors must be fitted to all fuel gas supply lines and to oxygen supply lines when they are used in conjunction with fuel gases (e.g., oxy-acetylene welding).



Check the regulator is of the appropriate type (e.g. it is unsafe to fit a nitrogen regulator to an oxygen cylinder), and suitable for both the cylinder pressure and the outlet pressure required.

Ensure any fittings used downstream of the regulator are suitable for the pressure and gas types used. If unsure, ask for help from a technical member of staff.

If using a cylinder key, this should be secured to the gauge/cylinder, so it is always available for emergency cut off.

Always open valves slowly as rapid opening may result in an explosion. Do not use excessive force on valves and gauges. If a cylinder valve cannot be opened readily, it should be returned to the supplier.

All regulators, hoses and connections must be in good condition and secure. A safety valve of some form is advisable to prevent high pressure being applied to your apparatus. In welding equipment blow-back preventers should be fitted.

Regulator valves are not intended for use with low flow rates and low back pressures. Always use a needle valve to control gas flow from the low-pressure side.

8.5 Cylinder Valve Operation

Before operating any cylinder valve, ensure appropriate eye protection is worn at all times.

- Open cylinder valves slowly using the correct spindle key or the handwheel fitted on some cylinders.
- Soft seat, spindle key operated cylinder valves should not be subjected to excessive torque.
- An opened valve should never be left against the backstop but should be turned back half a turn to avoid seizure in an open position.
- To shut the valve turn it clockwise just enough to stop the gas completely - never use force.
- If you stop work for more than a few moments, close the cylinder valve.
- The cylinder valve key should remain in place throughout the work.

Spindle key & valve

Handwheel type valve

Non-flammable gases such as oxygen, nitrogen, argon and air all have conventional right-hand threads.

Flammable gases such as acetylene, hydrogen, propane and mixtures containing fuel gas all have left-hand threads.

After use, always shut off the gas at the cylinder valve, and release the pressure in the gauges before finally shutting all valves. Do not rely on the regulator to stop the gas flow for more than brief periods

If grit, dirt, oil or water enters the cylinder valve then safety and/or quality may be compromised, and gas leakage may occur.

Before assembling regulators and fittings, it is extremely important to ensure there are no particles of dirt in the cylinder outlet.

If a supply of clean compressed air or nitrogen is available this should be used to blow out any loose particles of dirt from the valve sockets.

Never use oil or grease on any part of a valve or regulator.

Do not use PTFE to connect regulators to cylinders. If a gas tight seal cannot be obtained, change the fittings.

Check your equipment regularly for leaks. Always use the proprietary liquids that are intended for detecting leaks.

Do not use soap and water as leak detector. Some soaps contain fats that react violently with oxygen.

Regulator valves are not intended for use with low flow rates and low back pressures. Always use a needle valve to control gas flow from the low-pressure side.

8.6 Hoses and Fittings

Examine each cylinder, hoses and any fittings before installing for use, and if any defect is detected (or it is beyond its expiry date) reject immediately and return to the supplier.

Line snubbers and flash-back arrestors must be in position for both oxygen and acetylene to prevent fire or explosion by 'blow-backs' rupturing regulator diaphragms.

It is preferable to have each gas hose of the same equal length, taped or clipped together to prevent hose loops catching on any protruding objects.

The gas cylinder and outlet valve are designed to supply gas through an approved pressure regulator.

- The pressure regulator screws directly into the valve outlet.
- never install additional piping or fittings between regulators and the outlet valves of MCPs.
- when individual cylinders of the same gas are manifolded together to a common outlet, the pressure regulator should be screwed into this outlet.
- use needle or fine adjustment valves downstream of the pressure regulator only, never upstream.

9. Training and Competence

9.1 General cylinder use

All staff and students who use gas cylinders must be suitably trained and have the necessary skills to carry out work safely. They should complete a training course on gas cylinder safety awareness theory and practice, e.g., Using Gas Cylinders Safely in Universities Online | Gas Safety Training provided by Gas Safety Consultants Ltd. In addition, in-house training will be provided on the system the user will be operating.

Once trained, users will be able to understand the risks associated with the gas cylinder and its contents and operate the cylinder and regulator correctly. Users should be able to carry out an external visual inspection of the gas cylinder and any attachments (e.g. valves, flashback arresters, and regulators), to determine whether they are damaged.

To arrange training, please contact your supervisor, technician, or Local Safety Coordinator. A record of those who have received training will be kept by the Local Safety Coordinator.

9.2 Cylinder handling and changing regulators

Only staff who have successfully completed an approved gas safety course and are authorised by the School to do so, are permitted to move cylinders and connect and disconnect regulators. A list of School-designated trained staff members who can help with any moving, handling or regulator changes can be found on the School health and safety webpages.

If you are interested in this training, please discuss with your line manager or supervisor.

10. Maintenance and Inspection

10.1 User Inspections

All users should be suitably trained to conduct a visual inspection before each use. This should include checking labels are correct and in place and ensuring no visible damage to the cylinder or fittings. Visible indicators include dents, bulges, evidence of fire damage and severe grinding marks, etc. A checklist of what to look for in a visual inspection before using a cylinder can be found in Appendix 1.

10.2 Formal Inspections

All pressure systems must be examined, tested, and certified by a competent person annually, and appropriate records kept. The School has prepared policy and guidance on pressure systems to which users of compressed gas should refer.

Formal inspections of gas cylinders, regulators, connections and hosing should be a carried out by suitably trained and competent staff, or external providers, at regular intervals and records kept. The BCGA Code of Practice 47 (CP47) provides a table (included in Appendix 2) with appropriate checks and intervals.

10.4 Regulator Replacement

The British Compressed Gas Association (BCGA) recommends regulators be replaced every 5 years, or in the case of corrosive gas types, 2 years, regardless of the amount of use. Gas equipment will age and deteriorate over time. Components, such as elastomers and seals, will deteriorate from their date of manufacture whether or not they are in use. Always refer to the manufacturer's guidelines (different manufacturers use different markings to indicate manufacture/replacement dates. If a date is not clearly visible contact a trained member of staff).

More information on the inspection of mobile and portable gas equipment can be found in the BCGA Code of Practice 47.

11. Emergency Procedures

Emergency procedures must be included as part of the risk assessment for any work involving the use of gas.

11.1 Fire

On discovering a fire:

- Operate the nearest available Fire Alarm to raise the alarm. Dial Security on (01224 27)3939 or 999 from a safe place, giving details of the incident and location.
- Follow the Fire Evacuation Plan for the area/building concerned.
- If possible, and safe to do so, isolate any piped supplies to the area affected.
- Cylinders may burst, vent or explode when subjected to extreme temperatures.

Never attempt to tackle a fire involving a cylinder; leave it to the emergency services.

Information on the contents of the cylinders must be provided to the emergency services.

Acetylene: If an acetylene cylinder has been involved in a fire **KEEP WELL AWAY AND EVACUATE THE AREA**, do not approach or attempt to move the cylinder or open the valve. Always be sure to alert emergency services to the presence or possible presence of acetylene cylinders.

11.2 Leakage from a Cylinder

If a small leak is found during routine leak check, contact a technician for help.

If a larger leak is present, isolate the gas supply if possible. Increase ventilation by opening external windows, but only if safe to do so. It may be necessary to evacuate the lab dependant on the type of gas that has escaped. Risk assessment and gas monitors should help inform this decision. Contact a technician or other member of staff

If it is not possible to isolate the leak, evacuate the laboratory/area and take steps to prevent re-entry until safe to do so, especially in cases of an oxygen depleted atmosphere. Contact a technician or other member of staff.

Do not move leaking cylinders until the leakage has stopped.

11.3 Gas alarms

In the event of a gas alarm sounding, do not attempt to locate the source of the leak.

Evacuate the lab immediately and take steps to prevent re-entry.

Follow the procedures found on the main alarm panel if present. If the alarm sounding is not part of the main alarm panel/system, i.e., a portable or personal alarm, do not re-enter the lab, take steps to prevent re-entry and seek help from a member of staff.

Procedures of what to do in case of an alarm sounding can be found in Appendix 3.

11.4 Rupture of Bursting Disc in Carbon Dioxide Gas Cylinder

Some cylinders such as carbon dioxide cylinders have bursting discs which operate if the pressure exceeds the maximum permissible service level (e.g. 50 bar).

The bursting disc is designed to rupture at 180-200 bar - if pressures approaching this value occur when a regulator has been fitted, then rupture will occur.

The bursting disc failure allows total loss of contents i.e. it does not relieve pressure and re-set, in the same manner as a pressure relief valve.

Evacuate the laboratory/area immediately and take steps to prevent re-entry. Contact a member of staff.

If the cylinder discharges into an unoccupied room, there is a risk to staff of asphyxiation from lack of oxygen. Risk assessments should take into account the amount of gas that could be released into the room and whether this may result in an unsafe atmosphere. Gas monitoring systems must be in place if deemed necessary by risk assessment.

PIs/supervisors must provide staff, students and visitors with suitable and sufficient information and instruction on what to do in the case of a bursting disc rupture.

12. References

- University guidance on compressed gases.
- HSE workplace exposure limits.
- British Compressed Gases Association (BCGA) is a not-for-profit association trade association which issues a range of publications providing safety information and advice on best practice. Codes of practice are available free of charge
    - CP44 The storage of gas cylinders. Revision 1: 2022 - BCGA
    - CP47 The safe use of individual portable or mobile cylinder gas supply equipment. Revision 1: 2018 - BCGA
- HSE Pressure Systems Safety Regulations 2000.
- BOC. Health & Safety | BOConline UK

Appendix 1 - Cylinder and Regulator Visual Checklist

Item	YES	NO
Suitably identified? All cylinders must carry a label. This is the only sure means of identifying the contents. The label should be complete and attached to the cylinder.		
Safely Positioned? Cylinders should eb located upright, in a safe position, away from naked flame and securely fastened at a distance greater than half its height to avoid toppling		
Is the cylinder free from damage? The cylinder should be free from dents bulges, evidence of fire damage or severe griding marks.		
Is the regulator in good condition? Check the regulator has no damage and the gauge can be easily read. Never use a damaged or faulty regulator.		
Correct regulator type? Is the regulator of the correct type for the gas being used? Never use a regulator specified for a different gas type.		
Is the regulator in date? Never use a regulator that is out of date. If you have difficulty locating a date or interpreting codes, contact a member of technical staff.		
Connections in good condition? Any connected tubing or hosing should be checked cuts, burns, cracks or other surface defects		
Are all connections free from leaks? Leak test the connections using an approved leak test solution (i.e., Snoop)		

IF YOU HAVE ANSWERED **NO** TO ANY OF THE ABOVE, **DO NOT USE** THE CYLINDER AND CONTACT A MEMBER OF TECHNCIAL STAFF FOR ASSISTANCE.

Appendix 2 - Guidance on Inspection and Maintenance of Individual Portable or Mobile Cylinder Gas Supply Equipment

The following table is from: BCGA CODE OF PRACTICE 47, THE SAFE USE OF INDIVIDUAL PORTABLE OR MOBILE CYLINDER GAS SUPPLY EQUIPMENT, REVISION 1: 2018

EQUIPMENT	INTERVALS				
	AT ASSEMBLY	**BEFORE USE**	**AFTER USE**	**ANNUAL**	**REPLACEMENT / REFURBISHMENT INTERVALS**
REGULATORS and their integral protective devices	• Check compatible with the gas. • Ensure within life for use. • Check the regulator inlet pressure is compatible with the maximum cylinder pressure. • Ensure the Pressure Adjustment control is firmly fixed to the body and operates freely. • Check the inlet and outlet connections sit square to the regulator's body. • Check condition of threads and sealing surfaces. Ensure no signs of PTFE tape. • Check both gauges on regulator naturally face the front and are undamaged. • Ensure both gauge needles reset to zero. • No oil, grease or other contamination.	• Check body for any signs of soot, oil, grease or other contamination. • Check compatible with the gas. • Ensure the Pressure Adjustment control is firmly fixed to the body and operate freely. • Ensure the regulator gauges start at zero prior to use. • Ensure the pressure rises on the high-pressure gauge when opening the cylinder outlet valve. • Check the low-pressure gauge rises smoothly	• Check for any damage, contamination, defects or faults. • Check that gauges return to zero during the venting process.	• Full visual inspection. • Check life dates. • Functional tests to ensure correct operation. Typically, this will include a creep test to ensure regulator integrity.	• 5 years from date of manufacture or manufacturer's recommendations. • Replace with a new or refurbished unit NOTE 1. NOTE 2.

	• Leak test all joints at working pressure.	when setting the gas pressure. • Leak test all joints at working pressure.			
FLAME ARRESTORS and their integral cut off valves.	• Check correct type fitted. • Check manufacturing standard. • Ensure within life for use. • Check condition of threads and sealing surfaces. • Check the Direction of Flow is correct. • No oil, grease or other contamination. • Leak test all joints at working pressure. • Check the Pressure sensitive cut-off valve button is not restricted/ damaged/ tied down.	• Ensure flame arrestors are fitted. • Leak test all joints at working pressure.	• Check for any damage, contamination, defects or faults.	• Check unit for leaks, flow restrictions and reverse flow to ensure correct operation of non-return valves. • Where pressure sensitive cut off valves are fitted, they shall operate at a pressure of no greater than 1.2 bar. • If of a pressure sensitive type, check shut-off in the tripped condition in the direction of flow. • Check life dates.	5 years from date of manufacture or manufacturer's recommendations. Replace with a new or refurbished unit. NOTE 1. NOTE 2.
HOSE ASSEMBLIES (including non-return valves)	• Check the manufacturing standard. • Check suitability of hose colour, internal bore size • and length. • Check threads and sealing surfaces. • Check hoses condition for damage (e.g. kinking twisting or cracking). • Ensure *HCV and Nut & Tails are fitted using correct ferrules and are	• Ensure all the gas hose is unwound from gas cylinder trolley prior to use. • Check hoses condition for damage (e.g. kinking twisting or cracking). • Leak test of all joints at working pressure.	• Check for any damage, contamination, defects or faults.	• Reverse hose to ensure the correct operation of non-return valve where fitted. Bend hose in a tight radius to ensure reinforcement is not visible and there is no sign of collapse or distortion.	• Determined by operating conditions. • Replace as required. NOTE 2.

	located in the correct place. • Leak test of all joints at working pressure.				

NOTE 1: Components such as elastomers, seals and diaphragms, will wear and deteriorate from their date of manufacture whether in gas service or not. Items stored out of gas service for one year or over should receive checks in accordance with the annual requirements.

NOTE 2: Some equipment is marked to either identify the date it was manufactured or the date when it needs replacement or refurbishment. Refer to BCGA TIS 18 [50], *Date marking of gas accessories*.

*HCV: Hose Check Valve

Appendix 3 - Gas Alarm Panel

INSTRUCTIONS ON HEARING THE ALARM

On hearing the alarm:

- Evacuate the lab and go to the alarm panel.
- Press the “Acknowledge” button on the panel – the sounder should silence.
- Press “Reset” button on the panel – the gas alarm indicator should stop flashing red and turn green again, indicating it is safe to re-enter.
- If the gas alarm continues to flash red, wait 5 mins and then press the “Reset” button again.
- The air handling unit in the lab will provide enough ventilation air changes to eventually clear the lab of any gas leaks and allow the panel to be reset.

  You must remain outside the lab during this time to warn other users that the lab is unsafe to enter.

- If the gas alarm continues to flash red after a second attempted reset place the “Lab Closed” sign on the door.
- Call security on Extn. 3939 to advise them that you have reset/tried to reset the alarm. You must do this every time, as any alarm that sounds from the gas panel will also set of an alarm at security control.

Under no circumstance is anyone to enter the lab whilst the alarm panel is showing a flashing red indicator unless authorised by the TRO.

Revision Record			
Issue	**Name**	**Date**	**Reason for Review**
1	ES	26/01/23	Full revision of guidance and now issued as a separate document.