Compressed Gas Systems Safety Procedure	
Enabling Policy Statement; Executive Owner; Approval Route:	Our Safety – Chief Operating Officer – Compliance Committee
Associated Policy Statements:	N/A
Authorised Owner:	Director of Health and Safety
Authorised Co-ordinator:	Health and Safety Officer (Hazardous Materials)
Effective date:	07 June 2023
Due date for full review:	06 June 2026
Sub documentation:	This Procedure should be read in conjunction with the University's - Pressure Systems Policy - Piped Compressed Gas – Change to system request form - Justification for the use of stand-alone gas cylinders within UoS buildings

Approval History

Version	Reason for review	Approval Route	Date
1.0	Reviewed and updated (including in accordance with new Policy Framework 2022). Replaces Gas Industrial Systems Safety Policy (Version 3.0, dated April 2019).	Compliance (Health, Safety and Wellbeing) Committee	7 June 2023

1 Purpose

This Procedure outlines the arrangements adopted by the University to prevent injury to persons and or damage to equipment from the hazard of stored gases. The aim of this Procedure is, therefore, to provide effective management arrangements and a safe environment for our students, employees, contractors, and visitors by conducting our business in a way that protects the health, safety and welfare of each individual.

2 Scope and Exceptions to the Procedure

This procedure applies to staff, students, contractors and visitors using gas systems and stand-alone cylinder installations. It is applicable to medical, research, special and industrial gases.

This procedure is to be used in conjunction with the latest technical guidance contained within the British Compressed Gas Association (BCGA) Codes of Practice, and HTMO-02-Part B.

Note: Whilst HTMO-02-Part B defines the roles and responsibilities for medical gases, and it is recognised that not all gases are for medical use (human or animal), the University considers the roles and responsibilities to be the same, irrespective of usage.

This Procedure does not apply to gas pressure systems used in the dispensing of beers, lagers, and other carbonated drinks. This is covered by separate University guidance.

3 Definitions and Terminology

A pressure system is defined as:

- A system comprising of one or more pressure vessels of rigid construction, any associated pipework and protective devices.
- The pipework with its protective devices to which a transportable pressure receptacle is or is intended to be connected.
- A pipeline and its protective devices.

Compressed Gas – a non-flammable material or mixture having in the container a pressure exceeding 41psia (absolute) (3 bar) at 70°F (21°C), or any flammable or toxic material that is a gas at 70°F (21°C) and has a pressure of 14.7 psia (1 bar), or greater. For the purposes of this procedure medical, research, special and industrial gases will hereafter be referred to as 'gases' unless otherwise specified.

Non-liquefied Compressed Gas – Chemical or material, other than gas in solution, that under the charged pressure is entirely gaseous at a temperature of 70°F (21°C).

Liquefied Compressed Gas – Chemical or material that, under the charged pressure, is partially liquid at a temperature of 70°F (21°C).

Gas Cylinder – a pressure receptacle or vessel, which includes a cryogenic receptacle, bundle of cylinders as well as cylinders themselves, plus the valve(s) or regulator fitted directly to the receptacle.

Written Scheme of Examination (WSE) – a document containing information about selected items of plant or equipment which form a pressure system which operate under pressure and contain a 'relevant fluid'.

A relevant fluid is defined as:

- Steam at any pressure.
- Any fluid or mixture of fluids which is at a pressure > 0.5 bar above atmospheric pressure.

- A gas dissolved under pressure in a solvent (e.g., Acetylene).

***Training and* Briefing** – Training is equipping staff and students (and others where the University has a duty-of-care) with relevant skills and knowledge to deal appropriately with a given health and safety situation.

Briefing is informing such persons of relevant knowledge in relation to health and safety.

Training and briefing will be made available in a range of formats according to the needs of the trainee and different groups of staff, students, and others.

Authorising Engineer – a suitably qualified person with specialist knowledge of pressurised gas systems, including those systems for which the Authorised Person is responsible. They are employed independently of the University providing advice on the skills and abilities of the Authorised Person, including the suitability of nominated individuals to fulfil this role.

Authorised Person – the person designated by the University as responsible for the day-to-day management of compressed gas pressurised systems.

Quality Controller (Medical Gas Pressure Systems) (MGPS) – required where supply of medical gas is to humans and/or animals. The Quality Controller (MGPS) will accept the professional responsibility for the last independent check of a MGPS that if faulty could cause critical clinical consequences to the human/animal.

Competent Person (Gas pressure systems) – is the person who carries out the installation, maintenance work, and regulatory inspections on the gas pressure systems. The Competent Person should have received appropriate training and should be on a list of Competent Persons.

Competent Person (Pressure Systems Safety Regulations (PSSR) – as defined in the Pressure Systems Safety Regulations 2002 is a Chartered Engineer responsible for drawing up written schemes of examination for the system.

Designated Compressed Gas Officer – person with whom the Authorised Person liaises on any matters affecting the compressed gas pressure systems within the School, Department or Directorate[1], and who would give permission for a planned interruption to the supply.

4 Procedural Principles

4.1 Commitment

Compliance with the requirements of this Procedure will ensure:

- The University meets its statutory obligations in respect of pressure systems and equipment regulations.
- The safety of staff, students, and others from the use of stored gases.
- The safety and effective management of piped compressed gas pressure systems and their component parts.
- Everyone is aware of their roles and responsibilities.
- That those who use stored gases during their work activities are appropriately informed, instructed, and where necessary, trained and supervised.

[1] For the purposes of this Procedure School, Department and Directorate will include other similar entities such as Institutes and Centres.

4.2 Arrangements

In order to meet the above objectives, the University will:

- Clearly define the organisational arrangements for achieving compliance (see roles and responsibilities section of this Procedure).
- Ensure resources are made available to achieve compliance.
- Appoint Authorising Engineer to ensure all gas lines are adequately designed, suitable for their intended purpose, and installed correctly.
- Appoint an Authorised Person (Compressed Gas Pressure Systems) to oversee the day-to-day management of all gas pressure systems.
- Appoint a Quality Controller (MGPS Medical Gas Pressure Systems) where the gases in use are used in a medical (human or animal) environment.
- Appoint a Competent Person (Compressed Gas Pressure Systems) for the installation and maintenance of the gas pressure systems.
- Appoint a Competent Person (PSSR) to undertake the written schemes of examination.
- Appoint a Designated Compressed Gas Officer (as appropriate) for each Department, School, or area where piped compressed gases are installed.
- Confirm that any pressure system is designed and manufactured from suitable materials.
- Ensure any system can be operated safely.
- Ensure that, where fitted, relief valves discharge to a safe external place.
- Ensure all Written Schemes of Examination are in place and examination undertaken before the system is used.
- Ensure Written Schemes of Examination are updated following modifications or upgrades.
- Ensure that all piped gas lines are adequately managed, inspected and maintained.
- Ensure all new installations and modifications to existing installations are undertaken by the Competent Person (Compressed Gas Pressure Systems).
- Implement a robust justification process for gas cylinders located in laboratories and work areas.
- Make, and keep up to date, a record of the location of all piped compressed gas systems and standalone gas cylinders.
- Instigate suitable and sufficient training for all users of compressed gas pressure systems.
- Undertake appropriate user checks and ensure these are recorded.
- Review compressed gas system arrangements periodically or whenever there are changes in relevant legislation, guidance, or University activities.

4.3 Written Scheme of Examination

Before using any qualifying pressure equipment (new or otherwise), as defined above, a Written Scheme of Examination (WSE) must be in place, and an examination undertaken.

4.4 Insurers Requirements

It is a requirement of the University's Insurers that the University follows the Guidance and Recommendations of the relevant professional bodies, including the British Compressed Gas Association (BCGA).

4.5 Stand-alone gas cylinders - BCGA and Fire Service

Due to increased dangers associated with the use of stand-alone compressed gas cylinders located in buildings in the event of a fire, the preferred method of providing compressed gas within the University is via piped systems attached to gas cylinders securely housed outside the building. This follows recommended guidance from the British Compressed Gas Association (BCGA) and the Fire Service.

The use of stand-alone cylinders within laboratories will only be sanctioned in the following circumstances:

- Where building design, layout or process prevents use of piped gas system; and

- A fire risk assessment has formally been reviewed, and where applicable, an assessment under the Dangerous Substances and Explosive Atmospheres Regulations (DSEAR) 2002 (amendment 2015) has been completed, with controls implemented.
- A justification for the siting of internal cylinders has been submitted to the Health and Safety Department and approved.

4.6 Piped compressed gas systems attached to gas cylinders.

Roles and responsibilities for persons within the University of Surrey for piped compressed gas systems attached to gas cylinders are detailed below.

4.7 Roles and Responsibilities

For piped compressed gas systems attached to gas cylinders:

4.7.1 Director of Estates & Facilities is responsible for:

- The integrity of the piped gas pressurised systems.
- Appointment of the Authorising Engineer who will be suitably qualified in accordance with HTM-02.
- Appointment of the Authorised Person on the recommendation of an independent Authorising Engineer (MGPS).
- Appointment of the Competent person (Gas pressure systems) following assessment by the Authorised Person (MGPS)**.**
- Appointment of Competent Person (Pressure Systems Safety Regulations) to undertake Written Schemes of Examination (WSE).
- Appointment of the Quality Controller (Medical Gas Pressure Systems).
- Ensuring that compressed gas pressure systems comply with the requirements Pressure Safety Systems Regulations 2000, the recommendations of the British Compressed Gas Association (BCGA) and the Medical Gas Health Technical Memorandum HTM-02.
- Selecting and employing competent contractors for capital project installations.
- Ensuring that the Authorising Engineer and/or Authorised Person is consulted prior to commissioning all installations and modifications (including as part of a capital project).
- Ensuring that a design risk assessment for new and refurbished installations and facilities for compressed gas cylinders and associated system is conducted and recorded.
- Ensuring that any compressed gas cylinder and system installed or re-fitted (as part of a capital project) is in accordance with health and safety regulations and appropriate industry/sector standards.
- Ensuring that suitable commissioning of the compressed gas system is carried out and that the relevant commissioning documentation (including where applicable the Written Scheme of Examination) are provided to Authorised Person and Designated Compressed Gas Officer.
- Ensuring that completion handover documentation is forwarded to the Authorised Person.
- Ensuring that users (under their management) receive appropriate training in the operation of relevant parts of the installation.

Note: Accountability cannot be delegated, although tasks associated with the above responsibilities can be delegated to a suitably qualified person (e.g., a project manager).

4.7.2 Authorising Engineer should be suitably qualified person in accordance with the requirements of Chapter 7 Health Technical Memorandum HTM-02. They will have

specialist knowledge of Medical, Industrial, Special and Research Gases, in particular the gases that the authorised person will assume responsibility on appointment.

They will:

- Act and be employed independently of the University.
- Undertake an audit of all medical, research, industrial and special pressurised gas systems including the permit to work system and report production.
- Assess the Authorised Person procedures and authorising process.
- Provide updates on standards/technology and procedures.
- Validate design requirements.
- Advise on processes and procedures were requested for medical, research, industrial and special gases.

4.7.3 Authorised Person is responsible for:

- Engaging competent contractors for the installation, maintenance, modification, and repair of compressed gas systems.
- Advising on the requirements for any compressed gas system install/refit/repair to ensure it is in accordance with health and safety regulations.
- Having a planned preventative maintenance programme in place for compressed gas systems local inspections and checks, statutory testing, and where required, servicing and repairs.
- Ensuring all statutory tests and inspections are conducted within specified timescales and records are available.
- Having a permit to work system in place to ensure safety of all persons during testing, inspection, installation, and ensuring return of the system to a safe condition.
- Maintaining operating instructions and other documentation relating to compressed gas systems within their remit.

Note: In ensuring the requirement for statutory tests/inspections and planned preventative maintenance are met, the Authorised Person will provide appropriate notice and ensure work is planned to minimise disruption to learning, teaching and research.

4.7.4 Quality Controller (Medical Gases) is responsible for:

- Quality control of the medical gases at the outlet points and any relevant plant.
- The last independent check of a Medical Gas Pressure system that, if faulty could cause critical clinical consequences to humans or animals.

4.7.5 Competent Person (Gas pressure systems) is responsible for:

- Carrying out installation, maintenance, extension, modification, repair, and testing of piped compressed gas systems.
- Undertaking system tests on completed work with appropriate calibrated test equipment.
- Signing permits to work and acknowledging responsibility for the work.
- Signing permits declaring work is completed as indicated on permit.
- Working with due care for personal and others safety.

4.7.6 Competent Person (Pressure Systems Safety Regulations) is responsible for:

- Carrying out examinations in accordance with the Written Scheme of Examination (WSE), including:
    - Reviewing WSE and confirming it is suitable.
    - Producing a report for each examination.
    - Notifying users/owners of repairs required.
    - Identifying and reporting cases of imminent danger, making immediately

safe, where possible.
- Agreeing postponements of examination, where appropriate.
- Drawing up or certifying Written Schemes of Examination.

4.7.7 Heads of School/Department/Directorate (or other Senior Managers as administratively appropriate) have overall responsibility for:
- The safe use of piped compressed gas systems within their area of responsibility.
- Formally appointing a Designated Compressed Gas Officer or Officers in respect of the day-to-day management of piped compressed gas systems within their area of responsibility.
- The provision of adequate resources to achieve the following:
  - Initial installation of piped compressed gas line.
  - Provision of Written Scheme of Examination.
  - Revision to existing Written Scheme of Examination following modification to existing piped compressed gas line.
  - Upgrade to piped gas line and associated equipment (i.e., whip restraint cables, flash back arrestors, pressure relief valves), as required.
  - Upgrade/modification of any part of piped compressed gas line due to change of Regulations or BCGA guidance.

4.7.8 Designated Compressed Gas Officer will:
- Undertake the day-to-day management of piped compressed gas systems (as defined and agreed with Head of School/Department/Directorate or another Senior Manager, as administratively appropriate).
- Consult the Authorised Person on the requirements for any compressed gas system install/refit/repair prior to any works commencing.
- Liaise with the Authorised Person to ensure the effective inspection and maintenance of all piped compressed gas systems under their supervision.
- Grant permission in liaison with Authorised Person to agree shutdown/ planned interruption of supply of compressed gas.
- Advise and assist with any risk assessment undertaken for the process for which the gas is to be used**.**
- Ensure any equipment connected to the compressed gas system (e.g., a laboratory incubator) owned and maintained by a School/Department is compatible and can be safely connected.
- Maintain training records of users and responsible persons within the School, Department, or Directorate with regard to compressed gas safety.
- Provide a schematic diagram of any proposed modification to an existing pipeline to the Authorised Person, for approval.
- Advise on the provision of suitable and sufficient Personal Protective Equipment (PPE).
- Advise on the provision and maintenance of suitable and sufficient equipment to facilitate the safe handling of compressed gas cylinders.

4.7.9 Persons responsible for the area in which compressed gas is used (e.g., Laboratory Managers, Principal Investigators, or other persons as administratively appropriate) will ensure:
- A risk assessment is undertaken for the process for which the gas is to be used**.**
- Users of compressed gas supplies undertake required user checks.
- Users of piped compressed gas and stand-alone compressed gas cylinders receive Gas Safety Awareness training.
- No modifications to existing lines are undertaken without the knowledge of the Designated Compressed Gas Officer, submission of the required notification, and

approval in writing from the Authorised person.

4.7.10 Users (including staff, researchers, students, and others working with compressed gas systems) must:

- Work in accordance with the findings of any risk assessment and safe working procedure for the use, handling and storage of gas cylinders.
- Work in accordance with any information, instruction and training provided.
- Undertake user checks on gas systems and all associated equipment including cylinders before using them.
- Immediately report any defects/hazards to their supervisor and the Designated Compressed Gas Officer.
- Use any Personal Protective Equipment (PPE) provided.
- Follow emergency response procedures if an incident occurs.

4.7.11 Director of Health and Safety is responsible for:

- Providing advice and guidance on the application of legislative requirements and, where necessary, liaising with the enforcement authorities.
- Advising on the need for fire risk assessments and, where applicable, a DSEAR assessment required under the Dangerous Substances and Explosive Atmosphere Regulations 2002 (as amended, 2015).
- Reporting incidents under the Reporting of Injuries, Diseases, and Dangerous Substances Regulations (RIDDOR).
- Ensuring adequate arrangements for the storage and retention of maintenance and inspection records which are accessible to all relevant persons.
- Monitoring the continued effectiveness of this Procedure.

4.8 Standalone Gas cylinders in the laboratory/workplace

Most stand-alone pressure cylinder installation systems will consist only of a cylinder, regulator and low-pressure hose feeding the output of the regulator to the process equipment.

Where compressed gas cylinders have been brought into the work area, the responsibility for the cylinder, and all associated equipment, maintenance, inspection, and upgrades lies solely with the Department, School or Directorate as detailed below.

Departments, Schools, and Directorates are responsible for appointing a Designated Compressed Gas Officer for the management, maintenance, and inspection of stand-alone gas cylinders and associated equipment as well as the provision of adequate resources to achieve the following:

- Annually review all cylinders stored within laboratory/work area areas.
- Where the building design and process allows, consideration must be given for the provision of piped gas supply from an external store.
- Provision of robust justification for the siting of internal cylinders in accordance with the required notification and approval process.
- Consultation with the Authorised Person for the supply of laboratory gases in new building projects and refurbishments.
- Consultation with the Fire Safety Officer in relation to fire safety, on installation and use of laboratory gases.
- Supply, inspection, maintenance, and replacement of appropriate and suitable regulators.
- Supply, inspection, maintenance, and replacement of suitable associated equipment e.g., flash back arrestors, low pressure hose assemblies, valves, and fittings.
- Upgrade/modification of any part compressed gas line due to change of Regulations or BCGA guidance.
- Consultation with the Authorised Person where supply of gas is required at a pressure of 2 Bar and above, with regards to suitable fittings and supply.

- Consultation with the Authorised Person where hose length from cylinder to equipment is greater than 2 (two) metres.
- Ensuring users of stand-alone compressed gas cylinders receive Gas Safety Awareness training.
- Provision of suitable and sufficient Personal Protective Equipment (PPE).
- Provision and maintenance of lifting and handling equipment to facilitate the safe handling of compressed gas cylinders.

5 Governance Requirements

5.1 Implementation: Communication Plan

The Procedure will be available vias the University procedures webpages.

Relevant Health & Safety Committees and EF/CS Committees will be notified, and information disseminated through line management. Faculty Health and Safety Committees will also be informed, as required.

This Procedure and relevant supporting documentation is also published on the University Health and Safety intranet site.

5.2 Implementation: Training Plan

The Designated Compressed Gas Officer will be trained to undertake their role.

All persons either directly using or indirectly (i.e., changing) compressed gas either connected to a manifold or stand-alone cylinder are required to attend Gas Safety Awareness and/or Cryogenic Gas Safety training before any work with compressed gas is undertaken.

Where the connection of equipment to the compressed gas system is undertaken by a member of University staff (rather than the equipment supplier), they will be suitably trained to undertake such connections.

This training is in accordance with the recommendations outlined by the British Compressed Gas Association (BCGA) GN23 Gas safety. Information, instruction, and training Revision 1: 2018.

5.3 Review

The Director of Health and Safety will monitor for required changes and updates. Minor changes will be reviewed by the Hazardous Substances Working Group and approved by Compliance Health, Safety and Wellbeing) Committee. Major changes will also be reviewed by the Hazardous Substances Working Group, prior to submission to the Compliance (Health, Safety and Wellbeing) Committee for approval, and if required, noted at Executive Board.

This procedure will be reviewed every three years or in line with relevant changes in legislation, if sooner. The Health and Safety Consultative Committee will be consulted during the review process, as required.

5.4 Legislative Context and Higher Education Sector Guidance or Requirements

5.4.1 Applicable Legislation

This procedure complies with the requirements of the Health and Safety at Work Act 1974, and other pressure systems and equipment legislation as follows:

- Pressure Safety System Regulations 2000 (PSSR 2000).
- Pressure Equipment Safety Regulations 2016.
- Provision and use of Work equipment Regulations 1998.
- Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 2013 (RIDDOR).
- CP4 Gas supply and distribution System (excluding acetylene) revision 5: 2020.

- CP6 The safe distribution of acetylene in the pressure range 0-1.5 Bar Revision 3, 2015.
- CP7 The Safe use of oxy-fuel gas equipment (individual portable or mobile cylinder Supply) Revision 8: 2018.
- CP18 The safe storage and use of special gases Revision 3: 2014.
- CP30 The safe used of Liquid Nitrogen Dewars Revision 3: 2019.
- CP44 The storage of Gas cylinders Revision 1: 2022.
- CP47 The safe use of individual portable or mobile gas supply equipment Revision 1: 2018.
- GN3 Safe cylinder handling and the application of the manual handling operations regulations to gas cylinders Revision 3: 2016.
- GN13 DSEAR risk assessment guidance for Compressed gases Revision 1: 2021.
- GN23 Gas Safety. Information, instruction and Training Revision 1: 2018.

5.4.2 Legislative context

This procedure sets out to comply with the required 'duty of care' placed upon the University. Under Health and Safety Law a 'duty of care' is generated between organisations and individuals when carrying out activities that could foreseeably cause harm.

The primary duty of care is owed through the employer-employee relationship in which the employer owes a duty of care to ensure that work activities that could result in harm to the employee are assessed and controlled. That duty of care is put into practice by the line management responsibilities as set out in the hierarchy of the organisation.

This duty of care cannot be delegated away; instead, the act of delegation must be accompanied by a realistic and workable system of monitoring or supervision to ensure that the delegated task has been adequately implemented (i.e., the responsibility is not met by giving directions; it is met when those directions have been confirmed as carried out). The result is a cascade of delegated accountability that runs through the organisation via the line management network, accompanied by a system of monitoring, supervision, and feedback.

The duty of care extends to assurance that services provided by others (be they another department of the University or contractors) are undertaken safely. The level of assurance required should be commensurate with the risk of the activity. In addition, anyone carrying out an activity owes a duty of care to anyone who may be put at risk by the activity, such as students, staff, and visitors.

5.5 Sustainability

The following gases are recognised as greenhouse gases: Carbon dioxide (CO2), Nitrous Oxide, Methane, Chlorofluorocarbons and water vapor and the university uses these gases for education and research – where possible use is kept to minimum, and users are encouraged to find an alternative method.

The components used for the manufacture of manifolds and regulators and the materials used for the installation of compressed gas lines (copper/stainless steel) are all recyclable/recoverable. Compressed gas cylinders are manufactured from cast iron for robustness – the cylinders are reused multiple times over a ten-year period – at that point they undergo an integrity test and are re-certified or the metal is recycled.

Use of oxygen depletion detectors are essential for safety. Whilst they are connected to the electrical supply for power, the draw of current is minimal. In addition, the use of alarms to indicate a cylinder is empty and requires changing is essential for continuous supply of gas in some areas of research (i.e., supply of CO_2 to incubators); again, energy requirement is minimal.

6 Stakeholder Engagement and Equality Impact Assessment

6.1 An Equality Impact Assessment was completed on **14/03/2023** and is held by the Authorised Co-ordinator.

6.2 Stakeholder Consultation was completed, as follows:

Stakeholder	Nature of Engagement	Date	Name of Contact
Governance	Development and creation of this Procedure v1.0.	20 March 2023	Andrea Langley, Regulatory Compliance Manager (OIA).
Director of Health and Safety	Development and creation of this Procedure v1.0.	18 August 2022	Matthew Purcell, Director of Health and Safety (Cervus+).
Members of the Compliance Management Group	Development and creation of this Procedure v1.0.	20 March 2023	Members of this Group.
Faculty Health and Safety Committees	Development and creation of this Procedure v1.0.	20 March 2023	Members of these Committees.
Members of the Health and Safety Consultative Committee	Development and creation of this Procedure v1.0.	20 March 2023	Members of this Committee.
Head of Insurance	Development and creation of this Procedure v1.0.	20 March 2023	Sally Condie, Head of Insurance (Cervus+).
Equality, Diversity and Inclusion	Development and creation of this Procedure v1.0.	20 March 2023	Jo McCarthy-Holland, Equality and Diversity Manager.
EF/CS Health and Safety Management Group	Development and creation of this Procedure v1.0.	20 March 2023	Members of this Management Group.