Shropshire Community Health NHS
NHS Trust

Policies, Procedures, Guidelines and Protocols

Document Details		
Title		**Medical Gases Pipeline Systems Management Policy**
Trust Ref No		652
Local Ref (optional)		
Main points the document covers		Use and Storage of all Medical Gas Pipelines and cylinders
Who is the document aimed at?		Community Hospitals and all staff involved with medical gas, cylinders and related equipment
Author		Richard Best – Associate Director of Estates
Approval Process		
Approved by (Committee/Director)		Quality & Safety Committee
Approval Date		18 September 2024
Initial Equality Impact Screening		
Full Equality Impact Assessment		
Lead Director		Director of Finance
Category		Estates
Sub Category		
Review Date		17 September 2027
Distribution		
Who the policy will be distributed to		Community Hospital Managers
Method		Electronically and available on the Trust's website
Document Links		
Required by CQC		
Required by NHSLA		
Other		
Amendments History		
No	Date	Amendment
1	20.10.14	Update on November 2005 policy for Bridgnorth Hospital. Now includes all Community Hospitals
2	8-04-22	Policy Review
3	19-7-24	Amendment following colour code requirements for medical gas cylinders
4		

CONTENTS

1. INTRODUCTION

1.1 Policy Statement

This policy is intended for use by all staff (regardless of employing organisation) working within the Trust's premises involved with medical gas cylinders, systems and related equipment.

Within the Community hospitals there are piped medical gas systems. At the Dental sites there are dental compressed air and vacuum systems, and within the Minor Injuries Units there are compressed gas cylinders for pain relief.

This Operational Policy for Medical Gases addresses the provisions of Medical Gas Pipeline Systems (MGPS) as defined in Health Technical Memorandum 02–01, and HTM 2022 Dental Compressed Air and Vacuum Systems (DAVS). It sets out the roles and responsibilities of staff and outlines the operational management of the MGPS / DAVS.

1.2 Background

The MGPS provides a safe, convenient and cost-effective supply of medical gases to points where these gases can be used by clinical staff for patient care. There are however inherent dangers if either the pipeline or cylinders are not used correctly.

Dental hospitals, clinics and surgeries require compressed air to power dental instruments and a vacuum system to remove detritus from the operation site. The performance requirements of dental compressed air and vacuum systems (DAVS) differ from those for medical air and vacuum, and they should be provided in addition to the medical gas pipework systems (MGPS).

This policy is aimed at alleviating the danger or risk to the patient, and all those who handle cylinders and pipelines. Hazards include amongst others, confusion of types of gas, injuries from handling cylinders, sudden escape of contents causing fire, and oxygen enrichment of atmosphere caused by leaks. Oxygen and Nitrous Oxide in particular are both "oxidising" gases that vigorously support combustion with any fire or flame.

Note that maintenance of the MGPS infrastructure is subcontracted either through our Estates contract with Midlands Foundation Partnership Trust (MPFT), or with NHS Property Services Ltd (NHSPS) as our Landlord.

1.3 Legislation

SCHT has a legal responsibility to comply with the Health and Safety at Work Act 1974, The Management of Health and Safety at Work Regulations 1992 and other associated Health Technical Memoranda to effectively control and manage the safe use of medical gases.

The Control of Substances Hazardous to Health Regulations 2002 (usually called COSHH) state that certain substances which are classified as being hazardous to health, and which employees may be exposed to, must be identified in the workplace and the health risks to employees assessed. These regulations are applicable to medical gases.

The Trust is committed to managing such systems to meet regulatory standards and to ensure compliance requirements are met.

2. Definitions

Anaesthetic Gas Scavenging System (AGSS): A complete system which conveys expired and/or excess anaesthetic gases from the patient breathing system to the exterior of the building(s), or to a place where they can be discharged safely.

Authorising Engineer (AE) - is a chartered or incorporated engineer with the required knowledge, training and experience who possess the necessary independence from local management as is appointed in writing by the Designated Person. The AE assesses the suitability and appointment of Authorised Persons.

Authorised Person (AP) – are individuals possessing sufficient technical knowledge and training appointed by in writing by the Executive Manager on the recommendation of the Authorising Engineer. All Authorised Persons (MGPS)

Area Valve Service Unit (AVSU): An isolating valve in an enclosed box with a lockable door containing a breakable glass front and bearing the name of the gas it controls, the area it controls and, where appropriate, a key number, is provided at the entrance to the Ward / Department areas where MGPS is installed / operational. This valve facilitates both routine and emergency isolation of the named medical gas supply. This valve box contains emergency inlet ports, which are gas specific. They may be used to supply gas to the Ward when the main supply fails or is shut down for essential engineering work.

Competent Person (CP)- An individual recognised by the Authorising Persons as having sufficient technical knowledge, experience and training to prevent danger to themselves and others when working on the system. In some instances, this may be a specialist contractor / supplier.

Cryogenic manifold system: A supply source of Medical Oxygen comprising a number of interconnected cylinders containing Liquid Oxygen at a very low temperature. The system allows vaporisation of the liquid to give a supply of oxygen gas to the user. The cryogenic system is supported by an automatic cylinder manifold that will supply gas in the event of failure of the cryogenic system.

Dental Compressed Air and Vacuum System (DAVS): Dental hospitals, clinics and surgeries require compressed air to power dental instruments and a vacuum system to remove detritus from the operation site, this should be provided in addition to the medical gas pipework systems (MGPS) and is known as DAVS.

Designated Person (DP) - is an individual appointed by the Healthcare organisation (a board member or a person with responsibilities to the board) who has overall authority and responsibility for the electrical systems on the premises.

Duty Holder – This is a requirement under the Health & Safety at Work Act 1974 and unless this has been formally delegated and accepted by another person in writing the duty holder is taken to be the most senior manager or owner.

Authorised Persons are responsible for implementing the policy on a daily basis.

Emergency Reserve Manifold (ERM): A manifold used as an alternative means of supply for a medical gas supply source, for example, the automatic manifold supporting a duplex Medical Air plant. Also, ERM refers to additional manifolds that

have been added to a MGPS to protect against supply failure arising from such events as main manifold failure.

Entonox®: BOC trade name for a 50/50 mixture of Nitrous Oxide and Oxygen. Used for pain relief.

Hazard level: The term used to describe the level of risk to a patient served by an MGPS when work on that MGPS is taking place. In this Policy, two levels of hazard are defined: **high** and **low**. Either of these will be used to define the type of Permit used to manage the MGPS work.

Local area alarm: An alarm indicator unit sited in clinical areas, especially high dependency, and used to signal normal operational conditions, or high or low medical gas pipeline pressure to local clinical staff.

Manifold (automatic): A device that allows connection of two banks of high-pressure gas cylinders to a medical gas system. In normal operation it will switch from a depleted cylinder bank to the other (full) bank, maintaining continuity of supply while the depleted bank is replenished. It indicates cylinder and system pressures and is equipped with alarms which monitor its operating state and system over or under pressure. They are designed such that they will continue to supply gas at system pressure in the event of an electrical failure.

Manual handling applies to the manual handling of gas cylinders and other related equipment by human effort, by hand or bodily force. This includes the transporting, repair, replacement or maintenance of gas cylinders. (NB: No repairs should be carried out to cylinders and equipment other than by appropriate authorities/bodies.)

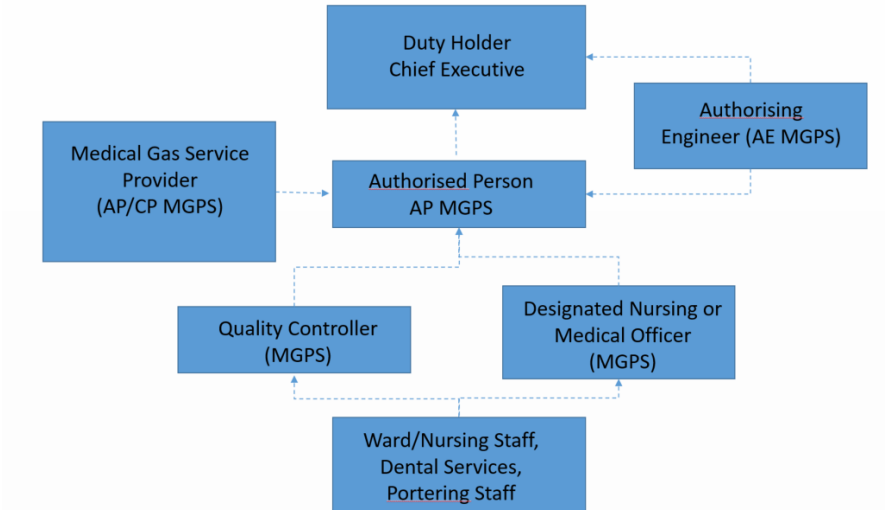
Medical Gas is a gas that is manufactured, packaged, and intended for administration to a patient in anaesthesia, therapy, or diagnosis. Within this policy specific gases may be referred to where appropriate.

Medical Gases Pipeline System (MGPS): A complete system which comprises a source of supply, pipeline distribution system, terminal units (to which the user connects and disconnects medical equipment) and a warning/alarm system

Plant alarm: An alarm indicator unit sited (especially) in continuously occupied areas and areas of more critical use e.g., and used to signal operational and fault conditions of both central plant and manifolds and high or low medical gas pipeline pressure to local clinical staff.

3. DUTIES

This section includes an overview of individual roles, departmental roles and duties including levels of responsibility for the use of medical gases.



Appendix I gives further information about the local Community Hospitals MGPS Structures.

3.1 Chief Executive

Ultimate management responsibility for Medical Gases and Medical Gas Pipeline Systems through the Trust rests with the Chief Executive.

Where dental care is provided within a hospital or trust, the chief executive or general manager has the formal responsibility for both the MGPS and the DAVS.

The Chief Executive delegates written appointment of the Trust's Authorised Persons for Medical Gas Pipeline Systems (MGPS) and Dental Compressed Air and Vacuum Systems (DAVS)

3.2 Trust Authorised Person (AP MGPS)

Note that maintenance of the MGPS infrastructure is subcontracted either through our Estates contract with Midlands Foundation Partnership Trust (MPFT), or completed by NHS Property Services Ltd (NHSPS) as our Landlord.
The Authorised Person

a) Works with the Medical Gas Service Provider(s) to manage any medical gas pipeline systems in premises where the Trust operates from. This includes monitoring the implementation of the permit-to-work procedure.
   In liaison with the Trust's Quality Controller (MGPS) will decide whether an MGPS should be taken into or out of use.

b) Is consulted before the purchase of any medical equipment that will be connected to the pipeline.

c) Recommends and organises appropriate training for staff involved in the use of medical gas systems

d) Is involved with the production of the Trusts Medical Gas Policy and associated Standard Operating Procedures, including the review of such documents within specified time periods

3.3 Medical Gas Service Provider

Note that maintenance of the MGPS infrastructure is subcontracted either through our Estates contract with Midlands Foundation Partnership Trust (MPFT), or completed by NHS Property Services Ltd (NHSPS) as our Landlord.

The Medical Gas Service Provider will: -

a) Liaise with the Trust's Authorised Person for Medical Gases, and support the Medical Gases Assurance Group

b) Undertake service/maintenance duties to the requirements of HTM 02-01 parts A and B

c) Ensure that all staff working on the medical gas systems are suitably trained and qualified and attend refresher training when required

d) Arrange all necessary insurance inspections within due dates

e) Hold maintenance records and MGPS/DAVS drawings.

f) E.g.

g) Provide advice regarding any necessary work on the MGPS/DAVS

h) Ensure all service records are kept for scrutiny and the process is reported at contract meetings

3.4 Authorising Engineer

The duties and responsibilities of the Authorising Engineer are:

a) To recommend individuals who are deemed suitable, via an assessment process as Authorised Persons

b) Ensure that all Authorised Persons have satisfactorily completed an appropriate training course

c) To ensure that all Authorised Persons are re-assessed every three years and have received an appropriate refresher training course

d) To review the management systems, including training and implementation of safety systems such as permit to work procedures

e) Monitor the implementation of an operational policy and associated procedures

f) Undertake an annual audit of the policy and associated procedures

g) To notify the Trust through the Authorised Person of any changes to regulatory guidance that applies to medical gas systems

3.5 Quality Controller (MGPS) - Pharmacy Department

The Pharmacy Department: -

a) Will provide a Quality Controller (MGPS) where available. It is the responsibility of the authorised Person (MGPS) to locate a suitable alternative if SCHT Pharmacy is unable to provide a Quality Controller (MGPS).

b) The "Quality Controller" is responsible for the quality control of medical gases at the terminal units, and from in house plant such as medical or dental air compressors.

c) The Quality Controller (MGPS), based on the system to be tested, will decide on appropriate testing in line with HTM 02-01 recommendations.

d) For new installations a full report detailing QC tests performed will be sent following the testing. For additions to existing MGPS or minor alterations, the completion of the permit to work will provide proof that the medical gases are fit for purpose.

e) For Dental Systems further testing should be performed at least annually and after major plant/pipework repairs or modifications. The user should keep records of pharmaceutical tests for at least two years.

3.6 Designated Nursing Officer / Practice Managers' Responsibilities

a) The local site procedures list the Designated Officers (MGPS) and the arrangements for cover due to absences of the Designated Officers (MGPS).

b) All Designated Officers (MGPS) should have received training on the MGPS relevant to their departments and on the action to be taken in the event of an emergency

c) The Designated Officer (MGPS) should give permission for any interruption to the MGPS and should sign the appropriate parts of the permit-to-work.

d) The Designated Officer (MGPS) would normally carry out the appropriate action in the event of an emergency (for example isolation of a ward supply)

e) Ensures PPE and cylinder trolleys are maintained and provided in a serviceable condition.

f) Ensures staff are aware of the Medical Gas policy and implements a sign-off process for locally implemented procedures. (See Section 5)

g) Ensures all employees, including themselves, are adequately trained in accordance with their identified needs. SCHT will gain written commitment from Employment Agencies used to supply temporary employees to ensure they are complying with SCHT's requirement to ensure that professional registration is maintained

3.7 Ward/Nursing Staff, Dental Services

All employees working substantively for SCHT (and contingent workforce, agency staff, personnel on work experience, employees from other organisations) need to be aware of this Medical Gas Policy: -

a) Staff need to be aware of their specific roles and/or responsibilities under this Policy, and to maintain their training or certification as per their role and/or responsibilities. (See Appendix H and I)
Staff ensure that medical gas equipment has been visually checked before use.

b) Any defective equipment should be removed from use immediately, labelled as faulty, decontaminated and sent to the Electro-Biomedical Engineering (EBME) Department with a description of the fault. If unable to be removed, report this to EBME

c) Staff ensure that the permit-to-work system is utilised in accordance with HTM 02-01: Medical Gas Pipeline Systems
All employees should ensure that all accidents/incidents and near misses are reported promptly on the organisation's Incident Reporting system, Datix

d) Any concerns need to be reported to the local Estates helpdesk without delay

3.8 Designated Porter

Designated Porters will undertake the following duties:

a) Assist with the delivery of gas cylinders/supplies.

b) Ensure deliveries are accurate and check delivery notes are correct.

c) Attach and remove from cylinders medical equipment regulators, flowmeters or any combinations.

d) Attach and remove cylinders from manifold systems and record dates of when cylinders were changed in the logbook.

e) Identify and remove from service any faulty cylinders and notify/label as required.

f) Ensure that the contents of cylinders are in line with the displayed collar information and that they are in date e.g. within the three-year fill timescale.

g) Complete entries in logbooks ensuring that information is up to date and legible.

h) Report medical gas related defects or incidents to the Authorised Person.

i) It is the responsibility of the Portering staff to transport and change/connect full medical gas cylinders and return empty cylinders to the medical gas storage area.

j) Ensure to check the medical gas cylinder labelling and colour coding, to confirm that the correct medical gas has been selected, before connecting an appropriate regulator with matching labelling / colour coding, for administration of the selected medical gas.

3.8 Medical Gases Assurance

All services are contracted out by an SLA to a third-party and SCHT will look to have representation at the providers Medical Gas Group who will feed back to the Trust via the Health & Safety Committee and other groups specific to areas covered within responsibilities above. This Group will: -

a) Provide the framework to ensure that the organisation complies with current legislation and best practice guidelines for medical gases.

b) Ensure training programmes for staff to work within their competency level are available.

c) Monitor incidents. Action(s) should be taken to ensure compliance with the policy and any learning from the incident should be shared.

d) Monitor the development of the local, site-specific operational guidelines for medical gas for each hospital site.
The Medical Gases Assurance Group will have responsibility for regular review of this Policy.

Other related role holders

3.9 Locality Managers, Senior Managers, and Head of Services Responsibilities

These Managers are responsible for: -

a) Ensuring that local, tailored procedures are developed which reflect site specific systems and processes used in their premises with regard to all staff who are involved with the use, handling and storage of medical gases.

b) Participating in the Permit to Work control system.

c) Ensuring protocols are in place to safely transport medical gases, both on and off site. In particular, transportation off site must be in accordance with the Carriage of Dangerous Goods Regulations. Additional information can be found at http://www.hse.gov.uk/cdg/.

3.10 Electro-Biomedical Engineering (EBME / SaTH MES)

The EBME Department will: -

a) Repair, maintain, calibrate and supply Regulators, Flow meters, Suction Units, hoses and High-Pressure systems connected to Medical Devices.

b) Provide technical advice to SCHT for the purchase of any medical equipment which will be connected to the medical gas pipeline system in order to avoid issues of insufficient capacity and inadequate flow rates.

4. THE DEVELOPMENT AND MANAGEMENT OF THE MEDICAL GASES POLICY

4.1 Health Technical Memorandum 02-01 Part A and B

This Health Technical Memorandum (HTM) is divided into two parts:

Part A covers piped medical gases, medical and surgical air, and medical vacuum installations: it applies to all medical gas pipeline systems installed in healthcare premises. Specifically, it deals with the issues involved in the design, installation, and validation and verification (testing and commissioning) of a medical gas pipeline system (MGPS).

Part B covers operational management. The guidance given in HTM 02-01 should be followed for all new installations and refurbishment or upgrading of existing installations. It is not necessary to apply the guidance retrospectively unless patient or staff safety would be compromised.

4.2 Sources of supply for oxygen pipeline installations

Oxygen is generally supplied in SCHT premises from compressed gas cylinders. Pipelines are installed in the following Community Hospitals: Bishops Castle, Bridgnorth, Ludlow and Whitchurch

4.3 Incident Reporting

All employees should be made aware of the procedure for reporting accidents/ incidents and near misses.

All accidents/incidents and near misses must be reported promptly on the organisation's Incident Reporting system (Datix), and where appropriate, managers should conduct an investigation and take remedial action to prevent recurrence.

4.4 Transport

In the event of transporting medical gas cylinders in vehicles liaise with the Locality Manager to obtain details of the local risk assessment and action plan.

4.5 Prescribing

The British Thoracic Society (BTS) - Guidelines for Emergency Oxygen Use in Adult Patients' (Thorax 2017 - Volume 72) addresses the use of oxygen for critically ill or hypoxic patients, patients at risk of hypoxaemia and non-hypoxic patients who might benefit from oxygen.

The concentration of oxygen required depends on the condition being treated; an inappropriate concentration may have serious or even lethal effects.

The BTS guidance also recommends that oxygen saturation should be measured in all breathless patients and supplemental oxygen given to all breathless hypoxaemic patients and to all critically ill patients.

Oxygen is a drug and should always be prescribed or ordered on a drug chart or prescription.

In most emergency situations, the guidelines state that oxygen can be given to patients immediately without a formal prescription or drug order.

4.6 Specific Requirements When Administering Oxygen In Community Hospitals

The British Thoracic Society (BTS) guidelines state that pulse oximetry should be available in all locations where oxygen is used. However, the BTS guidelines do not apply to patients receiving terminal palliative care. In these circumstances, it should always be a clinical decision to establish if oxygen saturation levels should be regularly monitored.

4.7 Specific Requirements for Patients using the Home Oxygen service

Home oxygen is ordered on a Home Oxygen Order Form (HOOF) and should be signed by a prescriber e.g. GP or respiratory specialist nurse.

4.8 Defective Equipment

This should be decontaminated, labelled and sent to EBME.

If the equipment cannot be moved, report the defect to EBME.

When faulty equipment is found, ensure it is reported on the organisation's incident reporting system (Datix).

4.9 Emergency Procedures

In the event of a fire situation involving or likely to involve the MGPS or which necessitates the area being evacuated, the Senior Duty Ward/Department Nurse must satisfy themselves that the welfare of patients is not compromised before they perform emergency isolation of the medical gas supply.

All staff should know the location of the Isolation Valve and the detail of this should be recorded within the local site specific operational procedure

During a fire, staff should remember that pressurised gas cylinders may explode if there is excessive heat, so people should evacuate to a safe distance. When notifying the fire services, warn them of the presence of pipeline gas and/or gas cylinders.

In all instances of fires or suspected fires the requirements of the SCHT Fire Policy should be followed until the Fire Service attend the site when the Senior Brigade Officer will assume full control of the situation and areas affected.

Prior to restoring the medical gas supply, the system must be checked and signed-off by both the Authorised Person (MGPS) and the Quality Controller (QC) for MGPS.

5. GUIDANCE ON DEVELOPING A LOCAL, SITE-SPECIFIC OPERATIONAL PROCEDURE

Within SCHT Hospital and Clinic settings, there are a variety of medical gas systems in place. Whilst this policy gives generic guidance and information about medical gas systems, each hospital/clinic must ensure that there is a **local, site specific procedure in place**.
This local procedure should contain detailed information about the systems used at that particular hospital/clinic and the following headings should be considered.

5.1 Designated Person(s)

Nominated Person - Identify who will take the role of nominated person(s) and define their role and responsibilities. Each SCHT ward and unit that holds and/or uses medical gases should have a least one nominated person. This could include porters, HCA's, nominated nursing staff, etc.

Possible roles and responsibilities of nominated person(s) could include:-

- changing the cylinders on the manifolds
- responsibilities for medical gases e.g. Cylinder storage and handling
- undergoing specialist training in medical gas safety, cylinder identification and safe handling and storage of medical gas cylinders, including relevant manual handling training.
- ordering and replacement of medical gas
- receiving delivery of medical gas
- Authorised Person (MGPS) holds responsibility for the day-to-day management of the MGPS at a particular site or sites. This includes the issue of permits in accordance with the permit-to work procedure. This person is usually a member of the Estates Department.

5.2 Management of Cylinders

Storage of Cylinders
Gas cylinders should be kept in a purpose built store that is in a safe location and complies with the following:

- Under cover, preferably inside and not subject to extremes of heat
- Be kept dry, clean and well ventilated at top and bottom
- Have good access for delivery vehicles and reasonably level floor to enable tail lift operation
- Allow for segregation of full and empty cylinders and permit separation of different gases within the store
- Cylinders must be restrained and stored vertically or horizontally as appropriate.
- Allow for strict stock rotation of full cylinders so that oldest are used first
- Be totally separate from any non-medical cylinder storage areas
- Be sited away from storage areas containing highly flammable liquids or other combustible materials

- Be sited away from any sources of heat or ignition
- They should not be stored in the same area as any oils or greases
- Have warning notices posted prohibiting smoking and naked lights within the vicinity of the store
- Be designed to prevent unauthorised entry to protect against theft or tampering
- Access / Exit points to be kept clear
- Entonox to be stored at temperatures above 10°C
- Cylinder management to include the prevention of contamination, clearly marked with contents.

Cylinder Manual Handling

Specific handling details include the use of Personal Protective Equipment (PPE) and appropriate footwear, type of trolley, correct manual handling methods.

- Wear gloves and safety shoes, or shoes that provide suitable toe protection
- Cylinders should only be moved with a trolley designed for appropriately sized cylinders
- Never roll cylinders along the ground as this may cause the valve to open accidentally. It will also cause damage to label and paintwork
- Cylinders should be handled with care, never knocked violently or allowed to fall over
- Never paint or obscure any markings or labels on cylinders
- Where possible, place cylinders near to an exit so that they can be moved quickly in an emergency
- Always comply with local procedures
- Cylinders must be placed in an appropriately designed holder. Cylinders must not be placed on patient's beds, they must `be placed in specifically designed holders/ trolley where they can be kept away from direct contact with combustible materials

Materials that do not normally burn in air, will burn more easily in oxygen, nitrogen oxide or medical gas mixtures containing these gases. Therefore, smoking or naked lights must not be permitted in the vicinity of a cylinder, a pipeline outlet or where cylinders are stored.

When using cylinders ensure no part of the valve or equipment is lubricated or contaminated with oil or grease. This is due to the risk of spontaneous combustion that can occur with high-pressure gases in the presence of hydrocarbons. Special care is needed with the use of hand creams/gels as these could provide sufficient contamination to the valve surface to cause an ignition when the valve is turned on.

Type of gas cylinders stored (e.g. Entonox, Liquid Nitrogen, Medical Air)
Make reference to local safe operating procedures dependent on gases used within site.

Signage

External signage should detail the types of gases stored (cylinder data chart)**,** hazards associated with these gases**,** prohibition signs and emergency contact details.

Internal signage should show the location of cylinder parking areas, hazard signs e.g. no smoking

cylinder data chart, hazard signs, prohibition signs, emergency contacts,

Cylinder Ordering

The stock level should ensure that an adequate supply is always available e.g. seven days' standard supply to be held at all times,

Consider contingency during bank holidays, out of hours etc.

Ensure appropriate record keeping.

Nominated person for ordering of cylinders to be decided locally.

Checks and stocktaking systems to be developed locally to reflect the needs of the unit.

On delivery of cylinders, labels to be attached with date of delivery clearly marked to aid stocktaking process.

*NB: Business Continuity plans should cover these issues***.**

5.3 Local Ward Guidance

Outline nursing and clinical staff responsibilities e.g. administration of gases is under the supervision of a medical practitioner or registered nurse who is trained in the use of medical gas equipment.

Protocol for checking flow meters must be in place.

Consider fire precautions, moving cylinders on the ward.

For the discharge of patients needing domiciliary oxygen, protocols should be in place to ensure cylinders are ordered and supplied before discharge, and information provided to the patient.

Protocols should be in place of what action(s) to take when alarms sound.

Keys to the medical gas store should be kept secure with only appropriate staff having access. (Location and access arrangements to be defined in local policy)

Cylinders must not be placed on patients beds, they must `be placed in specifically designed holders/ trolley where they can be kept away from direct contact with combustible materials.

Always use an appropriate cylinder carrier during patient transportation. These are available for beds and chairs. Never put a cylinder between a patient's legs. Never

cover a cylinder with a blanket (the bedding may become saturated and pose an extreme fire Hazard)

5.4 Emergency Procedures

In the event of a major gas leakage or fire, then the system may be isolated at the emergency shut-off point by the Senior Person in Charge.

5.4.1 First Aid for Liquid Nitrogen Incidents

If anyone working with liquid nitrogen becomes dizzy or loses consciousness, move them to a fully ventilated area at once - ENSURE THAT YOU OPERATE SAFELY and do not put yourself or others themselves at risk - a contaminated area should not be entered unless considered safe.

The person should be kept warm and rested whilst medical attention is obtained. If breathing has stopped then resuscitation should be commenced by a trained first aider

Apply artificial respiration immediately if the breathing has stopped or apply oxygen if they have difficulty breathing.

If a person is exposed to liquid nitrogen or gas, the affected tissue should be restored to normal body temperature as soon as possible.

Remove or loosen any clothing, belts, collars, etc that might restrict circulation to the affected area and bathe or immerse the area in water heated to 42°C. DO NOT heat the water above 45°C.

5.5 Other Useful Information

There are appendices attached to this policy which can be included in the local, site specific protocol as appropriate. The local, site-specific procedures for each community hospital will be monitored by the Medical Gas Advisory Groups within MPFT and NHS PS.

6. TRAINING AND SUPPORT

It is essential for the safety of patients that no person should operate, or work on, any part of a medical gas pipeline system or equipment unless adequately trained or supervised.

SCHT is committed to the provision of appropriate medical gas safety training for key personnel, relevant to their particular roles and activities. (Refer to Table 1 below)

6.1 Retraining and Reassessment

Retraining and reassessment should be carried out at regular intervals.

Table 1 shows recommended intervals, but there will be occasions when additional training may be required, e.g., in response to changes in technology or guidance, equipment failures, and incidents involving risks to staff/patients.

Table 1: Refresher training and reassessment schedule for personnel working with medical gas systems

Named Person	Frequency of Training
Authorised Engineer Authorised Person Competent Person Designated Medical Officer Nursing Officer	Every 3 years
Quality Controller	Every 5 years
Designated Porter/GSA	Every 3 years
General Nursing staff	Every 3 years
Housekeepers	Every 3 years

6.2 Training Records

Training records should be kept for all staff undertaking MGPS training.

It is the responsibility of individuals to maintain copies of their own training records, but there may be other requirements to be met; for example, in the case of Approved Engineer (MGPS), records will be kept by the Institute of Healthcare Engineering and Estate Management (IHEEM). Approved Person (MGPS) records will be kept by both the AP (MGPS) and the AE (MGPS).

Competent Persons (MGPS) directly employed by SCHT will be assessed by the Approved Person as competent to perform the required work, and records of appropriate training and experience will be kept by the AP and the Competent Person.

Contractors providing Competent Person services will be expected to maintain relevant records and produce these on request by the AE or AP.

6.3 Storing the Procedural Document

The signed procedural document will be stored (hard copy) centrally, as will the digital (soft copy) version.

7. PROCESS FOR MONITORING EFFECTIVE IMPLEMENTATION

The effective implementation of this policy will be monitored by the Medical Gas Advisory Group.

Medical gas incidents will be monitored through the incident reporting system and trends/themes analysed and reported into the Locality Health and Safety meetings for discussion.

Informal checks will be undertaken by the Health & Safety Team to ensure compliance with the policy in terms of use of cylinders and the findings will be reported to the Medical Gas Advisory Group.

8. ASSOCIATED DOCUMENTATION

This document references the following supporting documents which should be referred to in conjunction with the document being developed: -

- Health and Safety at Work etc Act 1974
- Management of Health and Safety at Work Regulations 1999
- Workplace (Health, Safety and Welfare) Regulations 1992
- Provision and Use of Work Equipment Regulations 1998
- Control of Substances Hazardous to Health (COSHH) Regulations 2002
- Pressure Equipment Regulations 1999
- Pressure Systems Safety Regulations 2000
- HTM 02 Part A and Part B.
- CQC Fundamental Standards 2017
- Medicines Act 1968
- SCHT Fire Safety Policy
- Manual Handling Operation Regulations 1992 (as amended 2002)
- Personal Protective Equipment at Work Regulations 1992
- SCHT Health and Safety Policy
- SCHT Health and Safety Strategy
- SCHT Control of Estates Projects and Contractors
- SCHT Manual Handling Policy
- Carriage of Dangerous Goods (Classification, Packaging & Labelling) Regulations 1996
- Carriage of Dangerous Goods by Road 1996
- BCGA-TIS-20-Revision-3-28-05-2023.pdf
  BCGA TIS20 - Revision 3

Are Appendices needed within the Policy?

APPENDIX A: CYLINDER CHANGING PROCEDURE

A.1 Preparing a Cylinder for Use

Ensure that hands are clean and grease-free before handling any medical gas cylinders or equipment. Where cylinders are handled on a regular basis, consider using safety footwear and appropriate gloves.

Check the name of the gas on the collar of the cylinder, the expiry date and the cylinder colour code. If in doubt, refer to the cylinder data sheet displayed in the Cylinder Store.

Remove the plastic seal but always retain the valve cover caps fitted to bull-nose cylinder
valves (F and G), for re-fitting after use.

Inspect the seal in the cylinder yoke for wear or damage. Change if necessary, taking care not to expose the surfaces to grease or oil; use only one seal on each cylinder yoke.

A.2 Disconnecting an Empty Cylinder from Equipment:

Turn off the cylinder valve and vent excess gas from the equipment regulator and connecting hoses by opening the equipment flow control valves for a few `seconds.

Shut off any equipment control valves.

Using the correct tool, loosen the equipment connector and remove from the cylinder valve. Do not vent the cylinder or leave the cylinder valve open.

Replace plastic valve covers on F and G size cylinders.

The cylinder should be returned to the EMPTY rack in the Cylinder Store as soon as possible, checking that any contents status label has been amended as appropriate.

APPENDIX B: CONNECTING A CYLINDER TO EQUIPMENT

B.1 Safety

In this operation the equipment is connected to the cylinder via a cylinder yoke, pressure regulator and high-pressure flexible hose or, in the case of star valves (or other integral flow-controller type units), a flexible low-pressure tube.

To ensure patient and staff safety it is essential that Designated Persons and users ensure a high standard of cleanliness when storing, transporting or connecting medical gas cylinders to regulators or other medical devices, particularly with respect to the presence of oil and/or grease (e.g., barrier creams).

Users must open medical gas cylinders slowly; If resistance to opening of the cylinder is excessive, the cylinder should not be used and should be returned to the manufacturer/supplier via BOC with a label to indicate the problem.

Users must read, understand and follow all instructions and labelling provided by the manufacturer/supplier.

Always make sure that the equipment is designed for use with the gas. NB: oxygen and medical air flow meters read differently if interchanged.

Great care should be taken when connecting F and G size cylinders of oxygen and medical air as the threads are the same e.g., bull nosed valves. The correct regulator should be matched with the correct cylinder

Entonox (N20/O2 mix, 50%/50%) regulator/flow meters are fitted with pin indexed valves and are therefore gas specific.

B.2 Procedure

Prepare the cylinder for use as in section A.1

Check the sealing washer at the valve/connector interface.

Offer the equipment connector to the cylinder valve and tighten firmly with the correct tool, or by hand as appropriate. Do not use excessive force.

Before opening the cylinder, check the equipment and other flow control valves are turned off.

Using the correct key (or knurled valve knob), open the cylinder valve slowly, fully anticlockwise and then back a quarter turn.

Check for leaks by closing the cylinder valve and observing to see if the high-pressure gauge on the regulator starts to fall. Replace a faulty cylinder where necessary.

Slowly adjust the pressure regulator/flow controller to the correct setting.

Open equipment flow control valve(s) slowly, checking for correct equipment operation.

B.3 When using cylinders

The following needs to be considered by staff using cylinders: -

- Have I checked the amount of oxygen in a cylinder before using it?
- Have I calculated how long the oxygen in the cylinder will last?
- Do I make sure empty or near empty cylinders are replaced immediately?
- Be mindful - Oxygen is a medicine! - read the label.
- Never handle the equipment with oily or greasy hands.
- Never use oxygen or store cylinders where there are naked flames or incandescent heat (e.g., cigarettes, cookers, fires, heaters, boilers and candles etc.)
- Always turn cylinder valves on “slowly”
- Always turn the cylinder off when not in use and store in a safe place

B.4 Reporting Faulty Cylinders

The BOC booklet “Gas Safe with Medical Gases” explains more fully the procedures for reporting and returning faulty cylinders to BOC.

(http://www.bochealthcare.co.uk/en/Quality-and-safety/Safety-and-technical-data/Safety-and-technical-data.html refers)

If a problem cylinder is discovered, it must be removed from service immediately, labelled (by means of an attached label (DO NOT mark the cylinder) and must be stored away from other cylinders.

Faults that should be reported are listed in the BOC booklet and include seized or leaking valves, empty-on-receipt cylinders, incorrect labelling and incorrect gas in the cylinder.

Incidents relating to faulty cylinders should be reported via the Trust’s incident reporting system (Datix).

APPENDIX C: CHANGING OF MEDICAL GAS REGULATORS ON CYLINDERS

C.1 Safety Warnings

DO NOT

- Lubricate the cylinder or the equipment with oil, wax or grease due to the risk of spontaneous combustion.
- Tamper or try to modify the equipment.
- Use any sealing compounds or tape.
- Smoke near the unit at any time as oxygen encourages fire.
- Change a regulator without first washing your hands before changing a regulator as this will remove any hand cream, which can also be combustible.
- Forget that materials, which do not normally burn in air, will burn more easily in oxygen, nitrous oxide or medical gas mixtures containing these gases.

C.2 Changing Regulator or Flow Meter

- Before use ensure that cylinders are secured safely in the appropriate trolley so they cannot fall over.
- Select the cylinder with the oldest filling date, if it is within the expiry date specified on the label.
- Cylinders containing liquefiable gases (e.g., nitrous oxide, carbon dioxide) are used upright with the valve uppermost.
- Check for signs of oil or grease on the cylinder valve. If either are discovered, do not use the cylinder, and arrange for it to be returned to the gas store as soon as possible, marked as faulty.
- used.
- Ensure to check the medical gas cylinder labelling and colour coding, to confirm that the correct medical gas has been selected, before connecting an appropriate regulator with matching labelling / colour coding, for administration of the selected medical gas.
- Ensure that the connecting face of the Pin Index yoke, or Bull Nose fitting regulator is clean and free from oil or grease.
- Check that the O-ring or sealing washer is in good condition. Replace if it shows any signs of wear or damage.
- Use only the correct cylinder valve key to open the cylinder valve
- When fitting the regulator to the cylinder, remove the disposable seal by pulling the tear tag and discard;

Policy for colour coding cylinders

The European Industrial Gas Association (EIGA) has encouraged its members to follow EN 1089-3 The UK has also adopted BS EN 1089-to provide the user with a clear distinction between medical and non-medical cylinders.
In compliance with BS EN 1089-3 [2] the body of medical gas cylinders shall be painted white. The contents of a medical gas cylinder shall be identified by the colour coding of the shoulder. In accordance with BS EN 1089-3, a summary of the changes required (from BS 1319C) for medical gases is as follows:

Product	Old colours		New colours		
	Shoulder BS 1319C	*Body BS 1319C*	Shoulder BS EN 1089-3		Body BS EN 1089-3
Medical Oxygen	*White*	*Black*		White RAL 9010	White RAL 9010
Medical Nitrous Oxide	*Dark Blue*	*Dark Blue*		Blue RAL 5010	White RAL 9010
Medical Air [1]	*Black / White*	*French Grey*		White RAL 9010 Black RAL 9005	White RAL 9010
Medical Carbon Dioxide	*French Grey*	*French Grey*		Grey RAL 7037	White RAL 9010
Medical Helium	*Brown*	*Brown*		Brown RAL 8008	White RAL 9010
Nitrous Oxide / Oxygen [1]	*Dark Blue / White*	*Dark Blue*		White RAL 9010 Blue RAL 5010	White RAL 9010
Carbon Dioxide / Oxygen [1]	*French Grey / White*	*Black*		White RAL 9010 Grey RAL 7037	White RAL 9010
Helium / Oxygen [1]	*Brown / White*	*Brown*		White RAL 9010 Brown RAL 8008	White RAL 9010

NOTES: 1. Where two colours are indicated for the shoulder colour they may be painted in bands or quadrants around the shoulder. It is custom and practice for medical gases to use quadrants. 2. Where valve guards are fitted, if they are colour coded, they should be in accordance with the shoulder colour in the table. Alternatively, they may be left unpainted or painted a different colour provided that it is does not conflict with the colour code specified for the cylinder shoulder.

For cylinders fitted with: -

- Bullnose outlet valves: remove the cap from the valve outlet by pulling forward and leaving to one side.
- Pin index valves: remove the disposable seal and outlet clip and discard.
- Attach the regulator, or yoke to the cylinder valve, and tighten the hand wheel or yoke firmly by hand. Never use excessive force as this may damage the valve outlet threads.
- Open the cylinder valve slowly with the valve key or hand wheel. Fully open the valve and then close a quarter turn to enable subsequent users to distinguish between an open or closed valve.
- Check that the contents gauge points to a green or full part of the contents gauge.
- To check for leaks, close the cylinder valve and observe the high-pressure gauge. If a fall in pressure is visible, then suspect a leak.
- Leave the valve key with the cylinder so that it may be closed in an emergency.
- Ensure that the equipment operating instructions are available.
- Cylinders should be checked regularly whilst in use to ensure that they have sufficient content and that leaks do not occur.

C.3 After use

Ensure that: -

- The cylinder valve is closed immediately, using the correct cylinder key, with moderate force only.
- The pressure in the regulator/flow meter is released before removal.
- Do not vent the cylinder contents or leave the cylinder valve open.
- All empty cylinders are returned to the empty store.

APPENDIX D: USING THE MEDICAL GAS CYLINDER STORE

D.1 Staff Responsibilities

Only staff who have received training in handling and moving of cylinders and cylinder identification and safety are permitted access to the Medical Gas Cylinder Store.

Users of the store have a responsibility not only for their own safety, but also for others and should therefore: -

- Report any damage, defective or missing items from the store to their line manager.
- Report instances of over-crowding of storage racks to their line manager.
- Follow manual handling guidelines
- Ensure full and empty cylinders are segregated and stored in their designated areas.
- Store cylinders safely in the appropriate racking or bays using restraining chains/bars/clips as appropriate.
- Ensure the store is kept free from rubbish and combustible materials.

Smoking, naked flames, or eating are not permitted in or around the store areas.

Ensure the store is locked following every visit.

D.2 Moving and Handling Cylinders

When moving and handling cylinders ensure that safety shoes and protective gloves are worn when loading/unloading medical gas cylinders.

Ensure wheeled carriers of the appropriate size are used when moving cylinders and use the safety bar/strap/chain to secure the cylinder during transit. Smaller sizes may be carried by hand but consider your own capabilities and the distance to be travelled. Do not carry by means of the cylinder valve.

Do not allow cylinders to drop, fall over or knock violently against one another.

Cylinder identification markings and labels should not be defaced, obscured or removed.

Never roll cylinders along the ground as this may cause the valve to open accidentally. It will also damage paintwork and labelling.

Do not mark cylinders with crayon, chalk, paint or any other materials, or affix labels with adhesive tape. Should a cylinder need identifying (e.g., faulty/involved in an incident) then a tie-on label should be used.

D.3 Rotation and Segregation

Separate full and empty bays should be provided. Cylinders should be clearly segregated and never mixed.

Separate, fully labelled areas are to be provided for each gas. Only store specified gases in their allotted areas.

F, G and J cylinders must be stored upright and securely retained using safety chains/bars/clips to hold them in place. Never allow cylinders to stand free.

Small sized cylinders (C, CD, D and E) should be stored horizontally on racks so as to prevent rolling and falling.

Ensure date rotation.

D.4 Return of Empties

Although empty, returned cylinders should be treated with respect and placed carefully on the appropriate racking or stood and chained upright in their designated empty bays.

Cylinders deemed to be “faulty” or “involved in an incident” should be clearly identified with a tie-on tag stating details of the problem or incident.

APPENDIX E: SUGGESTED STORAGE OF MEDICAL GAS CYLINDERS (MONTHLY) CHECKLIST

Hospital/Site:		
Date of Check:		
Undertaken By:		
1	Are cylinders stored in a purpose-built cylinder store?	Yes/No
2	Is the store under cover, dry, clean, well-lit and well ventilated?	Yes/No
3	Are full and empty cylinders kept separate?	Yes/No
4	Are F, G and J cylinders stored vertically and secured by chains?	Yes/No
5	Are C, D and E cylinders stored horizontally on shelves?	Yes/No
6	Is the storage area away from heat and ignition sources?	Yes/No
7	Is a key to the store available at all times?	Yes/No
8	Is warning signage displayed?	Yes/No
9	If “yes”, does it detail the type of gas, hazards and emergency contact details?	Yes/No
10	If Entonox is stored, is the room heated to maintain a minimum of 10°C?	Yes/No

APPENDIX F: GAS MANIFOLD CYLINDER CHANGE REGISTER

Date	Time	Signature	Printed Name	Bank Changed	Left Bank Pressure	Right Bank Pressure	Running Bank	ERM Pressure	Line Pressure	Remarks

This log Sheet is to be completed **after** each cylinder change

Note: On each cylinder change, the complete or left/right bank should be changed!

APPENDIX G: MEDICAL GAS CYLINDER STORE

Signage and labelling (including Hazchem signs)

Extract from HTM 02-01 Medical Gas Pipeline Systems

The following signs should be posted:-

Safety signage (Hazchem notices) in accordance with the requirements of the Health & Safety (Safety Signs & Signals) Regulations 1996, BS 54995:2002 and the Health and Safety at Work etc Act 1974 should be posted in and outside any area where cylinders are stored.

Commented [GI(RJAAHO1]: 54995 has been withdrawn, I believe BS ISO EN 7010 might be more appropriate

A store identification notice. Suitable wording could be: “Medical gas storage area – smoking, welding and naked lights prohibited”.

A store contents notice, clearly indicating the contents of the store.

A medical gas cylinder identification chart and other relevant safety warning charts, posted inside the store.

An “emergency actions” notice, giving details of emergency action procedures and location of keys and contact numbers, should be clearly posted on the front of the cylinder store.

APPENDIX H: COMMUNITY HOSPITALS OXYGEN MANIFOLD SAFETY & OPERATING PROCEDURES

***** PLEASE FAMILIARISE YOURSELF WITH THESE INSTRUCTIONS *****

Estates Helpdesk Telephone: 01785 221333

Estates Emergency Out-of-Hours: 07850 771882

H.1 Introduction

Your site is provided with a Medical Gas Pipeline System (MGPS) that provides oxygen at terminal units positioned by some or all bedheads. The means of supply consists of the multi-cylinder manifold system with automatic changeover, the pipeline distribution network, emergency isolation valves at the entrance to the department, terminal units on the wall or ceiling mounted pendants and the plant and pipeline pressure alarms.

An emergency manifold will supply oxygen in the event of total failure or exhaustion of the main manifold. In this situation the system must be continuously staffed and help summoned immediately.

MGPSs are used to provide a constant supply of medical quality oxygen for use in the treatment of patients.

Hazards from the system arise from the properties of the gas, the pressurised pipe system, the potential for misuse, technical failure, inappropriate or incompetent maintenance or alterations, manual handling and incorrect storage.

Patients will be put at risk should the supply of medical gas or suction fail unexpectedly, or the quality of the supply be compromised.

You will receive practical training in the use of the system.

H.2 Procedures

Connecting and Removing Oxygen Flow Meters

Terminal units are provided at each bedhead in some Community Hospitals and at certain beds or between two beds in others. In order to obtain a supply of oxygen a flow meter must be connected;

Hold the flow meter upright and press into the terminal, twisting slightly (if necessary) to align the engagement collar. The terminal unit will then retain the flow meter. Open the adjusting knob on the top of the meter to obtain the desired flow rate.

To remove, hold the flow meter and press the bezel ring on the terminal unit with the other hand; the flow meter will be released and there will be a slight discharge of pressurized oxygen which should soon stop.

Basic Safety

Never hang any equipment on the flow meter as they are quite easy to break and this will also damage the terminal unit.

Turn off flow meters when not required; this will prevent bed linen becoming saturated with oxygen. Be particularly vigilant where any patients are likely to attempt to smoke. Oxygen is not flammable but will vigorously support combustion.

Changing Cylinders on a Manifold

Unexpected loss of medical gas service will immediately place patients at risk. Incorrect cylinder storage and changing procedures can affect the continuity of supply from the manifold. Full gas cylinders can hold compressed gas at pressures of 137 bar or more.

If dropped, damaged, exposed to fire or otherwise misused, the results can be catastrophic. Unexpected release of the compressed gas can result in serious injury. The store is a no smoking area. Both oxygen, nitrous oxide and entonox vigorously support combustion and are highly dangerous when in contact with oils, grease, tarry substances and many plastics. **Keep them away from sources of ignition.** Never use lubricants on valves or connections.

Wipe your hands clear of alcohol gel before touching cylinders or regulators.

The cylinders used on the manifolds are very heavy. You must have attended a Manual Handling Course. If not transported and stored correctly, smaller cylinders are easily damaged.

Wear gloves and steel toe capped boots.

Full cylinders must be segregated from empty cylinders in storage areas in order to prevent empty cylinders being inadvertently connected to manifolds and also to reduce the risk of stock control errors. Only cylinder types relevant to the manifolds should be stored in the manifold room.

Gas leakage can present a fire risk if ignition sources are present. Connections must be tested for leakage after cylinders are connected to manifolds. Use a compatible leak detector spray (for advice contact suppliers or AP (MGPS)). Faulty cylinders must be identified and removed from service immediately.

Cylinder Valves: J sized cylinders are used in the oxygen manifolds; these have pin-index valves. This is part of a system of gas-specific valves that have been devised in order to ensure that only the correct gas cylinders can be connected to manifolds and equipment. A removable operating key is required in order to open the valve.

Basic Cylinder Storage and Handling

Cylinders must be secured in the storage racks by the restraining chains in order to stop them falling over.

Full and empty cylinders must not be mixed.

Keep the store tidy, do not discard plastic seals on the floor, do not use it as a store for other materials.

Leave the operating keys and leak detection fluid available for the next person's use.

Fill in the log book; a record of how often cylinders are changed is essential.

Report damage, connection problems, lack of tools, detection fluid etc. to your supervisor.

When moving cylinders from the storage rack to the manifold; use only the correct type of trolley. For short distances cylinders may be "churned". To churn a J sized cylinder it should be tilted slightly while in a vertical position and the cylinder rotated so that it will travel along in a controlled manner. It is essential that the cylinder is always under control and should not be tilted too far. Churning should only be undertaken by experienced staff who have undergone training. Do not attempt to pick them up.

Defective Cylinders

Faulty valve operation, damaged valve outlet, leaks, under-filled contents, empty cylinder (when labelled as full), doubts about the gas identity - these are all possible defects.

If you suspect any of these, place the cylinder in the empty storage rack, label with defective cylinder label and inform your supervisor immediately.

Pharmacy and Estates will be informed by the Supervisor. In cases where patients have or could be placed at risk an incident report will be completed by the Pharmacy Dept. The cylinder supplier will also be informed by the Estates Dept. Details of the batch number, filling date, expiry date, cylinder size code and gas must be retained.

Manifolds

These provide a constant supply of gas even in the event of electricity supply failure.

Two main banks each of six cylinders are connected to the supply system through an arrangement of automatic changeover valves, pressure reducing valves and pressure monitoring equipment.

A display panel indicates the current state of the system; pressure gauges indicate the reserve of gas available and the supply pressure. Pressure initiated alarms are displayed locally and also remotely at the point of use.

In addition an emergency reserve manifold is also provided. This only comes into use should there be a total failure of the main manifold system or when maintenance of the main panel is being carried out. This part of the arrangement does not have automatic changeover and continuous attendance is required. Before operating this you must have received appropriate training.

DO NOT OPEN OR SHUT ANY OF THE LEVER OPERATED VALVES ON THE MANIFOLD AND PIPELINES. THIS ACTION MAY RESULT IN LOSS OF OXYGEN SUPPLY TO THE WARDS.

Connecting Cylinders to a Manifold

The alarm system will show a "change cylinders" indicator with flashing yellow light and sounder. One bank will be displayed as "running" the other as "change" - this is the bank of cylinders to change.

Make sure that everything you will use is clean and free from oil and grease (including your hands).

Check that there are enough spare cylinders to change one bank.

Ensure that spare Bodock seals are available. (These are the small annular seals used to make the connection between cylinder valve and manifold – these become worn with use and are usually replaced at each service visit).

Visually check the condition of the manifold tail pipes and connections. If these appear damaged do not attempt to disconnect any cylinders but report the problem to your supervisor.

Shut the cylinder valves on the empty bank.

Disconnect the cylinders from the tailpipes -

For Oxygen, unscrew the clamp connection: **Be careful that the Bodock seal does not drop out**.

Release the securing chains one at a time and roll the empty cylinder to the "empty cylinder" section of the store.

Move the full cylinders and chain to the manifold. Remove the plastic valve covers.

Inspect the jointing faces, renew the Bodock seals if worn or damaged. Do not use more than one sealing washer at a time.

Connect the tailpipes to the cylinder valves, do not use excessive force. Do not use any lubricant.

Using the correct cylinder valve key, crack open the valve slowly in order to pressurise the tailpipe. If there is no sound of leaking, open the valve fully to its fullest extent and then back by a quarter turn. Repeat for all cylinders.

Check that the contents gauge is reading approximately 137bar for oxygen systems. The alarm system will return to "normal" indication.

Using a compatible leak detection fluid, test for leaks at the valve gland and tailpipe connections.

If it is not possible to stop a leak by re-tightening the connection, close the cylinder valve, release the pressure and fit a new Bodock seal. If this is still not successful, fit another cylinder and, if the leak has stopped, label the first cylinder as faulty.

Complete the log book, replace tools in the storage positions.

Responding to Alarms

General System Layout

There are two types of alarm system;

a) the **central alarm** system which receives signals from the main manifold; and,

b) the **area alarm** systems which are self-contained units monitoring pressure levels on the downstream side of AVSUs (The glass-fronted valve box for each ward). Area alarms provide indication of local gas pressure fault conditions.

Alarm Panel Display

All panels have green “power on” and red “system fault” indicators. (“System fault” indicates loss of mains supply or communications)

Indication of an alarm is by a flashing signal lamp that is lettered to describe the fault. An audible alarm is also provided.

Pressing the “mute” button will set flashing indicators to steady on the central alarm panel and repeaters but not on area alarm panels.

The mute function will automatically cancel after 15 minutes if the fault has not been cleared.

Further faults detected during a mute period will initiate the respective flashing indicator and audible alarm.

Action to be Taken on Receiving an Alarm

Central alarms –

The display legend indicates the nature of the alarm. The most likely response required is to go to the manifold room and change the cylinders on the empty bank. This action will restore the alarm to normal condition.

Table of central alarm panel indications, *reasons* and *required actions*

OXYGEN	N2O (if installed)	50/50 (if installed)	MA/SA (if installed)	Vacuum (if installed)		**GAS**
Normal						**Steady Green Light**
Change cylinders						**Flashing yellow light + sound**
Change cylinders **immediately**						**Flashing yellow light + sound**
Reserve low e.g. *pressure in standby system down to 50% contents* ***Inform Estates***						**Flashing yellow light**
Pressure Fault e.g. *system pressure 20% above or 10% below normal* ***Inform Estates***						**Flashing red light + sound**

Table of local alarm panel indications, reasons and required actions

OXYGEN	N2O (if installed)		**GAS**
Normal			**Green Lights**
HIGH PRESSURE *Pipeline pressure 20% above normal* ***Inform Estates***			Red lights flash and **alarm sound**
LOW PRESSURE *Pipeline pressure 10% below normal* ***Inform Estates***			Red lights flash and **alarm sound**

Medical gas pipeline systems are very reliable. Apart from the first indicated condition on a central alarm panel e.g. changing the cylinders on manifold systems, all alarms must be referred to Estates who will initiate appropriate action.

H.3 Maintenance

Servicing, repairs or alterations will only be carried out by appropriately qualified staff. Any faults must be reported to Estates as a matter of urgency.

A Permit to Work System will be used to control the activity. This will minimise risks by:-

- Ensuring continuity of supply by preventing inadvertent interruption of medical gas supplies without the knowledge and permission of those responsible for the ward/department.
- Preventing the cross connection of medical gas supplies
- Preventing damage to equipment and danger to patients by gases supplied at excessively high or low pressures
- Preventing the supply of in correct or contaminated gases to patients
- Providing a formal system of acceptance of a system back into service.

The AP will communicate with the Site Manager/Senior Nurse and advise the expected duration of the work and the number of services that will be involved. Where patients requiring medical gases will remain in the department, alternative temporary, supplies will be arranged.

Before work is started the Site Manager/Senior Nurse will sign the permit to work to release the system for maintenance/repair.

The work will be carried out by Estates-appointed specialist contractors.

H.4 Emergency Situations

Leakage/Fire

In the event of major leakage or fire in a ward area the oxygen supply can be turned off by breaking the glass and operating the valve contained in the valve box labelled for each ward.

Minor leakages from the ward wall terminal unit connections should be reported as a maintenance request and are unlikely to require immediate action. If oxygen is not required, removing the flow meter will allow the automatic valve in the terminal unit to shut, stopping the leak.

Electricity Failure

In the event of partial or total electricity failure the system will continue to supply oxygen.

The alarms have battery backup and will display a “loss of mains supply” fault only.

Abnormally High Oxygen Use

It is essential that usage is monitored each day in order that replacement cylinders can be ordered in good time.

Provision is made for the storage of spare cylinders; the intention being that a reorder is placed as soon as six are used, thus there should always be six spare cylinders.

Excessive usage should be reported as a fault allowing an investigation to be made.

WHEN IN DOUBT CONTACT ONE OF THE AUTHORISED PERSONS FOR ADVICE,