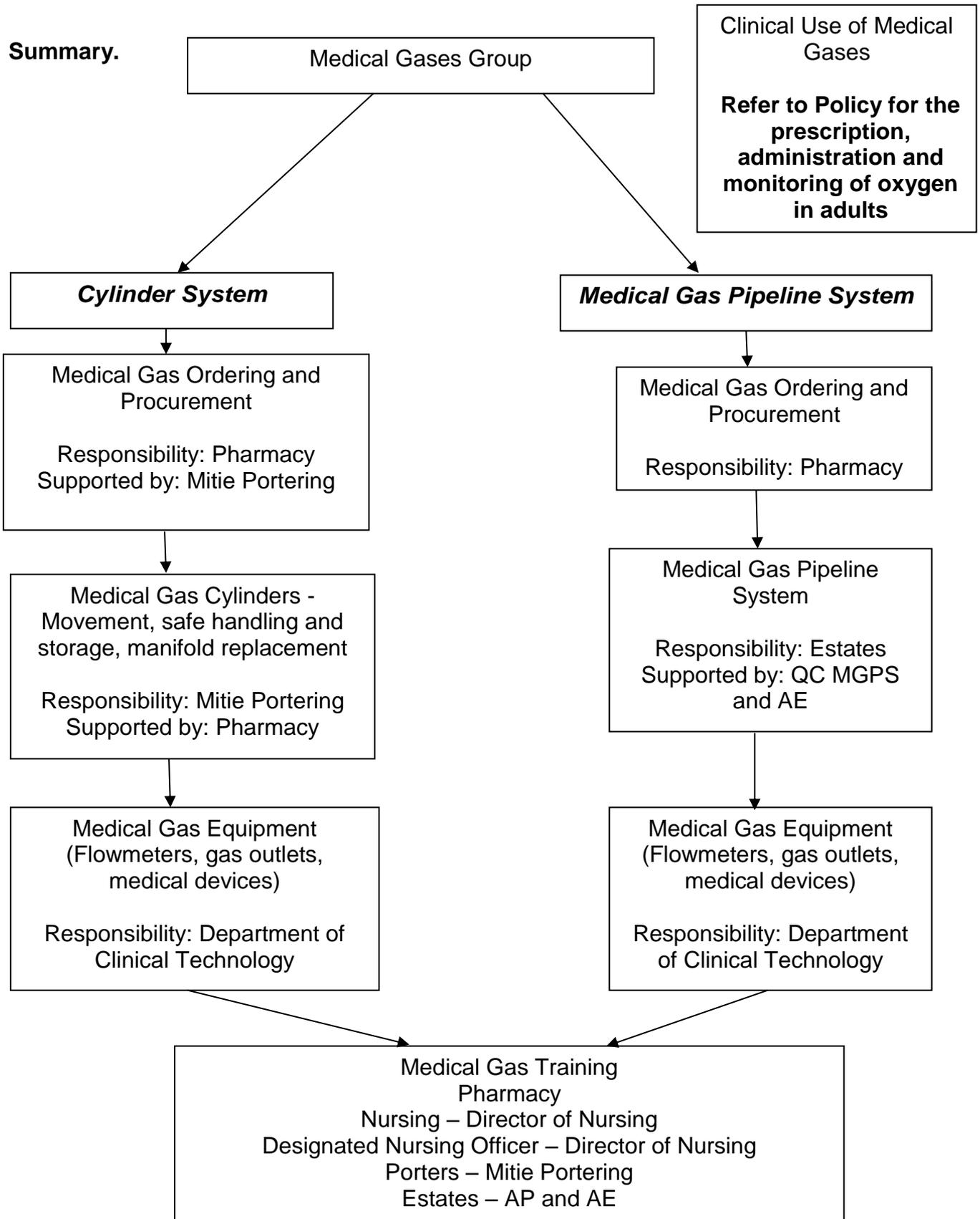


# **Policy for Medical Gas Pipeline and Cylinder Management**

**V14.0**

**April 2017**

**Summary.**



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## Introduction

1.1. Medical Gases are vital for the safe and effective care of our patients.

1.2. Medical Gases are provided to patients either via a pipeline supply or via cylinders.

1.3. Medical Gases impact on many areas within the hospital. This document is of particular importance to the following staff groups; Anaesthetics, Pharmacy, Nursing, Risk & Safety, Portering, Department of Clinical Technology and Estates.

1.4. This version supersedes any previous versions of this document.

## 2. Purpose of this Policy/Procedure

2.1. This policy addresses the provision of Medical Gases by Medical Gas Pipeline System (MGPS) and cylinder use at Royal Cornwall Hospitals NHS Trust; Royal Cornwall Hospital, Truro, West Cornwall Hospital, Penzance and St Michael's Hospital, Hayle sites, to ensure continuity of supply of medical gases at all times.

2.2. Development of this policy and its supporting protocols ensure compliance with:

- 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
- Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 2013
- Control of Substances Hazardous to Health (COSHH) Regulations 2002
- Pressure Equipment Regulations 1999
- Pressure Systems Safety Regulations 2000
- Highly Flammable Liquids and Liquefied Petroleum Gases Regulations 1972
- Medicines Act 1968 (amended 2013)
- Manual Handling Operations Regulations 1992 (as amended 2002)
- Personal Protective Equipment at Work Regulations 1992
- Electromagnetic Compatibility Regulations 2005
- Electricity at Work Regulations 1989
- Other guidance applicable to medical gas pipeline systems
- Health Technical Memorandum 02-01 – 'Medical gas pipeline systems':
  - Part A: Design, installation, validation and verification
  - Part B: Operational management
  - HTM 02 01
  - Dental Air HTM0201 Part A Chapter 8 Para 8.10
  - Dental Vacuum HTM0201 Part A, Appendix L Para 5
  - AGS (Dental) HTM0201 Part A, Appendix L Para 8-10
- National Health Service Model Engineering Specification C11 – 'Medical gases'
- European Pharmacopoeia standards for medical gases, including medical
  - compressed air
- Royal Cornwall Hospitals Trust Health and Safety policy
- Royal Cornwall Hospitals Trust Fire Safety policy

### 3. Scope

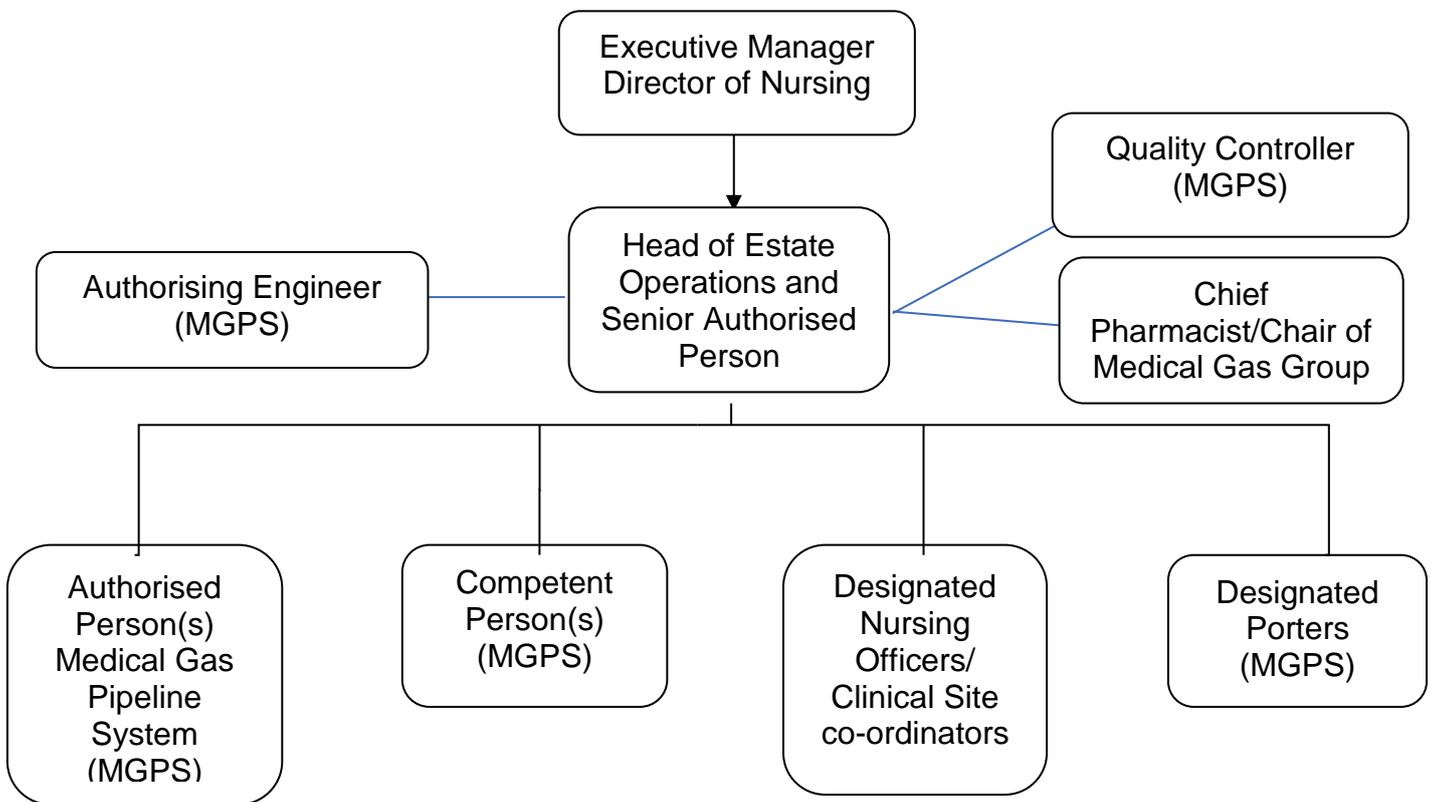
3.1. This document outlines how Medical Gas Pipeline Systems and Cylinders will be managed on all Royal Cornwall Hospitals NHS Trust sites, it is intended for use by all staff engaged in the use of medical gases on Royal Cornwall Hospitals Trust sites.

### 4. Definitions / Glossary

- VIE- Vacuum Insulated Evaporator
- Entonox - is a trade name for one suppliers Oxygen/Nitrous Oxide mix. For ease, the term is used throughout the policy but applies to all suppliers.
- HTM – Health Technical Memorandum
- Mitie – Mite Clean Environment are the Soft Facilities Management contractor

### 5. Ownership and Responsibilities

Organisation Structure



### **5.1. Chief Executive / Executive Manager**

- Ultimate management responsibility for the medical gas pipeline system rests with the Royal Cornwall Hospitals Trust Chief Executive.
- The chief executive herein delegates day-to-day management responsibility for the medical gas pipeline system to Director of Nursing
- The chief executive herein delegates written appointment of Senior Authorised Person (MGPS) to Head of Estates.

### **5.2. Authorising Engineer (MGPS)**

The Senior Authorised Person (MGPS) will appoint and Authorising Engineer (MGPS). The Authorising Engineer is an accredited external contractor appointed by the Chief Executive.

The duties and responsibilities of the Authorising Engineer are:

- to recommend to the Head of Estate Operations those persons who, through individual assessment, are suitable to be Authorised Persons (medical gas pipeline system);
- to ensure that all Authorised Persons (MGPS) have satisfactorily completed an appropriate training course;
- to ensure that all Authorised Persons (MGPS) are re-assessed every three years and have attended a refresher or other training course before such re-assessment;
- to review the management systems of the medical gas pipeline system, including the permit-to-work system;
- to monitor the implementation of the operational policy and procedures.

### **5.3. Authorised Person (MGPS)**

Authorised Person(s) (MGPS) are required for all Royal Cornwall Hospitals Trust sites. The Authorised Person(s) (MGPS) and their work base are listed in Annex 2. The Director of Estates and Facilities is responsible for ensuring that the Authorised Persons (MGPS) assume effective responsibility for the day-to-day management and maintenance of the medical gas pipeline system.

The duties and responsibilities of Authorised Persons (MGPS) are:

- to ensure that the medical gas pipeline system is operated safely and efficiently in accordance with the statutory requirements and guidelines;
- to manage the permit-to-work system, including the issue of permits to Competent Persons (MGPS) for all servicing, repair, alteration and extension work carried out on the existing medical gas pipeline system;
- to supervise the work carried out by Competent Persons (MGPS) and monitor the standard of that work (a register of Competent Persons (MGPS) must be kept);
- to ensure that the Royal Cornwall Hospitals Trust medical gas pipeline system maintenance specification and schedule of equipment (including all plant, manifolds, pipework, valves, terminal units and alarm systems) are kept up to date;
- to liaise closely with Designated Nursing/Medical Officers, the Quality Controller (MGPS) and others who need to be informed of any interruption or testing of the medical gas pipeline system;
- in accordance with the Royal Cornwall Hospitals Trust policy on provision of services, provide advice on the provision and/or replacement of medical gas

pipeline system central plant and associated systems. The Estates Department will hold overall responsibility for the provision and maintenance of medical gas pipeline system services at all the Royal Cornwall Hospitals NHS Trust sites.

- to organise such training of Estates staff (and other staff if requested) and/or transfer of medical gas pipeline system information as is needed for the efficient and safe operation of the medical gas pipeline system.

#### **5.4. Competent Person (MGPS)**

All Competent Persons (MGPS) are craft persons, employed by the Royal Cornwall Hospitals Trust or their nominated medical MGPS contractor.

The duties and responsibilities of Competent Persons (MGPS) are:

- to carry out work on the medical gas pipeline system in accordance with the Royal Cornwall Hospitals Trust maintenance specification;
- to carry out repair, alteration or extension work as directed by an Authorised Person (MGPS) in accordance with the permit-to-work system and Health Technical Memorandum 02-01;
- to perform engineering tests appropriate to all work carried out and inform the Authorised Person (MGPS) of all test results;
- to carry out all work in accordance with the Royal Cornwall Hospitals Trust Health and Safety Policy.

#### **5.5. Quality Controller (MGPS)**

It is the responsibility of the Chief Executive to appoint, in writing, on the recommendation of the Chief Pharmacist, a Quality Controller(s) with medical gas pipeline system responsibilities.

The Authorised Person (MGPS) will be responsible for liaising with the Quality Controller (MGPS) and organising attendance as required.

The duties and responsibilities of the Quality Controller (MGPS) are:

- to assume responsibility for the quality control testing of the medical gases at the terminal units (that is, the wall or pendant medical gas outlets) and plant test points;
- to liaise with the Authorised Person (MGPS) in carrying out specific quality and identity tests on the medical gas pipeline system in accordance with the permit-to-work system, HTM02 and relevant Pharmacopoeia standards;
- receive training on the verification and validation of medical gas pipeline system and be familiar with the requirements of this medical gas pipeline system operational policy and HTM02.
- To be registered on the National Register of QC (MGPS)

#### **5.6. Chief Pharmacist**

- To recommend a suitable Quality Controller (MGPS), as described above.
- To take an active role in the management of medical gas cylinders.

#### **5.7. The Pharmacy department**

The Pharmacy department at the Royal Cornwall Hospital is responsible for:

- Contracting for, ordering, receiving, storing and supply (via Portering, Estates and Supplies services) of medical gases and special gas mixtures
- Receive delivery notes for compressed gas cylinders, check against invoices received and pass invoices for payment

- Maintaining a record of cylinder rental charges and pass rental invoices for payment;
- Ensuring that cylinder gases comply with Ph. Eur. requirements;
- Ensuring that other gases and gas mixtures comply with manufacturers' product licences;
- Investigating incidents involving cylinders;
- Undertaking routine inspections of medical gas cylinder stores so as to ensure conformance with HTM02-01

### **5.8. Designated Nursing Officer and Site Co-ordinators for Medical Gases**

Responsibility for granting permission for all levels of hazard of work lies with the ward manager/ward sister for the department/area.

The duties and responsibilities of the Designated Nursing Officer are:

- To liaise with the Authorised Person (MGPS)
- To give permission for medical gas supplies to be interrupted in their area.
- To ensure that additional staffing are obtained, if required, in conjunction with the Clinical Nurse Manager
- To be aware of what to do in an emergency i.e. shut down required due to fire, triage of patients as a result of interruption of supply etc
- To ensure their staff are trained to manage emergency situations and continuation of care of their patients.
- To ensure that their team have access to Action Cards to guide management of emergency situations. Action Card template located in Major Incident Plan on hospital document library.

The Clinical Site Co-ordinators may have to undertake this roll in the absence of the DNO outside of normal working hours.

### **5.9. Designated Porters (MGPS) [as delegated by Accounts Director of Mitie as per soft facilities management contract].**

Designated Porters (MGPS) with particular responsibilities for medical gases, will have undergone specialist training in the identification and safe handling and storage of medical gas cylinders, including relevant manual handling training.

Note: Theatres, Imaging and the Emergency Department will require a Designated Porter (MGPS) for they fulfil these roles in their areas.

Designated Porters (MGPS) on the RCH site will undertake the following duties:

- assist with the delivery of gas cylinders by the supplier;
- deliver full gas cylinders from the cylinder store(s) to clinical areas and return empty cylinders to these stores ensuring full and empty cylinders are clearly segregated;
- Check off receipts and transfer gas delivery notes from the delivery driver to Supplies staff in the Goods Inwards / Bulk Fluid store;
- attach to and remove from cylinders, medical equipment regulators (or regulator/flowmeter combinations) and manifold tail-pipes;
- identify, label and remove from service, faulty (eg leaking) cylinders and subsequently notify Supplies staff of the location of such cylinders;
- perform twice weekly (Monday / Thursday) checks on cylinder stocks at Trelawny and Princess Alexandra Wing gas stores and request full for empty

replacements to be ordered. Emergency orders can be placed out of hours by referring to Mitie procedures.,

- ensure rotation of stock (first in – first out) so that all cylinder contents are used within the three-year fill/refill timescale specified by the gas supplier.
- ensure stores are safe, secure and free from rubbish and combustible materials following every visit

The Designated Porters (MGPS) must work safely at all times, using the appropriate personal protective and manual handling equipment, damage to which must be reported immediately to Hotel Services Manager.

### **5.10. Estates Department**

- a contact point for emergencies connected with the Medical Gas Pipeline System
- Provision of Authorised and Competent Persons (MGPS)
- holds the keys to the isolating valves (area valve service units)
- holds the record drawings of the medical gas pipeline system.

### **5.11. Department of Clinical Technology**

Responsible for the maintenance and calibration and supply of Regulators, Flowmeters, Suction Units and High Pressure systems (including hoses) connected to Medical Devices. To provide technical advice to those responsible for the purchase of any medical equipment which will be connected to the medical gas pipeline system in order to avoid insufficient capacity and inadequate flow rates;

### **5.12. Mitie, on behalf of the Pharmacy service will:**

- Undertake twice weekly stock checks of the main Pharmacy Gas store (Tower).
- Place orders for the authorised gas stores on site.
- Receive delivery notes for compressed gas cylinders ready for reconciliation /payment;

### **5.13. Line managers**

Line managers are responsible for ensuring staff they manage that use/handle medical gases are appropriately trained as per the Trust and professional guidance and are competent to carry out their role.

- Ensuring medical gases in their area are appropriately stored.

### **5.14. Role of the Medical Gas Group**

The Medical Gas Group is responsible for:

- To prepare and maintain the operational policy and procedures relating to the purchase, storage and use of gases at the Royal Cornwall Hospital.
- To prepare detailed risk assessments of the various activities involved in the purchase, storage and use of medical gases so as to enable priorities for action to be set.
- To advise the Trust on matters relating to gases.

- Review Trust incidents relating to medical gases and provide advice to prevent a recurrence.
- To act as a source of advice and information to gas users at the Royal Cornwall Hospital.
- To ensure that the recommendations are acted upon in a timely manner.
- The nominated chairperson for the group shall ensure minutes of meetings, policy review details and meeting schedules are reported to the Medication Practice Committee.

### **5.15. Role of Individual Staff**

All staff members are responsible for:

- Attending the appropriate training relevant to their role
- Ensure they are competent to undertake the role.

## **6. Standards and Practice**

### **6.1. Medical Gas Pipeline System record drawings and documentation**

6.1.1 The Authorised Person (MGPS) will maintain copies of the following

- Up-to-date and accurate as-fitted record drawings (including valve/key numbers/ terminal unit identification) for all medical gas pipeline system;
- Service contracts and emergency numbers.
- Any necessary medical gas pipeline system insurance/statutory documentation;
- Medical gas pipeline system safety valve replacement schedule (on a five-yearly basis);
- New and completed permit-to-work books for work on the systems;
- Plant history/maintenance records;
- Manufacturer's technical data sheets/operational and maintenance manuals for all medical gas pipeline system components;
- Health Technical Memorandum 02, all latest editions of any associated supplements and NHS Model Engineering Specifications;
- Medical gas pipeline system contractors' service contracts and ISO 9001 (or equivalent) certificates, staff training records, equipment calibration certificates (copies);
- A list of all personnel associated with the medical gas pipeline system, such as the Authorised Person and Competent Person registers;
- Emergency and other useful telephone numbers;
- Medical gas pipeline system staff training records;
- Calibration certificates of test equipment;
- The medical gas pipeline system operational policy and emergency procedures
- Details of the Quality Controller

6.1.2 Pharmacy will maintain copies of the following:

- delivery notes for medical gas cylinders;
- sales invoices for medical gas cylinders;
- delivery summary form (tracks cylinder stock information);
- cylinder rental invoices;
- cylinder rental reconciliation form (monitors trends in cylinder use over six months);
- delivery notes for special gas and industrial gas cylinders;
- sales invoices for special gas and industrial gas cylinders;

- rental invoices for special gas and industrial gas cylinders.

## **6.2. Training**

- It is essential for the safety of patients that no person should operate, or work on, any part of a medical gas pipeline system unless adequately trained and supervised. Medical gas pipeline system training at all Royal Cornwall Hospitals Trust sites for all Estates staff is administered by the Senior Authorised Person.
- A record of those trained is kept within the relevant department.
- It is the duty of departmental managers to ensure that all staff working with the medical gas pipeline system are appropriately trained.
- The chief pharmacist will ensure any QC (MGPS) has the appropriate training in place.

## **6.3. The Medical Gas Pipeline System structure**

### 6.3.1 Description of services: Full schedule of Plant held and maintained by Estates.

#### **At Royal Cornwall Hospital**

##### **OXYGEN**

- VIE 1 – Duty and reserve Vacuum Insulated Evaporator (VIE) near Trelawny Block with distribution pipes to Trelawny and Tower/Princess Alexandra Wing. Vacuum Insulated Evaporator owned and maintained by the external contractor/supplier.
- VIE 2 - Duty and reserve Vacuum Insulated Evaporator (VIE) to near the rear of East Tower block with distribution to the main pipeline. Located outside the back of the Tower block adjacent to the 'banjo' car-park. Vacuum Insulated Evaporator owned and maintained by Air Products.
- Valve arrangements in place to separate the supply system. Standard arrangement provides VIE 1 supplying Trelawny Wing and VIE 2 supplying Tower Block and Princess Alexandra Wing.

Emergency contact numbers held by Estates and on-call engineers out of hours. Capacity held for twelve days in main Vacuum Insulated Evaporator and six in reserve.

##### **MEDICAL AIR (7 Bar)**

- Triplex installation located in the Medical Gas Plant Room, Connected to main 7 Bar Air pipeline. Serves the entire clinical site.
- 2 x 6 cylinder manifold reserve with 18 spares held on site.
- Air distributed at 7 bar with local reducers providing 4 bar air. Standby manifold will last for 12 hours at normal usage rate.
- Triplex installation located in Peninsula Dental School, covering the Peninsula Dental School Only

##### **VACUUM**

- Duplex installation located in the Medical Gas Plant Room Connected to main Vacuum pipeline but valved to serve only Tower Block.
- Triplex installation located in Princess Alexandra Wing, Connected to main Vacuum pipeline but valved to serve only Princess Alexandra Wing.

- Quadruplex installation located adjacent to Sub Station 6, Connected to main Vacuum pipeline but valved to serve only Trelawny Wing.
- Simplex Installation located in Clinical Oncology (Sunrise Building), covering Clinical Oncology Only
- Quadruplex installation located in Peninsula Dental School, covering the Peninsula Dental School Only

#### NITROUS OXIDE

- 2 x 5 cylinder manifold with 2 x ESU sited in gas store area. This serves entire site.

#### ENTONOX

- 2 x 5 cylinder manifold with 2 x ESU in plantroom outside Princess Alexandra Maternity Wing. Serves delivery suite only.

#### CARBON DIOXIDE

- 2 x 4 cylinder manifold serving General Theatres 4&5 only
- 2 x 4 cylinder manifold serving Trelawny Theatres 8 & 9 only
- 2 x 4 cylinder manifold serving Endoscopy, Tower block

#### ANAESTHETIC GAS SCAVENGING SYSTEM (AGSS)

Anaesthetic Gas Scavenging System pumps – provided locations below.

- General Theatres 1-5 (Duplex)
- Trauma Theatres 6-9 (Duplex)
- Ophthalmic Ultra Clean Theatres 10 & 11 (Duplex)
- Day Surgery Theatres 12 & 13 (Duplex)
- Dental Theatre (Simplex)
- CT Scanning Department (Duplex)
- Maternity Delivery Suite (Simplex)
- ED, XRay and Cath Labs (Duplex)
- Endoscopy & Sennen Wards (Simplex)
- Clinical Oncology (Simplex)
- MRI Scanning Department (Simplex)
- XRay Tower Block (Simplex)
- Peninsula Dental School (Duplex)

#### GENERAL

- Alarms – local alarms for all theatres and ward areas. Plant alarms for both Oxygen VIEs, Air Plant, VAC plant (Not including Peninsula Dental School), Nitrous Manifold to porters and switchboard. Entonox manifold alarm to Delivery Suite. All Peninsula Dental School (PDS) Alarms to the PDA Reception.
- All keys, permit books held in the Estates Offices with the Authorised Persons.
- Drawings held in Estates main office.
- Access – via Estates pass key. Available from telephone switchboard in emergency.
- Emergency Contact – Weekdays – via Estates helpline, out of hours – via on call engineer through switchboard

#### **At West Cornwall Hospital**

- Oxygen – Vacuum Insulated Evaporator sited near nurse home, serves entire site. 2 x 6 manifold with additional J cylinders provides 24 hr emergency standby.
- Air – Duty standby compressors with 2 x 5 standby manifold sited in med gas plant room.
- Vacuum – duty/standby vac pumps provided in med gas plantroom
- Alarms – all remote to telephone switchboard.
- Nitrous Oxide – 2 x 5 manifold with 2 x ESU in med gas room.
- CO<sub>2</sub> 2 x 4 cylinder manifold serving theatres
- AGSS Theatres (Duplex) & Casualty Simplex

#### **At St Michaels Hospital**

- Oxygen – Vacuum Insulated Evaporator and reserve VIE adjacent to car park serves entire site. Standby reserve manifolds located adjacent to the VIE and in the Cylinder Manifold room
- Air – Triplex Installtion, with 2 x 5 standby manifold sited in med gas plant room.
- Vacuum – Duplex duty/standby vac pumps provided in med gas plantroom
- Alarms – all remotod to telephone switchboard.
- Nitrous Oxide – 2 x 5 manifold with 2 x ESU in med gas room.
- AGSS Theatres 1 & 2 (Simplex) & Theatres 3 & 4 (Duplex)

#### **6.4. Alarms**

A comprehensive alarm and monitoring system ensures that in the event of failure of the main supply, standby or emergency supplies are brought into use and key personnel are alerted. Alarms are provided at continuously staffed points within each site. Electrical power failure does not result in an immediate loss of medical gas supply, oxygen and nitrous oxide supplies will continue to operate and medical air systems have a reserve system with at least four hours capacity. (Note - these services are also supported by the site standby electricity supply generators)

#### **6.5. Permit to Work Systems**

- The Director of Estates and will ensure that the Permit to Work system described in HTM02 is implemented in full.
- No work involving alterations, extensions or maintenance is permitted until approval has been obtained from an Authorised Person and where required by HTM02, the Quality Controller.
- The permit book(s) will be kept by the Estates Operations Manager. On completion of work the system will be tested as defined in HTM02 by a registered QC(MGPS).
- All routine maintenance and testing procedures will be the subject of a Permit to Work. This will be issued by the Authorised Person who will ensure that either the work will not disrupt the supply or arrange alternative supplies.
- The Designated Nursing Officer, Head of Department or their deputy will authorise the work before commencement and on completion.
- Maintenance procedures will comply with HTM02, NHS Estates Notifications and manufacturers advice
- Other activities, particularly building work, near Medical Gas Pipelines systems will be regulated to control any risk to the system. The proximity of a Medical Gas Pipeline system will be noted in the pre-tender health and safety file

## **6.6. Security**

- All valves, will be secured to prevent use by unauthorised persons. The keys will be kept by the Estates Operations Manager - keys will be available 24 hours per day through the Estates on-call system.
- Central plant, bulk stores and manifold rooms will be kept secured with entry being restricted to trained staff. For key holders see appendix 3.
- General rules and conditions for control of lockable line valve assemblies  
Pipeline valves in ducts, risers, ceiling spaces etc. shall be secured in the normal operating position.

### **6.6.1 Access to valves**

- Under normal events, only the Authorised Persons (MGPS) using the appropriate key from Estates medical gases key cabinet should access area valve service units and any other locked line valve assemblies under control of a permit-to-work.
- The key cabinet contains a list identifying all area valve service units and locked lockable line valve assemblies, with corresponding key numbers. Key-holders are listed in Appendix 3.
- In the event of an emergency, access to the valve boxes and area valve service units may be gained by smashing the breakable glass fronts.
- A member of the nursing staff will perform this action after steps have been taken to ensure that no patient is compromised by isolation of the gas supply.

## **6.7. Area valve service units (AVSU)**

- Locked boxes containing isolating valves in enclosures with breakable glass fronts (AVSU) are provided at the entrance to wards and departments.
- area valve service units provide;
  - facilities for both routine and emergency isolation of gas supplies.
  - contain an emergency inlet port, which is gas specific
  - may be used to supply gas to a ward when the main supply fails if Non Interchangeable Service Terminals (NIST) are fitted or is shut down for essential engineering work.

**See Appendix 4 Emergency Procedure**

## **6.8. Cylinder storage**

- Risk and safety issues surrounding compressed gas cylinders are managed by holding such cylinders only in designated storage areas that have been approved for this purpose and that are operated in accordance with approved policies and procedures.
- Approval of a store will be given by the Director of Estates and Facilities.

Before approving a cylinder store the Director of Estates and Facilities shall take account of:

- advice from the Medical Gas Group and the Trust's Fire Safety Adviser.
- economic consequences of the intended cylinder holding
- clinical need for the store.
- procedures for using the store prepared by the store manager

- A cylinder store is any place where three or more full cylinders are kept in anticipation of need OR a place where three or more empty cylinders are held awaiting return.
- Every cylinder store shall be under the control of an officer whose name has been approved by the Director of Estates & Facilities. The officer responsible for each store shall ensure the store is used in accordance with Trust policies.
- Each site (Treliske, West Cornwall and St Michaels) has one main cylinder store.

## 6.9. Contractors

- Will comply with the Trust Safety Policy and Rules for The Control of Contractors. They will have BS EN ISO 9000 registration with the scope defined as design, installation, commissioning and maintenance of medical gas pipeline systems.
- Contractors site attendance reports will be signed by the Estates manager or representative who will then send them to the local Estates office. Copies will be kept with the site and central contracts files.
- Contact telephone numbers will be circulated to estates staff by the Head of Estates.

## 6.10. Routine procedures

Tasks called for by HTM02 or by this policy will be carried out in accordance with HTM 0201 and written Work Instructions, where conflict between HTM0201 and the written instructions exist HTM 0201 takes precedent unless written derogation has been applied and received. Derogations should be signed off by the executive lead (the Director of Nursing) and based on risk assessments. The table below shows the scope of each instruction identified and names the person responsible for writing the instruction and the person responsible for approving it. Work Instructions shall be made available in the Trust electronic document library as part of this policy.

## 7. Dissemination and Implementation

7.1. This policy will be available on the RCHT document library

7.2. All appropriate porters and estates staff will be trained in this policy as will any other member of staff that have a role in implementing this policy.

## 8. Monitoring compliance and effectiveness

Element to be monitored	Cylinder management HTM 02 Piped Medical Gas Systems – Undergo an annual audit of procedures under the direction of the Authorising Engineer (Medical Gas Pipeline System) Review of datix incidents
Lead	The Chair of the Medical Gas Group
Tool	BOC cylinder audit tool Datix
Frequency	Annual cylinder and HTM02 audit Ongoing review of datix incidents
Reporting arrangements	The Medical Gas Group

Acting on recommendations and Lead(s)	Required actions will be identified and completed in a specified timeframe
Change in practice and lessons to be shared	Required changes to practice will be identified and actioned within 6 months. A lead member of the team will be identified to take each change forward where appropriate. Lessons will be shared with all the relevant stakeholders

## 9. Updating and Review

9.1. All policy documents will be reviewed no less than every three years or shorter where appropriate.

9.2. Revisions can be made ahead of the review date when the procedural document requires updating. Where the revisions are significant and the overall policy is changed, the author will ensure the revised document is taken through the standard consultation, approval and dissemination processes.

9.3. Where the revisions are minor, e.g. amended job titles or changes in the organisational structure, approval will be sought from the Executive Director, and will be re-published accordingly without having gone through the full consultation and ratification process.

## 10. Equality and Diversity

This document complies with the Royal Cornwall Hospitals NHS Trust service Equality and Diversity statement.

### **10.1. Equality Impact Assessment**

10.2. The Initial Equality Impact Assessment Screening Form is at Appendix 2.

## Appendix 1. Governance Information

<b>Document Title</b>	Policy for Medical Gas Pipeline and Cylinder Management			
<b>Date Issued/Approved:</b>	13/02/2017			
<b>Date Valid From:</b>	13/02/2017			
<b>Date Valid To:</b>	13/02/2020			
<b>Directorate / Department responsible (author/owner):</b>	Alison Hill, Head of Pharmacy Supply Services			
<b>Contact details:</b>	01872 253531			
<b>Brief summary of contents</b>	The arrangements for the provisions of medical gases by pipeline or cylinder in the Trust			
<b>Suggested Keywords:</b>	Medical gases, oxygen, cylinders, gas, pipeline, medical gas			
<b>Target Audience</b>	RCHT		CFT	KCCG
	✓			
<b>Executive Director responsible for Policy:</b>	Director of Nursing			
<b>Date revised:</b>	13/02/17			
<b>This document replaces (exact title of previous version):</b>	Operational policy for medical gas pipeline systems and for cylinder gases			
<b>Approval route (names of committees)/consultation:</b>	Medical Gas Group, Medication Practice Committee			
<b>Divisional Manager confirming approval processes</b>	Director of Estates			
<b>Name and Post Title of additional signatories</b>	Alison Hill, Head of Pharmacy Supply Services, Chair of Medical Gas Group			
<b>Signature of Executive Director giving approval</b>				
<b>Publication Location (refer to Policy on Policies – Approvals and Ratification):</b>	Internet & Intranet	✓	Intranet Only	
<b>Document Library Folder/Sub Folder</b>	Estates/HealthAndSafety			
<b>Links to key external standards</b>	CQC			
<b>Related Documents:</b>	Refer to Section 2.2			

Training Need Identified?	Yes
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**Version Control Table**

<b>Date</b>	<b>Version No</b>	<b>Summary of Changes</b>	<b>Changes Made by (Name and Job Title)</b>
18 Nov 08	V12.0	Previous version history not known.	
10 Jan14	V13.0	Complete review of previous policy to accommodate the new oxygen tank arrangements	Iain Davidson (chief pharmacist)-on behalf of the Medical Gas Group
13 Mar 17	V14.0	Updates: change in arrangements due to facilities management contract with Mitie. Addition of new CO <sub>2</sub> manifold on site. Appendix 20 added.	Alison Hill (Head of Pharmacy Supply Services) on behalf of the Medical Gas Committee

**All or part of this document can be released under the Freedom of Information Act 2000**

**This document is to be retained for 10 years from the date of expiry.**

**This document is only valid on the day of printing**

**Controlled Document**

This document has been created following the Royal Cornwall Hospitals NHS Trust Policy on Document Production. It should not be altered in any way without the express permission of the author or their Line Manager.

## Appendix 2. Initial Equality Impact Assessment Form

Name of the strategy / policy / proposal / service function to be assessed (hereafter referred to as <i>policy</i> ) (Provide brief description): <b>Policy for Medical Gas Pipeline and Cylinder Management</b>	
Directorate and service area: Estates	Is this a new or existing Policy? Existing
Name of individual completing assessment: Iain Davidson	Telephone: 2591
1. Policy Aim* Who is the strategy / policy / proposal / service function aimed at?	Safe use of medical gases by RCHT staff
2. Policy Objectives*	Safe use of medical gases by RCHT staff
3. Policy – intended Outcomes*	Safe use of medical gases by RCHT staff
4. *How will you measure the outcome?	Audit
5. Who is intended to benefit from the policy?	Patients and staff
6a) Is consultation required with the workforce, equality groups, local interest groups etc. around this policy?  b) If yes, have these *groups been consulted?  C). Please list any groups who have been consulted about this procedure.	no

<b>7. The Impact</b>			
Please complete the following table.			
Are there concerns that the policy <b>could</b> have differential impact on:			
Equality Strands:	Yes	No	Rationale for Assessment / Existing Evidence
<b>Age</b>		<b>x</b>	
<b>Sex</b> (male, female, trans-gender / gender reassignment)		<b>x</b>	

<b>Race / Ethnic communities /groups</b>		<b>x</b>	
<b>Disability -</b> Learning disability, physical disability, sensory, impairment and mental health problems		<b>x</b>	
<b>Religion / other beliefs</b>		<b>x</b>	
<b>Marriage and civil partnership</b>		<b>x</b>	
<b>Pregnancy and maternity</b>		<b>x</b>	
<b>Sexual Orientation,</b> Bisexual, Gay, heterosexual, Lesbian		<b>x</b>	
<p>You will need to continue to a full Equality Impact Assessment if the following have been highlighted:</p> <ul style="list-style-type: none"> <li>• You have ticked “Yes” in any column above and</li> <li>• No consultation or evidence of there being consultation- this <u>excludes</u> any <i>policies</i> which have been identified as not requiring consultation. <b>or</b></li> <li>• Major service redesign or development</li> </ul>			
8. Please indicate if a full equality analysis is recommended.		<b>Yes</b>	<b>No</b> <b>X</b>
9. If you are not recommending a Full Impact assessment please explain why.			
This is a policy about medical gases and has no impact on equality or diversity			
Signature of policy developer / lead manager / director		Date of completion and submission 01/01/14	
Names and signatures of members carrying out the Screening Assessment	1. 2.		

**Keep one copy and send a copy to the Human Rights, Equality and Inclusion Lead,**  
c/o Royal Cornwall Hospitals NHS Trust, Human Resources Department, Knowledge Spa,  
Truro, Cornwall, TR1 3HD

A summary of the results will be published on the Trust’s web site.

Signed \_\_\_\_\_

Date \_\_\_\_\_

## Appendix 3. Contacts

### Authorised Persons

Senior Authorised Person (MGPS) Head of Estates Operations and Maintenance Estates Royal Cornwall Hospital Trust	01872 253400
Authorised Person(s) (MGPS) Estates Operation and Maintenance Technical Officers Estates Royal Cornwall Hospital Trust	01872 253400

### Quality Controllers

Pharmacy Quality Controller,  
Royal Cornwall Hospital 01872 253507  
Contracted service using individuals who are listed on the current Medicines Register of  
Quality Controllers (MGPS)

### Competent Persons

Estates Craftsman, Royal Cornwall Hospital 01872 253400

The Medical Gas contractors will also provide competent persons, Register of Competent  
Persons (MGPS) maintained by Authorised Person (MGPS)

### Key holders for Medical Gas Store Room / Manifold

Porter Supervisor, Royal Cornwall Hospital	01872 252468
Receptionist, West Cornwall Hospital	01736 874000
Receptionist, St Michaels Hospital	01736 758845
Estates Department	01872 253400

## **Appendix 4. SOP MG001: Emergency Procedure for Interruption of Medical Gas Supply**

The most senior Authorised Person will co-ordinate the response to an emergency situation.

### **1.0 Oxygen system**

#### **At the Royal Cornwall Site**

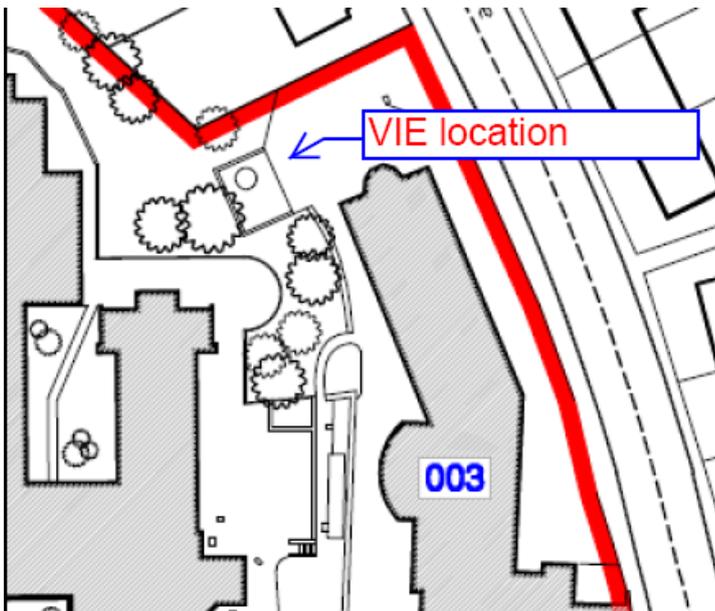
In the event of failure of one of the VIE oxygen supply tanks, the reserve will provide continued supply. Where both the primary and reserve tanks have malfunctioned, the second VIE compound will be used to supply the site. This will require some rebalancing of the system by the Authorised Person.

If there has been a local incident meaning a clinical area no longer has access to the oxygen pipeline from the main pipeline, the team co-ordinating the incident response will need to make the clinical decision on whether to transfer patients on oxygen to another clinical areas, or for the porters to provide a Backfeed trolley with cylinders to connect to the clinical area pipeline inlet, or lastly, individual cylinders for each patient.

#### **At the West Cornwall Site**

- The VIE compound houses the primary bulk oxygen vessel
- There is a medical gas bottle store as a secondary supply.
- There is no tertiary/reserve supply installation at WCH.
- At any time a relatively low number of patients are receiving oxygen (<5 from recent pharmacy audits) therefore emergency supply from the portable cylinders on site is quite feasible until either repairs are effected or the patients transferred to the RCH.
- Patients passing through the operating theatre and in recovery are not included in this, however, should there be a major interruption of oxygen supply arising from a fault or incident with the VIE or connecting pipeline then theatre activities would be brought to a rapid conclusion (WCH theatres deal only with low risk elective surgery) and portable G size cylinders used.

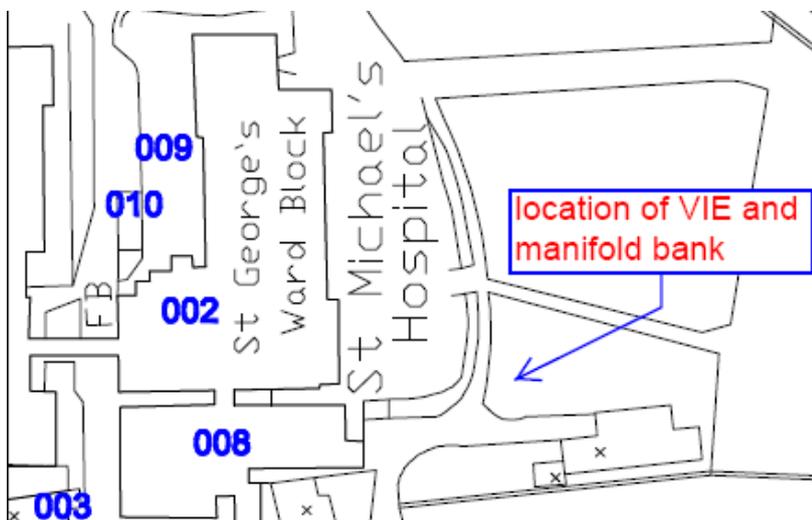
Diagram 1: Current location of WCH VIE compound.



**At the St Michaels Site**

- The VIE compound houses the primary bulk oxygen vessel and a manifold bottle bank in the VIE compound as secondary supply.
- There is a further manifold bank located in the hospital which would provide the reserve supply if required.
- There is a bottle store located on site.

Diagram 2: Current location of SMH VIE compound and manifold bank.



**Important:** Cylinder manifolds have limited capacity in relation to the normal Royal Cornwall Hospitals Trust demand supplied from a CLS, so additional manpower may be required in an emergency situation of this kind, both to change the cylinders on the manifold and to bring the replacement cylinders to the manifold.

Measures to reduce gas consumption may also need to be taken.

It is the duty of Portering to ensure that sufficient J-size cylinders are available to maintain the gas supply and that there is an emergency procedure in place for handling these cylinders.

## **2.0 Medical and surgical compressed air**

- The automatic manifold supporting the medical air plant will come on line automatically and will change banks automatically.
- Cylinder replacement will be the responsibility of Portering. Care should be taken to prevent transfer of oil/grease from the compressor plant to the manifold cylinder connections.

## **3.0 Nitrous oxide and Entonox**

- The nitrous oxide and Entonox automatic manifold systems are fitted with manually-operated emergency supply manifolds.
- These supply gas in the event of failure of, or loss of gas from, the main manifold.
- The emergency supply manifold will come on line automatically; it will not be necessary to open the emergency supply manifold main isolating valve to ensure that gas supply is maintained.
- When in use, it will not change from left to right cylinder banks automatically.
- Estates and Portering staff should be fully trained in the operation of the emergency supply manifold.
- Detailed instructions identifying which valves to turn and in which order shall be posted adjacent to each emergency supply manifold.
- Due to the limited capacity of the emergency supply manifold, it is essential that the pressure in the cylinders be monitored continuously while it is in use.
- Manual changeover from an almost empty to a full cylinder will be required. A full one must then replace the empty cylinder.
- It is the duty of Portering to ensure that sufficient cylinders are available to maintain the gas supply.

## **4.0 Medical Vacuum**

- The medical vacuum system has no emergency reserve manifold system.
- Failure of the plant for any reason will result in total failure of the vacuum service.
- The Trust has a small number of portable suction units held at ward level for use in emergency or planned works at a ward/department level.

## **5.0 Carbon Dioxide Manifold**

- All Carbon Dioxide installations incorporate a duty and reserve manifold arrangement with a number of spare cylinders at each location.
- Should there be a major interruption of Carbon Dioxide supply arising from a fault or incident with the manifolds or connecting pipeline whilst patient(s) are undergoing procedures in the operating theatre(s), then theatre activities would be brought to a rapid conclusion.

## **6.0 Emergency cylinder ordering procedure**

**Note:** General Stores will perform routine cylinder ordering based on required stock levels and weekly use. Portering will check stocks weekly and report any deficiencies to pharmacy. For emergency ordering, the following procedure should be followed:

- General Stores will telephone the emergency number of the medical gas supplier.
- General Stores will tell the medical gas supplier that “new issues” are needed, if no empties are to be returned.
- Upon delivery by the medical gas supplier, the duty porter should check the delivery against the request and sign the driver’s delivery note.
- The note should then be passed to pharmacy.

## **7.0 Failure of mains electricity supply**

In the event of an electricity failure, medical gas supplies should be maintained by the emergency generator system (the “essential” supply).

The surgical compressed-air plant, vacuum plant, oxygen system, all manifolds and medical gas alarm systems are connected to the “essential” electricity supply and will continue to provide and monitor gas supplies as normal.

In the event of failure of both mains and generator supplies:

- the oxygen system will continue to supply gas from its secondary supply manifold system;
- the vacuum plant will not operate, and central vacuum service will be lost;
- normal portable vacuum units can be used only if local electricity supplies are available.

Ejector- or battery driven units will have to be used where vacuum provision is essential for critical care;

- the air compressor will fail, but air will be supplied from the air emergency supply manifold;
- nitrous oxide and Entonox manifolds will continue to supply gas;
- alarm panels will display a “system failure” red warning light and give an audible alarm.
- If the electricity supply to an alarm panel only is interrupted, the panel will display a “system failure” red warning light and emit an audible alarm; gas supplies will not be affected.

In any of these events:

- the Authorised Person (MGPS) will be informed of the situation via the nursing staff/telephonist;
- Portering and Estates will arrange for staff to monitor manifold gas consumption, replacing empty cylinders as necessary until the electricity supply is restored;
- the Authorised Person (MGPS) will arrange emergency cylinder/regulator supplies as necessary;
- the Authorised Person (MGPS) will monitor the situation and confirm resetting of compressor and vacuum plant and system alarms following restoration of supply.

## **8.0 A serious leak of medical gases**

In these events:

- the duty porter and the Authorised Person (MGPS) will be contacted by the telephonist/duty nurse;
- details of the leak should be confirmed: that is, the floor level, department, room number, the gas or gases involved and whether patient ventilators are in use;
- outside normal working hours, the on-call engineer will notify the Authorised Person (MGPS);
- it is the responsibility of the duty nurse (Designated Nursing Officer) to carry out isolation of medical gases to the area after ascertaining that no patients will be put at risk in any area(s) affected by the isolation; the duty nurse will issue appropriate instructions to make the situation safe, such as to open windows in the affected area and close doors, in accordance with the Royal Cornwall Hospitals Trust fire policy;
- the duty porter will remain on stand-by to provide extra gas cylinders as required;
- the Authorised Person (MGPS) will arrange for repairs to the system(s) affected to be carried out under the permit-to-work system.

## **9.0 Total or partial failure of a medical gas supply**

In these events:

- the person discovering the failure will inform the telephonist and duty nurse immediately; the telephonist will inform the duty senior manager, the duty porter and the duty Authorised Person (MGPS) of the leak;
- details of the failure should be confirmed: that is, floor level, department, room number(s), the gas or gases involved and whether patient ventilators are in use;
- as a precautionary measure, the telephonist will also notify critical care areas that a failure has occurred on part of the system so that they are prepared in the event of the fault extending to their departments;
- it is the responsibility of the duty nurse to check which patients may have been put at risk by the failure and, if necessary, to arrange immediate emergency medical action; depending on the reason for the failure and its possible duration, the Authorised Person (MGPS) will decide the most appropriate method of long-term emergency gas provision. This may involve establishing locally regulated cylinder supplies at ward/department entrances;
- nursing and medical staff should attempt to reduce gas consumption to a minimum during the emergency;
- Porter staff will be required to monitor/replenish cylinders at any emergency stations and at plantroom emergency supply manifolds;
- pharmacy will arrange emergency cylinder deliveries as necessary;
- the Authorised Person (MGPS) will liaise with the Competent Person (MGPS) to complete emergency repairs needed to reinstate the gas supply, using the permit-to-work system;
- when the supply is fully restored, the Authorised Person (MGPS) will complete a Serious Incident form and produce a full report, which will be given to the Director of Nursing within 24 hours of the incident.

In situations where it is envisaged that there will be long-term loss of oxygen or medical air service, the duty senior manager will liaise with clinical colleagues, including the senior nurse manager, the medical director and the Authorised Person (MGPS). Departments should refer to their business continuity plans and consider the need for transfer of

critically ill patients internally within the Royal Cornwall Hospitals NHS Trust or to other Trusts as appropriate.

## 10.0 Contamination of a medical gas supply

- It is not unusual for a smell to be noticed when using “plastic” equipment hoses to deliver gas to a patient. This smell usually disappears rapidly after first use of the hose, and will generally be familiar to operatives.
- However, if either operatives or patients complain of any unusual or strong smells from equipment, the situation must be treated seriously and immediate action taken to ascertain the cause.
- Where it is obvious that the smell is coming from the pipeline rather than a piece of connected equipment, **the gas supply must not be used.**
- In such an event, the fault should be treated as a complete gas failure to that area and the actions described above taken **immediately.**
- It is very important that, if such an incident occurs, the telephonist advises **all** departments of the problem, especially critical care areas.
- Contamination of the medical vacuum system will usually be detected during routine maintenance inspection and evidenced by the presence of liquid in the on-line bacteria-filter drain flask. The infection control nurse should be informed immediately and should advise on any additional precautions to effect filter change safely.
- Portable suction units may be used in areas where there is a possibility of the vacuum system being contaminated.
- (The need for portable suction units should be discussed with the infection control officer.)
  - It is the responsibility of the Competent Person (MGPS) to change the filter in accordance with the procedure described in Health Technical Memorandum 02- 01 and any additional advice from the infection control officer.
- If the contamination is due to system misuse, the Authorised Person (MGPS) must complete an incident report form.
- Decontamination of pipework (if necessary) should be carried out in accordance with the procedure described in Health Technical Memorandum 02-01 before filters are changed.

## 11.0 Failure of an Anaesthetic Gas Scavenging System

- Failure of an Anaesthetic Gas Scavenging System results in spillage of gaseous/vaporised anaesthetic agents into the area of use of the system.
- In theatres, it is likely that staff exposure to the spilled gases will exceed the Occupational Exposure Limits (COSHH Recommendations) for exposure when working in the area for extended periods, even though ventilation rates are high.

- A local alarm “system fail” warning and failure of the air receiver flow indicator will indicate failure of the system.
- Both should be inspected by operating department staff on a regular basis.
- The Authorised Person (MGPS) and the theatre manager will be informed of the failure by the theatre technician/operating department practitioners and all attempts should be made to reduce staff exposure, if operations continue with a failed system.
- When repairs have been completed (under a permit-to-work signed by the theatre nurse manager, or their nominated deputy), theatre staff should be made aware (by the person signing off the permit-to-work) that the system is back in use.

### **12.0 Over- or under-pressurisation of one or more gas systems**

- Local alarms are designed to indicate when system pressure(s) is/are outside the normal operating range.
- Excessively high or low pressures may cause medical equipment to malfunction.
- The duty nurse should report all instances of local alarm operation to the telephonist.

### **13.0 Emergency isolation of a gas supply**

#### **Fire**

Procedures in accordance with the Royal Cornwall Hospitals Trust fire policy should be followed in the event of a fire involving, or likely to involve, the medical gas pipeline system.

During a fire, the senior brigade officer will assume full control of the area(s) affected.

**Under no circumstances should medical gas supplies be isolated until the Designated Nursing Officer has confirmed that all patients likely to be affected have been evacuated and/or have alternative gas provision.**

## Appendix 5. Work Instruction MG002- Action to be Taken on Receiving an Alarm

1.1 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.

A dedicated Central Alarm system is installed for all MGPS Plant and Manifold supplies, with the exception of Carbon Dioxide. Carbon Dioxide manifolds supply specific localised theatres and is alarmed through a local alarm arrangement. The dedicated Central Alarm is located in the Switchboard and monitored by the Switchboard staff 24hours a day with a supplementary alarm activation through the site wide Building Management System (BMS) which is monitored by the Portering Staff.

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

<b>Gas Status on Indicator Panel</b>	<b>OXYGEN</b>	<b>NITROUS OXIDE</b>	<b>ENTONOX</b>	<b>MEDICAL AIR</b>	<b>VACUUM</b>	<b>Carbon Dioxide</b>
Green light	Normal	Normal	Normal	Normal	Normal	Normal
Flashing yellow light + sound	<b>Refill liquid</b>  <i>Liquid level down to 25%</i>  <b>Inform Estates</b>	<b>Change Cylinders</b>  <i>One bank empty</i>  <b>Change the cylinders in the manifold room</b>	<b>Change Cylinders</b>  <i>One bank empty</i>  <b>Change the cylinders in the manifold room</b>	<b>Plant Fault</b>  <i>Plant defect Compressor or dryer</i>  <b>Inform Estates</b>	<b>Plant Fault</b>  <i>Pump tripped out.</i>  <b>Inform Estates</b>	
Flashing yellow light + sound	<b>Refill liquid immediately</b>  <i>Standby system in use</i>  <b>Inform Estates</b>	<b>Change Cylinders</b>  <i>immediately standby bank below 10% capacity</i>  <b>Check that cylinders have been changed</b>	<b>Change Cylinders</b>  <i>immediately standby bank below 10% capacity</i>  <b>Check that cylinders have been changed</b>	<b>Plant Emergency</b>  <i>Receiver pressure falling</i>  <b>Inform estates</b>	<b>Plant Emergency</b>  <i>Receiver pressure falling</i>  <b>Inform estates</b>	

Flashing yellow light	<b>Reserve low</b>	<b>Reserve low</b>	<b>Reserve low</b>	<b>Reserve low</b>		
	<i>Pressure in standby system falling</i>	<i>Reserve cylinder bank fallen to 50% capacity</i>	<i>Reserve cylinder bank fallen to 50% capacity</i>	<i>Reserve cylinder bank fallen to 50% capacity</i>		
	<b>Inform Estates</b>	<b>Change reserve cylinders</b>	<b>Change reserve cylinders</b>	<b>Change reserve cylinders</b>		

Gas Status on Indicator Panel	OXYGEN	NITROUS OXIDE	ENTONOX	MEDICAL AIR	VACUUM	Carbon Dioxide
Flashing red light + sound	Pressure Fault	Pressure Fault	Pressure Fault	<i>Pipeline pressure failing</i>	Pressure Fault	
	<i>System pressure 20% above or below normal</i>	<i>Pipeline pressure failing</i>	<i>Pipeline pressure failing</i>	<i>Pipeline pressure failing</i>	<i>Pipeline pressure failing</i>	
	<b>Inform estates</b>	<b>Inform estates</b>	<b>Inform estates</b>	<b>Inform estates</b>	<b>Inform estates</b>	

1.2 Table of **local** alarm panel indications, *reasons* and **required actions**

Gas Status	OXYGEN	VACUUM
Green lights	NORMAL	NORMAL
Red lights	HIGH PRESSURE	
Flash and alarm sound	<i>Pipeline pressure 20% above normal</i>	

Red lights	LOW PRESSURE	LOW VACUUM
Flash and alarm sound	<i>Pipeline pressure 20% below normal</i>	<i>Pipeline pressure 20% below normal</i>

**Apart from those that require changing the cylinders on manifold systems, all alarms must be referred to Estates whowill initiate appropriate action.**

### **1.3 Monitoring of Alarms**

#### 1.3.1 Monitoring of alarms at Royal Cornwall Hospital Treliske

Central alarms – The dedicated Central Alarm is located in the Switchboard and monitored by the Switchboard staff 24hours a day with a supplementary alarm activation through the site wide Building Management System (BMS) which is monitored by the Portering Staff.

1.3.2 Monitoring of alarms at St Michaels Hospital – Hayle. A hybrid Central/Local alarm installation allows alarms to be monitored. Located at the first floor ward nurses station.

1.3.3 Monitoring of alarms at West Cornwall Hospital – Penzance The Central Alarm is located at the main reception desk and monitored by the reception/switchboard staff 24hours a day.

## **Appendix 6. SOP MG003: Planning to Take a Pipeline out of Use**

1. The HTM0201 Permit to Work System will be used to control the activity.
2. Any works or activities involving medical gas pipeline systems will be referred to an Authorised Person.
3. The Authorised Person will determine whether a permit is required and if the work falls into the “high” or “low” hazard category.
4. If the work is classed as a High Hazard (HTM02-01) the Authorised Person will advise the Quality Controller (MGPS) and agree the extent of testing required.
5. The Authorised Person will communicate with the Designated Nursing Officer and advise the expected duration of the work and the number of services that will be involved.
6. Where patients requiring medical gases will remain in the department, alternative temporary supplies will be arranged with the assistance of Department of Clinical Technology, Portering Services and the Supplies Department.
7. The Authorised Person will communicate the date, time and duration of the work to all parties.
8. The Authorised Person will provide drawings of the system with proposed modifications.
9. Where the work is classed as High Hazard and it is intended that the system is returned to use as soon as possible, the Authorised Person must ensure that the Quality Controller (MGPS) is on-site or available before commencing the work.
10. The HTM0201 permit system will be used to control the work.
11. If ward is in use Terminal units taken out of use during the works will be provided with “do not use” notices.

# Appendix 7. SOP MG004 Planning and Design – Extension or Change to the medical gas pipeline system

## 1. Planning

- Proposed extensions or alterations to medical gas pipeline systems must be referred to the Authorised Person at the project briefing stage.
- The Authorised Person will advise on the capacity of the existing plant, its compliance with standards and the extent of the works necessary to achieve the intended design outcome. Additional professional advice will be obtained as required.
- New systems that are not connected to those existing will be advised to the Authorised Person for consultation before the tendering stage.
- Systems will be designed to the NHS Estates Engineering Technical Memorandum HTM02-01 Confirmation to this effect will be obtained from design consultants.
- As fitted drawings will be made available to the Authorised Person before any testing is commenced. The Authorised Person will hand a set to the Quality Controller (MGPS) and agree the testing procedure.

## 2. Installation

- The installation procedures will comply with HTM02-01 The Authorised Person will witness pipeline carcass tests.
- For additions all pressure tests will be made before connection is made to the existing system.

## 3. Testing

- Engineering and Pharmaceutical tests and standards will comply with a HTM02-01 and the European Pharmacopoeia.
- Anaesthetic gases will be piped to external atmosphere during purging procedures.
- Where systems have been extended it will be necessary to test the original installation prior to any works take place, in order to prove that its performance has not been impaired.

### 3.1 Quality control Testing

- Each Quality Controller (MGPS) is ultimately responsible for deciding the tests that they will perform to prove that the pipeline being tested is fit for purpose.
- Test routine may be varied according to what a Quality Controller feels is necessary but must ensure compliance with HTM02-01.
- Test routine will be documented in each individual testing situation in accordance with requirements.
- All instrumentation will be calibrated against standard gases. Test equipment is checked for in date calibration certification.
- The QC and CP tests are carried out as required and described in the HTM02-01 guidance.
- Results are submitted in the form of a report, the Permit to work High Hazard book is annotated by the CP and QC as to what tests have been carried out.
- A verdict (Pass or Fail) shall be recorded in the Medical Gases Permit to Work.

- On completion of testing the full record is on the permit and sometimes on the contractors paperwork. Signature on the permit shows that the QC (MGPS) is happy that the system can be taken into use.
- Where departments are not to be taken into use immediately, the medical gas pipeline system must be left charged and operational after testing. If, this is not the case, the system must be filled to working pressure with Medical Air. It must be purged and re-tested prior to being brought into use.

#### **4. Taking the System into Use**

- Following successful engineering and pharmaceutical tests the system will be taken into use.
- The extent of the works is to be identified on the Permit to Work clearly defining points of isolation and areas affected. The QC (MGPS) is to satisfactorily complete quality tests prior to acceptance by the Authorised Person (MGPS) and Designated Nursing Officer
- The Authorised Person will amend the site records and maintenance contracts to include the new or extended system.

# Appendix 8. Work Instruction MG005- Decontamination of the Medical Vacuum System

## 1. Introduction

- HTM02-01 Part B Appendix D details this procedure and should be referred to in conjunction with this work instruction
- All staff performing Sec 2 & Sec 3 of this work instruction shall wear the following Personal Protective Equipment : Disposable mask FFP3 type, disposable overalls, disposable gloves, Overshoes, Safety goggles
- All Personal Protective Equipment to be discarded as clinical waste.

## 2. Cleaning Procedure

- Identify the terminal unit through which the fluid has entered the system
- Complete Cleaning Procedure as follows:
  - Prepare 10 litre of 1% Teepol / Savlon in hot water.
  - Aspirate 5 litre of solution through the contaminated terminal and leave with low flow.
  - Aspirate ½ litre of solution through the next (up to 10) terminals downstream of the terminal and leave with low flow.
  - Monitor the vacuum plant receiver.
  - Drain to waste.
  - Repeat using hot water.

Change bacterial filters (see below), drain flasks and monitor system for three days.

## 3. Bacteria Filter Changing on Central Medical Vacuum Plant

- A Permit to Work (general) will be issued by the Authorised Person.
- Where there has been contamination of the system with any toxic or infectious materials advice will be obtained from Infection Control.
- Complete the Filter Change :
  - Three clinical waste bags will be required and one litre of 1% Teepol / Savlon solution.
  - Isolate and remove one filter, place directly into one bag and seal.
  - Fit new filter, place on line and remove second filter, place in bag and seal.
  - Fit second filter and place on line.

Note – where drain flasks contain liquid these should also be discarded and replaced.

- Wipe down surfaces with disinfectant discard wipes and disposable Personal Protective Equipment into bag along with the other two bags. Bags to be handed to waste disposal team for incineration.
- Complete logbook

## Appendix 9. Work Instruction MG006- The Transportation of Medical Gas Cylinders

**Summary:** This task describes the transportation of medical gas cylinders with and without a patient.

**Manpower:** 1 Trained Porter

**Equipment:** Wheeled carrier/by hand, spanner (appropriate for size of cylinder), bed with cylinder holder

### 1. Changing a Gas Cylinder

- When the task of changing a gas cylinder has been issued to a porter, they will be informed of the cylinder size and type of gas required.
- A full gas cylinder should be taken from the appropriate cylinder store, replace the empty cylinder on the ward with the full bottle then return the empty cylinder to the relative empty gas cylinder store.
- 'F', 'G' or 'E' size cylinders must be transported using the appropriate wheeled carries provided, 'CD', 'C' or 'D' size cylinders may be carried by hand one at a time
- When replacing 'F' or 'G' size cylinders on wards/departments, the bottles should be rolled in and out of the appropriate carriers.
- Safety shoes and gloves provided should be worn at all times.
- The number of cylinders transported should not exceed the carrier's capability.
- All porters should attend appropriate Manual Handling training with regards to the transportation of gas cylinders.
- When decanting cylinders from the BOC delivery vehicle the porter should not at any time climb on to any part of the vehicle itself.

### 2. Transporting a Patient with a Gas Cylinder

Due to incidents nationally of patient harm due to poor practices when transporting patients with cylinders, the following guidance should be followed;

- Ensure the ward staff set up the cylinder for patient use before placing it close to the patient.
  - The most likely time for an ignition to occur is either when the valve is initially turned on or when a flow is selected. Hence the advice is to:
    - a) connect the tubing and oxygen delivery device to the cylinder;
    - b) slowly open the cylinder valve;
    - c) select the prescribed flow rate;
    - d) if required, check the gas is flowing;
    - f) fit the oxygen delivery device to the patient.
- Place the cylinder in an appropriately designed holder.
  - Where possible, cylinders should be placed in holders designed to be fitted, ideally, to the bottom of the bed (or to the back of wheelchairs).
  - The position of the holder needs to take account of how close the cylinder is to the patient.
  - The holder should ideally keep the cylinder upright so that if there is an ignition its impact would be minimised.

- Avoid placing the cylinder on the bed next to the patient if at all possible; use extra care when there is no option but to place the cylinder on the bed.
- There are times when there is no option but to place the cylinder on the bed or stretcher. If this is the only option, setting up and turning on the cylinder before putting the cylinder on to the bed will minimise the potential risk of injury to the patient.

### 3. Tracking Medical Gas Cylinder Movements

- Any cylinder moved around the Royal Cornwall Hospital site, including to or from the cylinder store must be tracked using the Accura tracking system.
- iPod touches are provided by Pharmacy to all porters involved in medical gas cylinder movements.
- Passwords are provided by Pharmacy Purchasing
- Training on the Accura system is provided by area Porter Supervisors.

# Appendix 10. Work Instruction MG007- Changing Cylinders on a Manifold

## 1. Introduction

- This instruction describes the way in which cylinders are changed on manifolds. It does not apply to any other action taken with gas cylinders.
- Only staff that have received the appropriate training are authorised to change cylinders on manifolds.
- Other staff may change cylinders only when under the direct personal supervision of a member of staff whose name appears on the list and then only as part of a training programme which has been approved by an authorised person.
- Names are added to the list (or removed from it) by any Authorised Person
- Before adding a name to the list the Authorised Person will be satisfied that the member of staff concerned has been trained in the task and has demonstrated satisfactory competence in it.

## 2. How To Change a Cylinder

- Ensure that you or anything you use is NOT contaminated with grease or oil.

### Choice of bank to change

Manifold cylinders are changed when the alarm system (see SOP MG002- Action to be Taken on Receiving an Alarm) indicates that a bank of cylinders needs to be changed. Always change a complete bank of cylinders. If there are insufficient full cylinders available to do this, seek urgent advice from an Authorised Person.

- Turn off valves
- Using the appropriate cylinder spanner, shut the cylinder valves firmly on each cylinder in the bank. Do not over tighten.
- Remove tails
  - For Oxygen, Air and Entonox unscrew the clamp connection taking care not to lose the Bodok seal. For Nitrous Oxide, holding the handle on the tailpipe, unscrew the connection using the spanner provided.
- Put empties in the empty store. Ensure that they are secured so that they cannot fall, using the chains provided.
- Collect full cylinders
  - Move cylinders to the manifold. Ensure that cylinders remaining in store are properly secured so that they cannot fall, using the chains provided.

### Checks to be performed on full cylinders

- Before using any cylinder, ensure that it shows no signs of physical damage, the plastic seal over the valve is intact and that the expiry date indicated on the label has not been reached.
- Any cylinder showing signs of physical damage should be dealt with in accordance with Annex 10. Otherwise cylinders failing inspection should simply be transferred to the empty store *without the valve seal*.

### Installing the Full Cylinders

- Secure the full cylinders to the manifold using the straps or chains provided. Make certain that they cannot fall.
- Connect tails

- Before reconnecting the tails, ensure that the surfaces are clean and that the Bodok seal is undamaged. Replace the seal if in doubt. Never use more than one seal at a time.
- Turn on
  - Cautiously open each cylinder valve in turn, listening for leaks. If a leak is heard, check the tightness of the connection – but do not use force – and check the Bodok seal. If there is still evidence of a leak replace the cylinder, if this does not cure the leak report the matter to an authorised person as a matter of urgency. If it does cure the problem, label the cylinder as faulty in accordance with Work Instruction MG009- Action to take with a faulty cylinder.
- Open each valve fully and then close it one-quarter turn. Check that the pressure indication is approximately 137bar for oxygen, air and Entonox, 50bar for nitrous oxide and that the alarm has cancelled. If this is not so, report it to an Authorised Person as a matter of urgency.
- Leak test each joint in accordance Work Instruction MG008- Leak Testing

#### Action if Leak Test Fails

- Close all cylinder valves on the bank and replace the Bodok seal at the leaking joint.
- If this does not work, replace the cylinder.
- If this works label the cylinder as faulty in accordance with Work Instruction MG009- Action to take with a faulty cylinder.
- If it does not work, report the matter to an Authorised Person as a matter of urgency.

#### Paperwork

- Fill in the manifold log with details of the actions taken.

## Appendix 11. Work Instruction MG008- Leak Testing

- This Work Instruction describes the method to be used to test joints in pressurised gas system to show that they do not leak.
- Sterile neutral detergent is specified for this purpose and no other product may be used. This is to avoid risk of cross infection associated with the storage of non-sterile detergent solutions. A single sachet can be used to test several joints on a single occasion but may not be kept once opened.
- A leak test shall be performed whenever cylinders are changed on pipeline manifolds.
- A leak test may be useful in diagnosing problems with other types of joint – for example between a cylinder and a regulator.

### 1. How to Leak-Test

- Apply a few drops from a sterile neutral detergent e.g. Savidol to the joint.
- Any leak should be immediately apparent as a stream of bubbles.

### 2. Action if Leak Test Fails

- Close all cylinder valves on the bank and replace the Bodok seal at the leaking joint.
- If this does not work, replace the cylinder.
- If this works label the cylinder as faulty in accordance with Work Instruction MG009- Action to take with a faulty cylinder.
- If it does not work, report the matter to an Authorised Person as a matter of urgency.

## Appendix 12. Work Instruction MG009- Action to take with a faulty cylinder

### 1. Introduction

This work instruction describes actions to be taken when cylinders are thought to be defective.

Complaints normally fall into two categories:

**(A) Faulty** - Cylinders are described as faulty where the complaint is minor and patients were not at risk.

**(B) Incident** - Cylinders are described as incident where a complaint is serious and patients were considered to have been at risk. This includes cylinders that have been involved in a fire or have ignited.

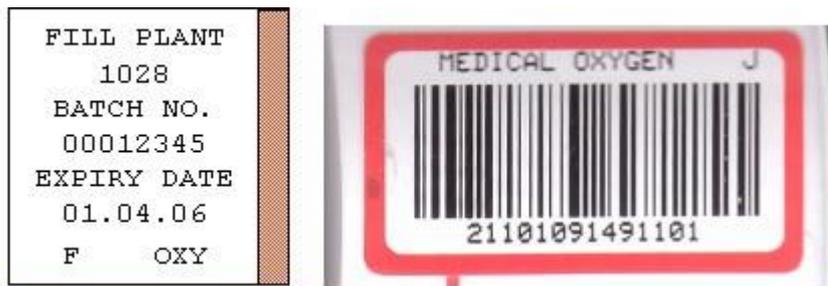
### 2. Table of Actions for (A) Faulty Cylinders

For most faults, cylinders are returned to BOC as if empty. The cost of gas is (usually) so small as to make any other action unnecessary.

Apparent Fault	Action
Cylinder does not bear a security seal over the outlet	Return as empty to BOC
Cylinder does not bear a batch number label on the valve or on the shoulder	Remove the security seal and return to BOC as empty
A cylinder taken from the full store is found to be empty or partly empty	Remove the security seal and return to BOC as empty
A leak-tight seal cannot be formed between the cylinder and the equipment to which it is attached (but other cylinders can be so attached)	Attach a luggage label to the cylinder valve. Write on the label: "LEAKING VALVE or UNION". Remove the security seal and return to BOC as empty
Other faults	Attach a luggage label to the cylinder valve. Write on the label giving a brief description of the fault. Remove the security seal and return to BOC as empty

### 3. **Actions to be Taken for (B) Incident Cylinders**

- Isolate Cylinder.
- Report incident to your line manager enter Datix report / Fast Track form as necessary.
- Contact Authorised Person medical gas pipeline system with the following information;
  - Name , location and contact details
  - Type and quantity of cylinders involved
  - Cylinder batch and barcode information (see below)
  - Nature of the complaint and any serious consequences arising



Authorised Person medical gas pipeline system to determine appropriate action following contact with BOC on 0800 111 333.

# Appendix 13. Work Instruction MG010- Changing of Medical Gas Regulators on cylinders

## 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.
- It is advisable to wash your hands before changing a regulator to remove any hand cream, which can also be combustible
- Materials, which do not normally burn in air, will burn more easily in oxygen, nitrous oxide or medical gas mixtures containing these gases.

## 2. Changing Regulator or Flow meter

- Before use ensure that cylinders are located in a safe position and secured so they cannot fall over.
- Use only the correct cylinder valve key to open the cylinder valve.
- Cylinders containing liquefiable gases (i.e. nitrous oxide, carbon dioxide) are used upright with the valve uppermost.
- Select the cylinder with the oldest filling date, provided that it is within the expiry date specified on the label.

### Fitting the regulator to the cylinder:

- Remove the disposable seal by pulling the tear tag and discard
- 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.
- Check for signs of oil or grease on the cylinder valve.
- If either is discovered, do not use the cylinder, and arrange for it to be returned to the gas store as soon as possible as faulty.
- Check the regulator or equipment to be used is appropriate for the cylinder to be used.
- 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.

- 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 handwheel.
- 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.

**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 cylinder store.

**IMPORTANT**

**If the equipment is damaged or you suspect a leak contact the Department of Clinical Technology  
Department via switchboard (or Estates out of hours)**

## Appendix 14. SOP MG011- Care and Use of Medical Gas Regulators and Flowmeters

### 1. Introduction

- Medical Regulators and Flowmeters are used with Medical Gases, either from the piped Medical Gas supply or from a high-pressure cylinder.
- A Flowmeter is only used with Piped Medical Gases.
- With high-pressure cylinders a Flowmeter is used in conjunction with a pressure regulator.
- Gases used within the Trust include Oxygen, Nitrous Oxide, Entonox, Medical Air, Oxygen/Carbon Dioxide mixtures, Oxygen/Helium mixtures and carbon dioxide.

### 2. Health and Safety Information

- **Oxygen in its gaseous state is non-flammable. It will, however strongly support combustion, and is highly dangerous when in contact with oils or greases.**
- **Store all equipment in a clean dust free location.**
- **Never attempt to carry out repairs.**
- **Always turn off after use.**

### 3. For Flowmeters connected to the Medical Gas Pipeline System.

- Regularly check for damage. Report damage to Department of Clinical Technology
- Report any suspected leaks to the Department of Clinical Technology Department
- Always hold the Flowmeter securely when inserting or removing it from the MGPS terminal. A sudden release of the equipment can cause injury.
- Ensure the Flowtube is vertical with the control valve at the bottom.
- **Do not** use excessive force when closing the valve
- When attaching the patient tubing make sure it is securely fitted to the outlet.
- Static electricity can cause the float to stick in the tube giving an incorrect reading. Check periodically that the flow rate can be changed by increasing the flow and then returning to correct setting. The float should follow the change.
- Clean only with non-alcoholic detergent wipes. Do not allow moisture to enter the equipment
- Air outlets in most areas will have covers fitted. In areas where piped air is required air flowmeters should be fitted with a labelled flap and must not be stored in the air outlet unless actively in use. Flowmeters should be stored in a designated place within the clinical area.

### 4. For Equipment connected to cylinders.

- Ensure the equipment to be used is connected to the correct gas.
- Report any leaks or damage to Department of Clinical Technology (or Estates out of hours)
- Check there is sufficient quantity of gas in the cylinder.
- Where a regulator with a flow tube is used follow the advice as in the previous section
- Where the two are combined (Select Flow) turn the flow selector knob until the required flow setting is displayed in the window under the control knob.
- Periodically check the cylinder contents and replace before it is empty.

- Clean only with non-alcoholic detergent wipes. Do not allow moisture to enter the equipment.

## Appendix 15. Work Instruction MG012- Care of Hoses

### 1. General Information

- Hoses are commonly used to provide Medical Devices with Medical Quality gases supplied from the Piped Medical Gas System.
- The Gases are Oxygen, Nitrous Oxide Medical Air and a vacuum supply.
- The energy stored in the hose when under pressure can be hazardous when released suddenly without warning; therefore the good condition of the hose assembly is of vital importance to safety.

### 2 User instructions

Prior to connecting the hose to the Piped Medical Gas System;

- Check the hose and probe for damage, ensuring there are no cuts or abrasions and the probe has its gas specific collar in place.
- Check the assembly is gas specific. Both ends must be marked with the same gas and the hose is correctly colour coded.
- Check the hose is attached to the correct inlet connection on the equipment.
- Connect the hose to the correct Piped Medical Gas terminal making sure it is locked in position before letting go of the probe.
- All Piped Medical Gas terminals are gas specific to prevent interchange ability with other services. Damaged probes and terminal units could compromise the safe operation of the system.
- The probe should not require undue force to engage the locking mechanism of the socket.
- There should be no leakage of gas from the connection.
- To remove the hose press in the outer collar of the terminal unit whilst the same time holding the hose just behind the probe.
- Always hold onto the hose when releasing it as the sudden ejection of the probe can cause injury.
- After use loosely coil the hose and secure onto the equipment.

### 3. Care of Hoses

- **DO NOT** allow moisture to enter the hose assembly
- **DO NOT** use any alcohol disinfectants
- Clean using detergent wipes.
- **Report all damaged hoses to Department of Clinical Technology Ex. 2491**

# Appendix 16. Work Instruction MG013- Care and Use of Portable Suction Equipment

## 1. Introduction

- Suction devices normally use the Medical Gas Pipeline System or are electrically powered either from the mains or with an internal rechargeable battery. The majority of the devices all operate in a similar way.
- This document cannot cover all the variations of available suction equipment and can only be used as a general guide.
- More specific information can be obtained from Department of Clinical Technology.
- All suction equipment should be treated with care due to the risk of contamination. Seek advice from Department of Clinical Technology when there is known contamination of the equipment.
- Regularly check all equipment for damage and carry out pre use check on a daily basis in areas where it may be used in an emergency.

## 2. Pipeline suction

- The Suction system comprises of two specific items, the suction controller and the receiving container.
- All controllers should be fitted with a combined overflow trap and bacterial filter, which are disposable. The filter is to protect the controller and pipeline system from contamination.
- The receiver may be reusable or the disposable type, some receivers have built in overflow traps in addition to the controller.
- All reusable jars are autoclavable.

### Pre use checks

- Connect the unit to the Pipeline system via probe and socket. Ensure the probe, whether it is a remote or direct fitting, is secure in the Pipeline socket.
- Check the filter is in place; replace it if it looks dirty or wet.
- Turn the On/Off lever to the On position
- Fully rotate the suction control knob to the Maximum position.
- Check by sound and or feel that a substantial airflow is present at the inlet, or suction tubing attached to the inlet. The suction will vary from time to time due to the number of controllers in use, but should be approximately 77 kPa (600mmHg) for High Suction
- For low vacuum units specifically used for Thoracic drainage block the inlet and rotate the control to maximum the gauge should not exceed 45 cm H<sub>2</sub>O.
- Attach tubing from suction controller to “Vacuum” or “Suction” port on the receiver jar (use 8mm bore tubing for maximum flow).
- Attach an extension tube to “Patient” port and recheck the suction by blocking the end of the tube.

### During use

- Periodically check that the receiver jar is not full, empty or replace as necessary and the filter has not become contaminated.

### 3. Electrically Powered Suction

- The performance of these units cannot be expected to match that obtained from the Piped Medical Gas supply.
- The MG Electric Ltd Sam 12 is mains powered and continuously rated, however the Laeardal LSU mains/battery unit will cut out after 2 minutes when running at maximum vacuum and should be considered for emergency use only. For long term use pipeline should be used.

#### Pre use checks

- Check filter and replace if wet or discoloured.
- Check the sealing rings on the filter connectors, were fitted, are in place.
- Where a reusable jar is fitted, check there is a shut off valve fitted in the cap of the jar.
- Fully close any vacuum control valves on the pump.
- Attach tubing (use 8mm bore for maximum flow) from filter to “Vacuum” port on receiver jar.
- Switch on the unit. Occlude the suction inlet on the receiver jar and note the time taken for the gauge to indicate an increase of 450mmHg. This should not exceed 10 seconds.
- Attach tubing to “ Patient” port.

#### During use

- Periodically check that the receiver jar is not full, empty or replace as necessary and the filter has not become contaminated.

# Appendix 17. SOP MG014- Medical Gas Cylinder Ordering, Receipts & Returns

## 1. General

- The requirements for availability, safe storage, safe handling and replenishment of cylinders are important for both patients and all those involved in the storage and distribution of cylinders.
- It is therefore important that adequate stocks are made available, stored safely, ordered on a timely basis and received correctly to meet this needs of continuity of supply.
- This document covers all authorized medical gas storage areas and all staff involved with the ordering, collection and return of cylinders; plus end user departments ensuring undue stocks of both full and empty cylinders are not held in their areas, to the detriment of the service.

## 2. Responsibility

- Staff involved with the contracting, ordering, receipt and distribution / collection of cylinders throughout each site are : Estates, Porters, Pharmacy, and Supplies
- Wards / Departments shall ensure that;
  - they review their requirements and ensure that only essential stocks is held
  - cylinders are appropriately stored on racking conforming to BS 1391 or cylinder trolleys to DS 2718.
  - Shall not create sub-stores of cylinders without authorisation from the authorised person and executive lead.
  -

## 3. Risk due to incorrect Order / Receipt / Return of Cylinders

- Unavailability of full gas cylinders may put patient's life at risk.
- Incorrect identification of full and empty cylinders could result in failure to place orders and create shortages in supply.

## 4. Supplies of Gases

- Current supplier of medical gas cylinders is BOC Limited against a Regionally negotiated contract.
- Charges are made up of three elements: Cost of the gas, the rental of the cylinder and a delivery charge.
- An agreed range of gases, sizes and quantity of cylinders has been determined by Pharmacy to service each site and acts as a float on a "Full for Empty" basis, as detailed on each stores inventory. No other cylinders should be stored in these locations.
- Special gases not listed on the inventories will only be ordered as a one-off following the approval of Chief Pharmacist/Head of Pharmacy Supply Services.
- End users will hold their own stock and must be aware that replenishments are not held locally and that each request will be dealt with on an individual basis with due notice to reflect supplier lead times.
- A stock check of inventory listed gases is undertaken twice weekly (Monday and Thursday) and replenishments are ordered on a "Full for Empty" basis.
- It is important that empty cylinders are returned to the store as soon as possible to facilitate the replenishment process.

- Deliveries are made the following day at the standard rate.
- Routine orders are made via the BOC online ordering portal.
- Should an emergency arise, an out of hours service can be provided by the supplier at a cost.
- Details of this procedure are held by the Portering Department in their procedures manual.

## **5. Receipts**

- BOC delivers on the day following order placement (Monday – Friday) and report to Supplies Service staff at Goods Inwards.
- Portering Supervisor assist in unloading and checking off the goods supplied against the delivery note.
- Portering staff check:
  - Quantity, size and type of cylinders delivered.
  - Cylinders are clean and in good condition.
  - Each cylinder is clearly labelled.
  - Valve outlets are protected by tamper evident seals
  - That only the corresponding number and type of empties are returned.
- Any discrepancies are to be marked on the delivery note and countersigned by the driver before Portering staff acknowledge receipt of the goods.
- Delivery notes shall be forwarded to Supplies Service Goods Inwards to be married up and placed in order number sequence in BOC Orders Awaiting Invoice file.

## **6. Invoice Reconciliation**

- Upon receipt of an invoice, remove the relevant order from the file, confirm details match those on the order / delivery note and sign the order as goods received.
- The white copy of the order is attached to the invoice and forwarded to Payments of Accounts to clear the transaction.
- The yellow copy of the order and delivery note is placed sequentially in the BOC Signed Off Orders file and kept on record.

## Appendix 18. Work Instruction MG016- Medical Gas Cylinder Ordering Process (RCH Site only)

### 1. Responsibility

- Staff involved with the contracting, ordering, receipt and distribution / collection of cylinders throughout each site are : **Porters, Pharmacy and Supplies**

### 2. Stock Check

The Royal Cornwall Hospital has two authorised locations for the storage of gas cylinders to which BOC make deliveries;

- Main Gas Store (Adjacent to the Med Gas Plant Room and Mini Laundry) Account 1375780
- Princess Alexandra Wing Gas Store Account 1375786
- Porter staff at PAW perform stock checks every Monday & Thursday morning where empty cylinders are counted and requirements phoned through to the Supplies Service based on site (extension 2842).
- Supplies Service staff perform stock checks in the Main Gas store every Monday and Thursday, listing the size, type of gas and the replenishment quantity required.

### 3. Order Placement

- Orders are raised, one for each delivery location. Details include:
  - Supplier
  - Delivery Location
  - Date
  - Account Number (as above)
  - Quantity, size and type of Medical Gas
  - Orders should state “Full for Empty” (i.e. replenishment) **OR** “New Issue”.

**NB** New issue would be additions to the existing float of stock and incur increased rental charges. In this instance, approval should be sought from the chief pharmacist or lead pharmacy purchasing technician.

- Routine orders should be made using the BOC online ordering portal. Porters should seek access to the portal from the Pharmacy Purchasing Department who will authorise the release of a username and password from BOC.
- In the event of the online system being unavailable BOC telesales 0800 111 333 detailing the above information and quoting the relevant Order number for each location.
- Each order shall be authorised and placed on file awaiting both the delivery note and invoice.
- Should an **emergency** arise, an out of hours service can be provided by the supplier. Details of this procedure are held by the Porter Supervisor under Section 8 Policy and Routine Memos – Procedure 13, Emergency ordering from BOC and also in the On-Call Manager’s Folder.

# Appendix 19. Work Instruction MG016- Using the Medical Gas Store

## 1. Staff Responsibilities

- Staff involved with the contracting, ordering, receipt, distribution and collection of cylinders throughout each site come from a variety of departments which include : **Estates, Porters, Pharmacy, Supplies, Theatres, X-Ray.**
- Only staff who have received training in Handling & Moving Cylinders and Cylinder Identification & Safety are permitted access to the Medical Gas Cylinder store(s).
- Users of the store(s) have a responsibility not only for their own safety, but also for others, they should therefore;
  - Report any damage, defective or missing items from the stores checklist to their supervisor
  - Report instances of over crowding of storage racks to their supervisor
  - 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 form 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
  - Store Temperature. Stores are intended to be well ventilated, and therefore may not offer the degree of protection needed to prevent separation at low temperatures of an Oxygen/Nitrous Oxide Mixture (ie. Entonox) into its components. It is important that cylinders of this gas mixture are kept above 10°C for 24hours before use, and arrangements should be in place to ensure that cylinders of this gas mixture collected from a cold store are not used immediately for patient treatment.

## 2. Handling and Moving Cylinders

When moving cylinders ensure that;

- Safety shoes and protective gloves should be worn when loading/ unloading medical gas cylinders.
- Ensure gloves and clothing are free from grease and oil, which may contaminate cylinders.
- Use wheeled carriers of the appropriate size when moving cylinders (especially sizes F, G & J), use safety bar / strap / chain to secure cylinder during transit. Smaller sizes may be carried by hand but consider your own capabilities and the distance to be travelled.
- 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.

### 3. Receipt

BOC enlists the help of Porterage staff to unload and check off the goods supplied against the delivery notes.

- Staff need to check:
  - Quantity, size and type of cylinders delivered against the delivery note.
  - That cylinders are clean and in good condition.
  - That each cylinder is clearly labelled.
  - That valve outlets are protected with tamper-evident seals.
  - That **only** the corresponding number and type of empties are returned.
  - Any discrepancies are to be marked on the delivery note and countersigned by the driver before acknowledging the receipt of the goods.

### 4. Rotation and Segregation

Staff shall ensure that :

- Separate full and empty bays are provided. Cylinders should be clearly segregated and never be mixed.
- Separate, fully labelled areas are 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.

NOTE. Special conditions apply to Entonox if stored at low temperatures, please refer to Medical Gas Data Sheet MED004042

- Smaller sized cylinders (C,CD, D and E) should be stored horizontally on racks so as to prevent rolling and falling.
- High usage lines are to be segregated (within their allotted areas) and marked “In Use” and “Latest Delivery”, and alternated at the time of receipt. Interchangeable signs can be moved from one to the other, so as to ensure oldest “In Use” stock is used up first.
- On low volume lines, members of staff collecting cylinder are expected to check cylinder labels and select the cylinder(s) with the shortest expiry date.

### 5. Issue from Stores / Return of Empties

- Departments should not place excessive demands on the Authorised Site stores. Requests should be for immediate replacement, or safety stock to cover one day / weekend / bank holiday requirements only.
- Surplus stock, held at Ward or Department level (be they full or empty cylinders), have a detrimental effect on availability to meet demands from other areas and inhibits the replenishment to the Authorised store(s), as orders are placed on a “Full for Empty” basis.
- All portering staff (including Theatre and X-ray) to be aware that orders for replenishment stocks for the RCH site are placed on Mondays and Thursdays, and that all empty cylinders should be returned to the Medical Gas Cylinder store the

## Appendix 20. Work Instruction MG017- Storage of Medical Gas Cylinders in Clinical Areas

### 1. General Information

- Medical gas cylinders held in clinical areas should be kept to a minimum
- Medical gas cylinders in ward areas should be kept in designated “cylinder parking” areas or stores agreed by the Chief Pharmacist/Head of Pharmacy Supply Services (contact x3488).
- Medical gas cylinders should only be stored in approved brackets, racks or storage areas as agreed by the Chief Pharmacist/Head of Pharmacy Supply Services.
- Appropriate signs should be installed wherever medical gas cylinders are in use.
- Medical gas cylinder holding levels should be agreed between the Ward Manager and Pharmacy.
- G size cylinders or above should not be used in clinical areas unless tethered to a load bearing wall at all times (including when in use).

### 2 User instructions

#### Replacement of cylinders

- Call Mitie on x2468 to replace cylinders on a “like for like” basis. The addition of any new types of cylinder must be approved by pharmacy (most general ward areas will only have either CD or E size oxygen cylinders).

#### Removal of cylinders

- Call Mitie on x2468 to remove any excess of cylinders

#### Mobilisation of patients on the ward

- Patients requiring oxygen therapy who are able to mobilise to use the toilet/shower facilities should be given a suitable trolley to transport their cylinder.

#### Transfer of patients

When a transfer with imaging, theatre or general porters is requested it should be booked as a transfer with oxygen. The porters carrying out the transfer will provide the necessary oxygen cylinders and safe cylinder carrying brackets. It is the nurses responsibility to connect the patient to the oxygen cylinder and check the flow rate before transfer (Policy for the Prescription, Administration and Monitoring of Oxygen in Adults).