<table>
<thead>
<tr>
<th><strong>Policy Title</strong></th>
<th>Medical Gas Policy</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Policy Number</strong></td>
<td>OP66</td>
</tr>
<tr>
<td><strong>Version Number</strong></td>
<td>4.0</td>
</tr>
<tr>
<td><strong>Ratified By</strong></td>
<td>Health and Safety Committee</td>
</tr>
<tr>
<td><strong>Date Ratified</strong></td>
<td>15/03/2018</td>
</tr>
<tr>
<td><strong>Effective From</strong></td>
<td>14/08/2018</td>
</tr>
<tr>
<td><strong>Author(s)</strong></td>
<td>Steve Hancock</td>
</tr>
<tr>
<td></td>
<td>Mechanical Engineer</td>
</tr>
<tr>
<td><strong>Sponsor</strong></td>
<td>Claire Coyne</td>
</tr>
<tr>
<td></td>
<td>Director of Clinical Support and Screening Services</td>
</tr>
<tr>
<td><strong>Expiry Date</strong></td>
<td>01/03/2021</td>
</tr>
<tr>
<td><strong>Withdrawn Date</strong></td>
<td></td>
</tr>
</tbody>
</table>

Unless this copy has been taken directly from Pandora (the Trust’s Sharepoint document management system) there is no assurance that this is the most up to date version.

This policy supersedes all previous issues.
## Version Control

<table>
<thead>
<tr>
<th>Version</th>
<th>Release</th>
<th>Author/Reviewer</th>
<th>Ratified by/Authorised by</th>
<th>Date</th>
<th>Changes (Please identify page no.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0</td>
<td>21/07/2011</td>
<td>K Smeaton</td>
<td>Health and Safety Committee</td>
<td>05/01/2011</td>
<td></td>
</tr>
<tr>
<td>1.1</td>
<td>27/09/2011</td>
<td></td>
<td></td>
<td></td>
<td>Colin Traill made some changes</td>
</tr>
<tr>
<td>1.2</td>
<td>08/03/2012</td>
<td></td>
<td></td>
<td>03/03/2012</td>
<td>Coleen Knox reviewed and updates made to page 51.</td>
</tr>
<tr>
<td>2.0</td>
<td>16/01/2014</td>
<td>K Smeaton</td>
<td>Health and Safety Committee</td>
<td>16/01/2014</td>
<td>Minor updates and corrections</td>
</tr>
<tr>
<td>3.0</td>
<td>14/01/2016</td>
<td>S Hancock</td>
<td>Health and Safety Committee</td>
<td>14/01/2016</td>
<td>Estates references changed to QE Facilities. Addition of a section on Maternity deliveries to patients home.</td>
</tr>
<tr>
<td>4.0</td>
<td>14/08/2018</td>
<td>S Hancock</td>
<td>Health and Safety Committee</td>
<td>15/03/2018</td>
<td></td>
</tr>
</tbody>
</table>
# INDEX

<table>
<thead>
<tr>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Introduction</td>
</tr>
<tr>
<td>2. General</td>
</tr>
<tr>
<td>3. Aim of Policy</td>
</tr>
<tr>
<td>4. Duties – roles and responsibilities</td>
</tr>
<tr>
<td>Chief Executive</td>
</tr>
<tr>
<td>Authorising Engineer</td>
</tr>
<tr>
<td>Authorised Person (MGPS)</td>
</tr>
<tr>
<td>Competent Person (MGPS)</td>
</tr>
<tr>
<td>Quality Controller</td>
</tr>
<tr>
<td>Pharmacy</td>
</tr>
<tr>
<td>Designated Medical / Nursing Officer (DMO / DNO)</td>
</tr>
<tr>
<td>Designated Person</td>
</tr>
<tr>
<td>Medical Gases Committee</td>
</tr>
<tr>
<td>MGPS operational policy review</td>
</tr>
<tr>
<td>MGPS record drawings and documentation</td>
</tr>
<tr>
<td>5. The MGPS Structure</td>
</tr>
<tr>
<td>5.1 Oxygen Plant</td>
</tr>
<tr>
<td>5.2 Nitrous Oxide</td>
</tr>
<tr>
<td>5.3 Medical compressed air plant</td>
</tr>
<tr>
<td>5.4 Central medical vacuum system</td>
</tr>
<tr>
<td>5.5 Entonox</td>
</tr>
<tr>
<td>6. Cylinder Storage</td>
</tr>
<tr>
<td>6.1 Area Valve Service Units (AVSUS)</td>
</tr>
<tr>
<td>6.1.1 Summary</td>
</tr>
<tr>
<td>6.1.2 General rules and conditions for control of linevalve assemblies LVAs</td>
</tr>
<tr>
<td>6.1.3 Access</td>
</tr>
<tr>
<td>6.1.4 Key Holders</td>
</tr>
<tr>
<td>6.2 Routine Procedures</td>
</tr>
<tr>
<td>6.2.1 The MGPS Permit to Work System</td>
</tr>
<tr>
<td>6.2.2 Planned interruption</td>
</tr>
<tr>
<td>6.2.3 HIGH Hazard Work</td>
</tr>
<tr>
<td>6.2.4 LOW Hazard Work</td>
</tr>
<tr>
<td>6.2.5 Actions in the event of a medical gas alarm</td>
</tr>
<tr>
<td>6.3 Cylinder Management</td>
</tr>
<tr>
<td>6.3.1 Introduction</td>
</tr>
<tr>
<td>6.3.2 Classification of gases by physical type</td>
</tr>
<tr>
<td>6.3.3 Classification of gas cylinders</td>
</tr>
<tr>
<td>6.3.4 Labelling/marking of cylinders</td>
</tr>
<tr>
<td>6.3.5 Cylinder Colour Codes</td>
</tr>
</tbody>
</table>
6.3.6 Cylinder sizing and naming ............................................................... 23
6.3.7 Medical gas cylinder valve types ..................................................... 23
6.3.8 Cylinder safety – main principles ................................................... 24
6.3.9 Cylinder storage and handling ....................................................... 25
5.3.10 Main Stores .................................................................................. 25
6.3.11 Ready to use stores ....................................................................... 25
6.3.12 Local storage (wards) ................................................................. 26
6.3.13 Local storage (non-specific storage areas) .................................... 27
6.3.14 Manifold rooms ........................................................................... 27
6.3.15 Exceptions .................................................................................... 27
6.3.16 Cylinder store construction ......................................................... 28
6.3.17 Ventilation .................................................................................... 28
6.3.18 Signage and labelling (including Hazchem signs) ....................... 28
6.3.19 Access .......................................................................................... 28
6.3.20 Emergency Access/exit ............................................................... 29
6.3.21 Fire Protection ............................................................................. 29
6.3.22 Electrical installations/lighting ...................................................... 29
6.3.23 Segregation of gases/cylinders ...................................................... 30
6.3.24 Cylinder restraint ......................................................................... 30
6.3.25 Personal protective equipment .................................................... 31
6.3.26 Store temperature ......................................................................... 31
6.3.27 Cleanliness ................................................................................... 31
6.3.28 Signage ........................................................................................ 32
6.3.29 Handling of cylinders .................................................................... 32
6.3.30 Protective clothing ........................................................................ 33
6.3.31 Trolleys, trucks and vehicles ......................................................... 33
6.3.32 Unloading equipment ..................................................................... 33
6.3.33 Transportation of cylinders with attached equipment .................. 34
6.3.34 Preparation of cylinders for use .................................................... 34
6.3.35 Operating cylinder valves ............................................................ 36
6.3.36 Connection and disconnection of cylinders ................................... 36
6.3.37 Manifold cylinder-changing procedure (for Designated Porters (MGPS)) .................................................. 36
6.3.38 Procedure for changing cylinders on medical equipment .......... 38
6.3.39 Defective cylinder classification .................................................. 40
6.3.40 Faulty cylinders ........................................................................... 40
6.3.41 Incident cylinders ......................................................................... 40
6.3.42 Dealing with defective cylinders .................................................. 41
6.3.43 General procedure ....................................................................... 41
6.3.44 Stock control and receipt of cylinders into stock ......................... 41
6.3.45 Ordering from suppliers .............................................................. 42
6.3.46 Returns to supplies ....................................................................... 42
6.3.47 Issue from stores .......................................................................... 42
6.3.48 Return of cylinders to stores ....................................................... 42
6.3.49 Receipt of cylinders to stores ....................................................... 42
6.3.50 Procedures for the rotation of stock ............................................ 43
6.3.51 Cylinder contents – status labels ................................................. 43
6.3.52 Handling of cryogenic liquid equipment ..................................... 44
6.3.53 Protective clothing ....................................................................... 44
6.3.54 Deliveries of entonox & oxygen to Maternity patients home .... 45
6.4 Shutdowns .......................................................................................................................... 45
6.5 Generator Operation on Mains Failure ............................................................................. 46
  6.5.1 Use of oxygen at high concentrations ....................................................................... 46
6.6 Emergency Procedure ..................................................................................................... 47
  6.6.1 Use of Emergency reserve manifolds ......................................................................... 47
  6.6.2 Oxygen system ........................................................................................................... 47
  6.6.3 Medical and surgical compressed air .......................................................................... 47
  6.6.4 Nitrous oxide and Entonox ......................................................................................... 48
6.7 Emergency Cylinder ordering procedure ......................................................................... 48
  6.7.1 Failure of mains electricity supply ............................................................................ 49
  6.7.2 In the event of failure of both mains and generator supplies ..................................... 49
  6.7.3 A serious leak of medical gas ...................................................................................... 50
  6.7.4 Total or partial failure of a medical gas supply ............................................................ 50
  6.7.5 Contamination of a medical gas supply ...................................................................... 51
  6.7.6 Failure of an anaesthetic gas scavenging system (AGSS) .......................................... 52
  6.7.7 Over or under pressurisation of one or more gas systems ......................................... 52
  6.7.8 Fire ............................................................................................................................ 53
7. Training .................................................................................................................................. 53
8. Equality and Diversity .......................................................................................................... 53
9. Process for Monitoring Compliance with the Policy ......................................................... 54
10. Consultation and review of the policy ................................................................................. 54
11. Implementation of this policy ............................................................................................ 54
12. References .......................................................................................................................... 54
13. Associated Documentation ................................................................................................. 54

APPENDICES

Appendix A Contacts .............................................................................................................. 56
Appendix B Certificate of Appointment .................................................................................. 57
Medical Gas Policy

1. Introduction

This policy addresses the provision of a piped medical gas pipeline system (MGPS) in all premises operated by Gateshead Health NHS Foundation Trust (The Trust). The main premise being the Queen Elizabeth Hospital around which the main points of this policy are based.

The MGPS provides a safe, convenient and cost-effective supply of medical gases to points where these gases can be used by clinical and nursing staff for patient care.

The Trust management recognise its commitment to maintaining the MGPS to required standards and the training of all personnel associated with its operation.

2. Scope of policy

This policy is intended for use by all staff involved with MGPS in the Trust.

It applies throughout the premises, to all fixed medical gas pipeline systems located in all departments such as Wards, Critical Care Departments, Dental, Pathology, Theatres and Treatment areas.

Compressed gas and vacuum supplies to general engineering workshops and pathology Department equipment are separate from the general MGPS and are NOT included in this policy, although the general principles in this document should be followed for these departments.

MGPS Terminal units define the limits of QE Facilities responsibility in this policy.

Medical equipment is the responsibility of the Electronics Department.

Equipment connected to the terminal units is NOT covered by this policy, other than where its mode of use may affect system operation or safety.

Medical gases should not be used for non-medical purposes, other than as a test gas for medical equipment.

Medical air should be used as the power source for ventilators; the routine use of oxygen as a driving gas is to be avoided.

MGPS management responsibility for the Trust resides with QE Facilities.

It is Trust and QEF policy that before work on the MGPS can commence a Permit to Work Form, signed by an Authorised Person (MGPS) MUST be completed.
3. **Aim of the Policy**

The Medical Gas policy has been developed with an aim to guide and support all staff who directly or indirectly interface with medical gases within their role of employment to ensure safe and effective procurement, use and management of medical gases; and therefore safeguard public health.

3.1 The policy has been developed and reviewed by members of the Medical Gas Committee and presented at the Health and Safety Committee. It will also be available on the Trust’s intranet for all relevant staff to view.

4. **Duties – roles and responsibilities**

**Chief Executive**

Ultimate management responsibility for MGPS rests with the Gateshead Health NHS Foundation Trust Chief Executive.

The Chief Executive herein delegates written appointment of Authorised person (MGPS) to the QEF Mechanical Engineer, QEF Electrical Engineer and the QEF Maintenance Supervisor from QE Facilities Engineers Department. This service is provided under contract by QEF.

The Chief Executive delegates day-to-day management responsibility as the Authorising Engineer for the MGPS is Mr Peter Williams of MGPS Services Ltd.

**Authorising Engineer**

The duties and responsibilities of the Authorizing Engineer are:

- To recommend to the QEF Managing Director those Persons who, through individual assessment, are suitable to be Authorised Persons (MGPS).
- To ensure that all Authorised Persons (MGPS) have satisfactorily completed the 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 prior to such re-assessment.
- To review the management systems of the MGPS, including the Permit to Work System.
- To monitor the implementation of the Operational Policy and Procedures.
- To report to the Trust board, via the QEF Managing Director, any areas of concern or non-compliance with the MGPS
- To carry out on site audits

**Authorised Person (MGPS)**

Authorised Persons (MGPS) are required for Gateshead Health NHS Foundation Trust and will be based in Queen Elizabeth Hospital.

The Authorised Persons (MGPS) are listed in (Appendix A.)

The Authorised Persons (MGPS) assume effective responsibility for the day-to-day management and maintenance of the MGPS.
The duties and responsibilities of Authorised Persons (MGPS) are:

- To ensure that the MGPS 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 MGPS;
- Supervision of the work carried out by Competent Persons (MGPS) and for the standard of that work;
- To ensure that the MGPS maintenance specification and schedule of equipment (including all plant, manifolds, pipe work, 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 MGPS.
- To provide technical advice to those responsible for the purchase of any medical equipment which will be connected to the MGPS, in order to avoid insufficient capacity and inadequate flow rates;
- In accordance with the Trust policy on provision of services, provide advice on the provision and / or replacement of MGPS central plant and associated systems (QE Facilities will hold overall responsibility for the provision and maintenance of MGPS services within the Trust.
- To organise such training of QE Facilities staff (and other staff if requested) and / or transfer of MGPS information, as is needed for the efficient and safe operation of the MGPS.

**Competent Person (MGPS)**

All Competent Persons (MGPS) shall be suitably qualified QEF staff or contractors.

All Competent Persons (MGPS) shall be registered to BS EN ISO 9001 / BS EN ISO 13458, with clearly defined registration criteria.

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

- To carry out work on the MGPS in accordance with HTM 02;
- To carry out repair, alteration or extension work, as directed by an Authorised Person (MGPS) in accordance with the Permit to Work System and HTM 02 (2005);
- 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 Trust’s and QEF’s Health & Safety Policy.

**Quality Controller (MGPS)**

It is the responsibility of the Trusts Chief Executive to appoint, in writing, on the recommendation of the Chief Pharmacist a Quality Control Pharmacist with MGPS responsibilities.

The Authorised Person (MGPS) will be responsible for liaising with the QC (MGPS) and organising attendance as required.
The duties and responsibilities of the QC (MGPS) are:

- To assume responsibility for the quality control of the medical gases at the terminal units, i.e., the wall or pendant medical gas outlets;
- To liaise with the Authorised Person (MGPS) in carrying out specific quality and identity tests on the MGPS in accordance with the Permit to Work System and relevant Pharmacopoeia Standards;
- To organise MGPS training of Pharmacy staff who may deputise for the QC (MGPS);
- They should have received training on the verification and validation of MGPS and be familiar with the requirements of this MGPS Operational Policy.

**Inpatient Pharmacy**

The Inpatient Pharmacy at the Queen Elizabeth Hospital will:

- Receive delivery notes for compressed gas cylinders, check against invoices received and pass invoices for payment;
- Order and supply from BOC and other medical gas suppliers, cylinders of medical gases and special gas mixtures for the following areas:

**All Wards, operating theatres, maternity and manifolds**

*Manifolds shall include all manifolds which use bottled gases, including emergency back-up supply manifolds.*

- Maintain a record of cylinder rental charges and pass rental invoices for payment;
- Ensure that cylinder gases comply with Ph Eu requirements.
- Ensure that other gases and gas mixtures comply with manufacturers’ product licences.

**Designated Medical / Nursing Officer (DMO / DNO)**

‘It is the policy of the Trusts that all MGPS work in Wards and Departments carried out under the MGPS Permit to Work System will be controlled by the nursing staff. The term DMO (Designated Medical Officer) will not be used’.

- Duties and responsibilities of the Designated Nursing Officer;
- Who the defined person is and a statement of their responsibility to liaise with the AP (MGPS);
- their scope of responsibility for giving permission to interrupt supplies;
- any requirement to employ a Designated Medical / Nursing Officer for High Hazard work or work involving more than one department;
- restrictions on working hours and arrangement for out of hours cover;
- responsibilities during emergency situations;
- training arrangements.
Designated Person
A Designated Person is a Porter with particular responsibilities for medical gases. He / she will have undergone specialist training in the identification and safe handling and storage of medical gas cylinders, including relevant manual handling training.

Designated Persons in the Trusts will undertake the following duties:

- Assist with the delivery of gas cylinders by British Oxygen Company (BOC)
- Deliver full gas cylinders from the Cylinder Stores (Maternity or Jubilee wing as appropriate) to where required on the Trusts premises and return empty cylinders to these stores;
- Attach to and remove from cylinders, medical equipment regulators (or regulator / flow meter combinations) and manifold tailpipes. Note: It is a nursing responsibility in clinical areas & Portering responsibility in other areas.
- Identify and remove from service faulty (e.g. leaking) cylinders and subsequently notify the Engineering dept Tel 2591 of the location of such cylinders;
- Advise Pharmacy where the cylinder contents are not used within the 3-year fill / refill timescale specified by the gas supplier.

The Designated Person must work safely at all times, using the appropriate Personal Protective and Manual Handling Equipment, damage to which must be reported immediately to the Portering Management Team.

Medical Gases Committee
Chaired by the QEF Mechanical Engineer

The Medical Gas Committee shall consist of the Authorizing Engineer (MGPS), the Senior Authorised Person (MGPS), the Trusts Matron (or a nominated Designated Nursing / Medical Officer); the QC (MGPS) or Chief Pharmacists representative; the Portering Charge Hand with Medical Gas responsibilities; Head of Medical Devices; Health and Safety Advisor; Fire Safety Advisor; Theatre SLM; Resus Officer; and a Respiratory Nursing Representative.

Other signatories to this document shall also be invited to join the group when appropriate.

MGPS record drawings and documentation
The Authorised Person (MGPS) will maintain copies of the following;
- Up-to-date and accurate ‘as fitted’ record drawings (including valve / key numbers / TU identification) for all MGPS;
- Any necessary MGPS insurance / statutory documentation;
- MGPS safety valve replacement schedule (on a 5-yearly basis);
- New and completed Permit to Work books for work on the systems (for 10 years);
- Plant history / maintenance records;
- Manufacturer’s technical data sheets / manuals for all MGPS components;
• Health Technical Memorandum 02, any associated supplements and NHS Model Engineering Specifications C11, all latest editions;
• MGPS contractors’ service contracts and ISO 9001(or equivalent) certificates, staff training records, equipment calibration certificates, service records (copies);
• A list of all Personnel associated with the MGPS, especially the Permit to Work System;
• Emergency and other useful telephone numbers;
• MGPS staff training records
• Calibration certificates of Trust held test equipment
• The Medical Gas Policy
• Hose replacement program (4-5 years fixed hoses)

Pharmacy will maintain copies of the following:
• Delivery notes for medical gas cylinders
• Delivery notes for all Bulk gas deliveries
• Delivery Summary Form (tracks cylinder stock information)
• Cylinder rental invoices
• Cylinder Rental Reconciliation Form (Monitors trends in cylinder use over 6 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
• Calibration records of QC test equipment and records of all QC tests performed.
• Training

It is essential for the safety of patients that NO PERSON should operate, or work on, any part of an MGPS unless adequately trained or supervised.

A record of QEF staff who have been trained is kept in the QE Facilities Engineering Department.

A record of QE staff who have been trained is kept by Workforce Development.

It is the duty of Departmental Managers to ensure that all staff working with the MGPS are appropriately trained.

The Authorised Person (MGAP) may request training records of contractors’ staff.

Training on MGPS will be provided as follows:

<table>
<thead>
<tr>
<th>Staff Group</th>
<th>Provider</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Authorised persons</td>
<td>External body/ QE Facilities</td>
<td>3 yearly</td>
</tr>
<tr>
<td>Designated persons</td>
<td>BOC/QE Facilities</td>
<td>3 yearly</td>
</tr>
<tr>
<td>Nursing staff</td>
<td>Matrons/BOC</td>
<td>3 yearly</td>
</tr>
</tbody>
</table>
5. The MGPS Structure

5.1 Oxygen plant

One vessel (V.I.E. 337) of a B.O.C. duplex V.I.E. vessel system supplies oxygen to the Queen Elizabeth Hospital.

It is located to the rear of the Phase 3 building adjacent to gas manifold and medical air compressor rooms.

A second vessel (V.I.E. 33-17) of a B.O.C. duplex V.I.E. vessel system, set to come on automatically in the event of plant failure supports the main vessel. It is located adjacent to the main vessel.

Security-Access

The duplex V.I.E. Vessel System is located in a locked compound. Competent Persons (MGPS), on proof of identity, must obtain an access code number from the Engineers Department to gain entry to the compound. BOC staff should report to engineering dept for Permit to work before undertaking Maintenance.

5.2 Nitrous oxide

A Medaes ((MCS2) size 2 x 10J) automatic cylinder manifold system supplies nitrous oxide to the Queen Elizabeth Hospital.

It is housed in the Medical gas manifold room to the rear of the Phase 3 building.

A manual cylinder manifold (2 x 10J), set to come on automatically in the event of a plant failure supports this system. It is located in the same room.

Security-Access

The nitrous oxide manifolds are located in a locked room. Competent Persons (MGPS), on proof of identity, must sign out the relevant key from the Engineers Department to gain access. A second key is held at Pharmacy.

5.3 Medical compressed air plant

A Medaes (Medplus air plant) quadruplex medical air compressor/receiver/dryer unit supplies medical compressed air to the Queen Elizabeth Hospital.

It is housed in the Medical gas compressor room located to the rear of the Phase 3 building and provides both medical and surgical air.

An automatic cylinder manifold (Medaes MCS2) size 2 x 10J), set to come on line automatically in the event of plant failure, supports this plant. It is located in the Medical gas manifold room located to the rear of the Phase 3 building.
Security-Access
The compressor plant and its emergency supply manifold are located in locked rooms. Competent Persons (MGPS) and Suitably Qualified Persons (MGPS), on proof of identity, must sign out the relevant key from the Engineers Department, to gain access.

5.4 Central medical vacuum system

A Medaes duplex vacuum pump/Triplex receiver system supplies the medical vacuum service to the Queen Elizabeth Hospital.

It is housed in the Medical gas compressor room located to the rear of the Phase 3 building.

Portable suction equipment is available throughout the hospital to support this plant in the event of plant failure. It is located at ward/department level.

Security-Access
The vacuum pump units are located in a locked room. Competent Persons (MGPS), on proof of identity, must sign out the relevant key from the Engineers department, to gain access.

5.5 Entonox

A Medaes ((MCS2) size 2 x 4G) automatic cylinder manifold system supplies Entonox to the Maternity Department Delivery Suite at the Queen Elizabeth Hospital.

It is housed in a manifold room to the North West corner of the Delivery Suite.

A manual cylinder manifold (2 x 1G) set to come on automatically in the event of a plant failure supports this system. It is located in the same room.

Security-Access:
The Entonox manifolds are located in a locked room. Competent Persons (MGPS), on proof of identity, must sign out the relevant key from the Engineers department, to gain access.

Security - Key holders:
Engineers Contact extension number 2591
Porters Contact extension number 2330
Pharmacy Contact extension number 2312

Emergency contact:
Engineers Contact number 2591 or on-call engineer via main switchboard

Signage
Appropriate identification and safety warnings should be displayed in accordance with current requirements.
A notice should state the location of the keys and be fixed to the plant room door.

6. Cylinder storage

Main cylinder stores are located at the rear of the Jubilee wing. The stores are constructed in accordance with HTM 02 section 8 and have appropriate signage provided. Porters are responsible of housekeeping of the cylinder store.

Security - Key holders:
- Engineers: Contact extension number 2591
- Porters: Contact extension number 2330
- Pharmacy: Contact extension number 2312

Emergency contact:
- Engineers: Contact number 2591 or on-call engineer via main switchboard

6.1 Area valve service units (AVSUs)

6.1.1 Summary

Locked boxes containing isolating valves in enclosures with breakable glass fronts (area valve service units, or AVSUs) are provided at the entrance to wards and departments. All AVSUs have a unique number and tag system for identification.

These valves provide facilities for both routine and emergency isolation of gas supplies.

These valve boxes contain an emergency inlet port, which is gas specific. This may be used to supply gas to a ward when the main supply fails, or is shut down for essential engineering work.

6.1.2 General rules and conditions for control of line valve assemblies LVAs

Pipeline valves (called lockable line valves assemblies LVAs) in ducts, risers, ceiling spaces etc. shall be locked in the normal operating position.

Pipeline valves will normally be left unlocked if they are sited in a locked plant room. QE Facilities will hold keys for these valves.

6.1.3 Access

Under normal events, only the Authorised Persons (MGPS) using the appropriate key from the QE Facilities medical gases key cabinet, should access AVSUs and any other locked line valves, under control of a Permit to Work.

The key cabinet contains a list identifying all AVSUs and locked line valves, with corresponding key numbers.
6.1.4 Key holders:
Key holders are listed in Appendix A.

In the event of an emergency, access to the valve boxes and AVSUs may be gained by smashing the breakable glass fronts.

**NURSE IN CHARGE OR A DESIGNATED 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.**

6.2 Routine procedures

6.2.1 The MGPS Permit to Work System
The aim of the MGPS Permit to Work System is to safeguard the integrity of the medical gas system, and therefore the safety of the patients.

It is the policy of The Trust that, with the knowledge and permission of the Authorised Person (MGPS) a Permit must be raised before any work, except changing of manifold cylinders or emergency isolation, by a member of the nursing staff, can be undertaken on any part of the Trusts Medical gas system.

Granting of a Permit to Work and the way in which the work is carried out must follow the directions of HTM 02, unless otherwise defined in this Policy.

Responsibilities for signing a Permit to Work lie with the Designated / Medical Nursing Officers in each Department.

Officers should ensure that colleagues are advised of the interruption to the gas supply, and its estimated duration.

Officers should also ensure via QE Facilities that all affected terminal units are appropriately labelled. Labels kept at engineer’s department by the Authorised Persons.

6.2.2 Planned interruption
A planned interruption will be needed for repair, extension or modification to the existing MGPS. An Authorised Person (MGPS) shall supervise any planned interruption in strict accordance with the Permit to Work System in HTM 02:2005. The QC (MGPS) Pharmacist shall be involved in any planned interruption from the initial planning stage.

The Authorised Person (MGPS) shall assess the hazard level of the work to be carried out in accordance with the definitions that are given in the following sections for High and Low Hazard work. (Note that Medium Hazard is no longer used as a classification).
6.2.3 HIGH Hazard Work

Any work on the MGPS, such as cutting or brazing, that will introduce hazards of cross-connection and pollution, will be classified as HIGH HAZARD and as such will have a High Hazard Permit to work raised against Job.

Cross-connection, performance, identity and quality tests shall be required before the MGPS is taken back into use.

High hazard work may require at least a planned interruption to a single ward or Department, or, at worst, a major shutdown of a system to a whole site.

In such events, an Authorised Person (MGPS) must ensure that key Personnel for each and every ward or Department are informed; if necessary, holding a site meeting.

The QC (MGPS) Pharmacist should be included in any discussions that may lead to an interruption of the MGPS.

Two weeks prior to the planned interruption, the Authorised Person (MGPS) shall liaise in Person with the DNO of the ward(s) or Department(s) concerned.

At the same time, the Authorised Person (MGPS) will complete Part 1 of the Permit to Work Form and the fourth sheet, showing the point of isolation.

The DNO of the ward(s) or Department(s) involved will be made aware that their signatures will be required on the date on which the work is due to take place.

The requirement for portable cylinders or vacuum units will be determined and confirmed, with details of the interruption, by a memorandum from Senior Authorised person to the DNO.

A copy of this memorandum will be sent to the ward(s) or Departments(s) concerned. A further memorandum, requesting the services of a Quality Controller (MGPS) and detailing the requirements for portable cylinders shall be sent to Pharmacy and their appointed QC pharmacist.

It is the responsibility of the Authorised Person (MGPS) to arrange, through the Portering and Pharmacy Departments, or an appropriate hire firm if necessary, for portable cylinders and regulators.

Any additional portable vacuum units to be supplied are the responsibilities of the DNO of the ward(s) or Department(s) concerned.

The Authorised Person (MGPS) will provide all details of the work to be carried out in Part 2 of the Permit to Work Form, including any other Permits, e.g. for ‘hot works’ or for entry into confined spaces.
Work shall only commence when the DNO for the ward(s) or Department(s) is / are satisfied that no patients will be put at risk by the shutdown of the MGPS and has / have signed Part 1 of the Permit to Work Form.

The Authorised Person (MGPS) will then supervise isolation of the AVSU(s) by the CP (MGPS), after confirming isolation details by consultation with the CP (MGPS) and examination of the sketch on the fourth sheet of the permit and any additional drawings, if available.

Once the system(s) has / have been isolated and de-pressurised, the Competent Person (MGPS) will sign Part 2 of the Permit to Work Form and, together with the Authorised Person (MGPS), the fourth sheet of the permit, and then commence work.

The Competent Person (MGPS) will sign Part 3 of the Permit to certify that work has been completed, and contact the Authorised Person (MGPS), so that the installation may be examined and tested.

Depending upon the extent of High Hazard work, the Authorised Person (MGPS) will determine and carry out, with the assistance of the Competent Person (MGPS), the necessary tests and examination of the system(s) in accordance with HTM 02 ‘Validation and Verification’

When these tests have been completed satisfactorily, the Authorised Person (MGPS) will initial the relevant spaces and sign Part 3 of the Permit.

The Quality Controller (MGPS), with the assistance of the Authorised Person (MGPS) will carry out identity and quality tests on the system(s) in accordance with HTM 02 ‘Validation and Verification’.

When these tests have been completed with satisfactory results, both will initial the relevant spaces and sign Part 4 of the Permit.

The Quality Controller (MGPS) will receive the pink copy of the Permit to Work Form from the Authorised Person (MGPS).

Note: It should be the normal practice of QE Facilities to retain the white copy along with the original (yellow) copy and the fourth sheet in the Permit to Work Book. Photocopies (signed and dated by the AP (MGPS) and the CP (MGPS)) of the white copy may be issued to the Competent Person (MGPS) on request. Alternatively, the CP (MGPS) can retain the yellow copy on request.

The DNO will accept the system(s) back into service by signing Part 5 of the Permit and will undertake to notify his / her colleagues that the system is fit for use.
6.2.4  **LOW Hazard Work**

Any work on the MGPS which will not introduce any hazard of cross-connection or pollution.

Low hazard work on terminal units is normally the result of a leak on an individual terminal unit due to a faulty valve or seal but may also include work on plant, which does not interrupt gas supplies.

This type of work is usually carried out at short notice because of the need for minimum disruption to patient care. In such events, the Authorised Person (MGPS) may have to arrange a portable cylinder or vacuum unit, so that the terminal unit can be taken out of service.

Work such as alarm panel service or compressor maintenance would be classed as low hazard and as such the low Hazard permit has no need to be signed by DNO.

The Authorised Person (MGPS) will fill out the relevant section of **Part 1** and the **fourth** sheet of the Permit to Work Form. The Authorised Person (MGPS) will liaise with, and fully brief, the DNO of the ward / Department who will then sign **Part 1**, if required.

The Authorised Person (MGPS) will provide all details of the work to be carried out in **Part 1** of the Permit to Work Form.

When satisfied with the extent of the work, the Competent Person (MGPS) will sign **Part 2**.

The Competent Person (MGPS) will sign **Part 3** of the Permit to certify that the work has been completed, and contact the Authorised Person (MGPS) for the installation to be examined and tested.

The Competent Person (MGPS), with the assistance of The Authorised Person (MGPS), if necessary, will carry out flow, pressure drop, mechanical function and gas specificity tests on the serviced terminal unit(s).

Other equipment function tests, e.g. on plant, will be made to the satisfaction of the Authorised Person (MGPS).

The Authorised Person (MGPS) Competent Person (MGPS) will initial the relevant spaces, and sign **Part 3** of the Permit.

When satisfied with the test results, the Authorised Person (MGPS) will sign **Part 4** of the Permit.
The DNO of the ward or Department will accept the MGPS back into service by signing Part 5 of the Permit and will undertake to notify his / her colleagues that the system is fit for use.

6.2.5 Actions in the event of a medical gas alarm
On detection of a local alarm indication e.g. in a ward area, the Senior Duty Nurse (Or other nominated person) should contact the Switchboard to confirm that a fault has been signalled and that QE Facilities has been informed.

In the event of an alarm condition on the central alarm panel, it is the responsibility of the DUTY TELEPHONIST to inform the Site engineer during working hours or the on-call engineer at all other times.

Notes:
Disabling the alarm system, other than when due authorization has been obtained from an Authorised Person (MGPS), is absolutely forbidden as this may compromise patient safety.

There should always be a ‘normal’ light. If there is no ‘normal’ light, then there is a fault of some kind, possibly just with the alarm panel.

However, QE Facilities should investigate this fault.

Alarms should be tested weekly by a Competent Person (MGPS) (Or other nominated person).

Alarms pressure switches should be tested annually

Operation of the TEST button will confirm operation of all audible / visual indicators.

Nursing / Medical staff should be advised of this test.

<table>
<thead>
<tr>
<th>ALARM INDICATION</th>
<th>Action (TELEPHONIST TO INFORM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NORMAL</td>
<td>No action to be taken</td>
</tr>
<tr>
<td>PLANT FAULT</td>
<td>NWH - QE Facilities</td>
</tr>
<tr>
<td></td>
<td>ONWH - QE Facilities (On-call rota)</td>
</tr>
<tr>
<td>PLANT EMERGENCY</td>
<td>NWH - QE Facilities</td>
</tr>
<tr>
<td></td>
<td>ONWH - QE Facilities (On-call rota)</td>
</tr>
<tr>
<td>Alarm Indication</td>
<td>Action (Telephonist to Inform)</td>
</tr>
<tr>
<td>------------------</td>
<td>--------------------------------</td>
</tr>
<tr>
<td>RESERVE LOW</td>
<td>NWH - Porters ONWH - Porters</td>
</tr>
<tr>
<td>PRESSURE FAULT</td>
<td>NWH - QE Facilities ONWH - QE Facilities (On-call rota)</td>
</tr>
<tr>
<td>Panel Indication</td>
<td>(all alarm panels)</td>
</tr>
<tr>
<td>Power On</td>
<td>No action to be taken</td>
</tr>
<tr>
<td>System Fault</td>
<td>NWH - QE Facilities ONWH - QE Facilities (On-call rota)</td>
</tr>
</tbody>
</table>

It is the responsibility of the AP (MGPS), to ensure that a procedure for each alarm indication is displayed next to the respective central alarm panel.

### 6.3 Cylinder Management

#### 6.3.1 Introduction

Medical gases are medicines and, as such, it is recommended that, regardless of operational infrastructure, the chief pharmacist should take an active role in the management of medical gas cylinders. It is essential that risk assessments are carried out as part of the cylinder management process.

Sound cylinder management is important for the following reasons:

- it is particularly important that documentation needed to establish conformity of identity and quality with Ph. Eur. requirements is retained for possible inspection;
- stock control issues are important in maintaining adequacy and continuity of supply;
- Improper methods of cylinder storage may give rise to serious health and safety issues.

#### 6.3.2 Classification of gases by physical type

**Permanent gases**

These are gases that remain in the gaseous state in the cylinders at normal temperatures. The volume of the contents of the cylinder is directly related to the pressure of the gas; for example, at a quarter of the filled pressure, the cylinder is a quarter full. Such gases include oxygen and medical air.

**Liquefiable gases**

These are gases that are supplied as a liquid at normal temperatures (for example nitrous oxide and carbon dioxide) or gases supplied as a liquid at a
cryogenic temperature, that is, below –40°C (for example liquid nitrogen and liquid oxygen).

**Notes**
The pressure of the gas stays fairly constant as the liquid is vaporised and only falls (often dramatically) when the cylinder is nearly empty.

Accurate measurement of cylinder contents is possible only by weighing the whole and deducting from it the tare weight of the cylinder (usually stamped on the cylinder shoulder).

### 6.3.3 Classification of gas cylinders
In this document, gas cylinders are classified into two main categories – medical and non-medical. Cylinders from these two categories must never be mixed, either in storage or in use.

Gas cylinders are subdivided into groups, depending on the major risk associated with the cylinder contents as follows:
A. group 1 – flammable;
B. group 2 – oxidising;
C. group 3 – toxic or corrosive (the contents may also be flammable or oxidising);
D. group 4 – others (including inert gases).

The most common gases, grouped as above, likely to be used in health buildings are shown in Table 2.

### 6.3.4 Labelling/marking of cylinders
Cylinders should be colour-coded and marked in accordance with BS EN ISO 407:2004, the Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 2009, and The Transportable Pressure Equipment Directive 1999/36/EC.

Each cylinder should have:
- a batch label to include a unique batch number, filling branch code, cylinder code and product and expiry date;
- a product identification label which includes:
<table>
<thead>
<tr>
<th>Group Classification of gas cylinder contents</th>
<th>Medical Gas</th>
<th>Non-medical gases</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Flammable (red diamond label)</td>
<td></td>
<td>• Acetylene</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• LPG (for example propane, butane)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• STG (synthetic town gas)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Methane</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Natural Gas</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Hydrogen</td>
</tr>
<tr>
<td>2. Oxidising and/or supports combustion (yellow diamond label)</td>
<td>• Oxygen</td>
<td>• Oxygen</td>
</tr>
<tr>
<td></td>
<td>• Nitrous oxide</td>
<td>• Nitrous oxide</td>
</tr>
<tr>
<td></td>
<td>• Oxygen/nitrous oxide</td>
<td>• Oxygen/nitrous, oxide mixtures</td>
</tr>
<tr>
<td></td>
<td>• Oxygen/Carbon dioxide</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Oxygen/helium mixtures</td>
<td></td>
</tr>
<tr>
<td>3. Toxic and corrosive</td>
<td></td>
<td>• Ethylene oxide (C2H4O)</td>
</tr>
<tr>
<td>3.1 Toxic and/or corrosive and flammable</td>
<td></td>
<td>• Carbon monoxide</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Ethylene oxide/carbon dioxide measures &gt;6% C2H4O</td>
</tr>
<tr>
<td>3.2 Toxic and/or corrosive and oxidising</td>
<td></td>
<td>• Nitric oxide measures</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Sulphur dioxide</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Chlorine</td>
</tr>
<tr>
<td>3.3 Toxic and/or corrosive only</td>
<td></td>
<td>• Ethylene oxide/halocarbon mixtures &lt;15% C2H4O (certain conditions only)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Ethylene oxide/carbon dioxide mixtures &lt;6% C2H4O</td>
</tr>
<tr>
<td>3.4. Others including inert, but excluding toxic or corrosive (green diamond on label)</td>
<td>• Carbon dioxide</td>
<td>• Compressed air</td>
</tr>
<tr>
<td></td>
<td>• Helium</td>
<td>• Carbon dioxide</td>
</tr>
<tr>
<td></td>
<td>• Medical</td>
<td>• Nitrogen</td>
</tr>
<tr>
<td></td>
<td>• Nitric oxide 1000vpm (volume parts per million) in nitrogen</td>
<td>• Argon</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Helium Halocarbon</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Refrigerants</td>
</tr>
</tbody>
</table>
(i) the product licence number;
(ii) The name and chemical symbol of the gas or gas mixture contained in the cylinder. Additionally, in the case of gas mixtures, the proportion of constituent gases should be shown;
(iii) a hazard warning sign;
(iv) a substance identification number;
(v) specific product and cylinder handling precautions;
(vi) particular instructions to the user where necessary;
(vii) safety information;

c. a serial number;

d. test mark, year and quarter of test.

Cylinders, pressure-reducing regulators and pressure gauges should be conspicuously marked “use no oil, grease or hand creams etc” or with the appropriate symbol. Cylinder yokes, pressure reducing regulators and pressure gauges should be clearly and indelibly marked with the designation of the gas or gas mixture for which they are intended. BS EN ISO 407:2004 may be used as guidance.

Pressure gauges should be in accordance with BS EN 837-1:1998, with the appropriate standard for the particular type of medical equipment or to S 4272-3:1989, as appropriate.

6.3.5 Cylinder colour codes
Cylinder colours are detailed in the safety data sheets provided by the cylinder gas suppliers.

6.3.6 Cylinder sizing and naming
Cylinder sizes and names are detailed in the safety data sheets provided by the cylinder gas suppliers.

6.3.7 Medical gas cylinder valve types
There are four basic valve types: bull-nose, hand-wheel, star and pin-index. The latter may be configured as either top/side spindle or knurled knob (Top) operated.

Bull-nose valves are used on larger cylinders: for example F and G. Gas connection is made between the spherical end (bull-nose) of the regulator and the conical seat of the valve outlet. The seal is either by direct metal to metal contact between the bull-nose and cone (uncommon nowadays) or by an O-ring on the bull-nose.

The hand-wheel valve is used on F, G and J sizes of medical nitrous oxide, VF and LF sizes of carbon dioxide, and many pathology and industrial gas cylinders. A flat sealing washer (a Bodok seal) fits between the cylinder connector and valve. The cylinder is usually provided with a metal valve protection guard and the gas outlet is fitted with a plastic or metal blanking
cap. Plastic caps should be discarded before use, but metal screw-on valve covers should be retained and replaced before the empty cylinder is returned to the supplier. If fitted, the valve guard should not be removed.

The star valve combines a regulator and valve as a single unit. They are operated by a single hand-wheel and are fitted with a variety of outlets and, in the latest cylinder types, a differently formed hand-wheel. A range of output flow rates is also available. They are fitted to some sizes of medical air and oxygen cylinders. The latest, lightweight cylinders from gas suppliers are fitted with a combined valve (similar in construction to the star valve), regulator and flow control device. The cylinders will become available in a range of sizes during the life of this Policy.

Pin-index valves (with a top spindle or knurled knob) are fitted to all E-size, and smaller, cylinders as well as to F- and G-size Entonox cylinders.

Pin-index valves with a side spindle (J-size oxygen and medical air for manifolds) should be operated with the correct key.

Safety notes
a) The pin-index valve is not fitted to G-size medical air and oxygen cylinders, and it is still possible to interchange these gases in ward areas where G-size cylinders, attached to items of medical equipment, are in use.

b) Knurled-knob valves fitted to smaller sizes of nitrous oxide cylinders should not be used to carry the cylinder, as it is possible for the valve to be opened accidentally, resulting in discharge of high pressure expanding (and hence cooling) gas into the hand. Frostbite could result.

c) While colour codes are being revised, Care must be taken to ensure that the new cylinders of industrial oxygen (at a pressure of 230 bar and having a black cylinder body and white shoulder akin to the “old” medical oxygen cylinder colour code) fitted with bull-nose valves are not inadvertently connected to medical equipment not designed to withstand this pressure (see Figure 3).

ZA, ZD, CD, DD, DF, ZH, HX and ZX cylinders are fitted with valves that have an integral pressure regulator, with an outlet pressure of 3 or 4 bar(g). These regulated valves are fitted with an ISO 5145 product specific filling connection and either a product specific BS 5682 Schrader outlet connection or a standard 6mm fir tree outlet.

6.3.8 Cylinder safety – main principles
The main hazards associated with gas cylinders are:

Careless storage, handling, dropping or impact can cause physical or personal injury. These hazards should be minimised:
(i) by the correct design, location and construction of cylinder storage areas;
(ii) by the provision of suitable storage and handling equipment;
(iii) by the adoption of safe operating practices; and
(iv) by medical gas training for staff;

Leakage of gas where the cylinder contents may be flammable, oxidising, asphyxiating, anaesthetic, toxic or a combination of these characteristics. In the event of leakage, gas may collect in a confined space and cause or contribute to a fire, explosion or health hazard.

6.3.9 Cylinder storage and handling

General

This section is concerned with the operational aspects of medical gas cylinders, including storage, handling and general safety, and applies also to the storage and handling of pathology and industrial cylinders. Attempts should be made to reduce manual handling of cylinders and excessive levels of storage.

All staff must have completed ‘The Safe Handling and use of Bottled Gas, BOC’s approved training’ and the Trust’s in-house Manual Handling training before any lifting/moving of cylinders is carried out.

Existing storage facilities should have been designed to comply with the recommendations of Health Technical Memorandum 16, Health Technical Memorandum 02 or earlier editions of Health Technical Memorandum 02, as appropriate. Gas cylinders should have been stored in either a storeroom that is part of the health building or a separate, specially constructed building, both areas being used exclusively for medical gas cylinders. These stores will usually be satisfactory, provided that the ventilation is adequate.

The decanting and filling of medical gas cylinders is subject to the Pressure Systems Safety Regulations 2000 and the Health and Safety at Work etc Act 1974, and should not be carried out on a healthcare site.

6.3.10 Main stores

Guidance on the construction and use of these stores is given below, and this should be applied to all other storage areas where possible. Additional guidance on cylinder storage can be found in BCGA’s (2005) Guidance Note GN2 – ‘Guidance for the storage of transportable gas cylinders for industrial use’.

6.3.11 Ready-to-use stores

In some areas, it will be essential to hold small numbers of spare cylinders for immediate use for connection to anaesthetic machines and for sudden unanticipated demands. Such areas would include operating departments, Accident & Emergency departments, coronary care units, central delivery suites of maternity departments, special care baby units, critical care areas etc.
These stores should only be used for full cylinders, and all empty cylinders should be returned immediately to the main cylinder store. Attempts should be made to reduce the number of cylinders within the department.

The numbers of cylinders held should be kept to the minimum; a 24-hour supply should suffice for normal circumstances, although this may have to be increased for weekends, bank holidays etc and other operational reasons.

These cylinders should be kept in a specially designated room. This should comply as far as possible with the requirements for manifold rooms, but in any case should be well-ventilated and, where practicable, have at least one external wall to facilitate natural ventilation.

This designated room should be clearly labelled with the types of cylinder contained and “no smoking” warning signs.

No combustible material should be kept in the ready-to-use store. The general principles given in this section on covering cylinder store construction should be followed where appropriate.

Cylinders should be stored in racks in accordance with BS EN ISO 407:2004.

Sufficient space should be provided for manoeuvring cylinders onto and off trolleys. Adequate means of securing large cylinders should be provided to prevent falling.

Small cylinders of oxygen/nitrous oxide mixtures should be kept horizontal and placed away from ventilation openings where practicable and not subjected to extremes of heat and cold.

Cylinders connected to regulators may be returned to these stores. Check for leaks, close the cylinder valve, and vent the regulator contents before disconnecting it from the cylinder.

A good stock of cylinder keys should be kept in/ near the store.

6.3.12 Local storage (wards)
Cylinders of medical air/oxygen mounted on trolleys or in designated racks are used as emergency gas supplies in ward areas. Designated “parking” areas should be sought for these trolleys, and the area should be signed to indicate its purpose.

All staff should be made aware of the location and function of these cylinders.
6.3.13 **Local storage (non-specific storage areas)**

There are occasions when small storage areas are established in a corridor. These usually consist of a cylinder support system and a notice identifying the purpose of the cylinders.

Such a method of storage is not to be encouraged, as the cylinders are vulnerable to mechanical damage and tampering. Efforts should be made to provide appropriate safe storage.

6.3.14 **Manifold rooms**

Manifold rooms should not generally be used as general cylinder storage areas (but see paragraph 8.47).

Only cylinders of the gases required for connection to the manifold should be kept in the manifold room. The manifold room should not be used for any other purpose (but see paragraphs 8.42–8.47).

**Note**

All manifolds may be sited together in the same manifold room, and it is therefore essential that cylinders of different gases stored within this room are kept segregated to ensure the efficient changeover of manifold cylinders.

The number of cylinders in manifold rooms should be restricted to the minimum required for operational and reserve purposes. This will include cylinders connected to the manifold(s) and a sufficient reserve to replenish one complete bank.

In the case of manifolds for nitrous oxide/oxygen mixtures, sufficient cylinders to replace two complete banks should be stored.

6.3.15 **Exceptions**

There will be small hospitals, dental units and other small sites where division of the storage area into “full” and “empty” bays, as described in this section, is not feasible.

Some sites, in the absence of a dedicated building, will also store small cylinders of all medical gas types in medical gas manifold rooms. In such cases, the Authorised Person (MGPS) should complete a risk assessment to validate the storage of such cylinders in the manifold room.

Care should be taken to ensure that different gas types and full and empty cylinders are segregated as clearly as possible and provided with a labelling system that clearly indicates the cylinder status (see paragraph 8.157).

The Authorised Person (MGPS) should ensure that appropriate training is being carried out on an ongoing basis.
The manifold room may be used for essential storage of nitrous oxide/oxygen mixture cylinders (on trolleys) to permit temperature equilibration before use with directly connected equipment.

6.3.16 Cylinder store construction
Cylinder stores should be located at ground level – not underground, for example in a basement.

Cylinder stores should be located as close as possible to the delivery point. Wherever possible there should be only one delivery supply point for each site.

No parking should be permitted within the delivery and storage area other than for loading and unloading cylinders.

The location of the cylinder store should be marked clearly on the site plan for ease of identification in the event of an emergency.

Stores should not be located in close proximity to any installation that may present a fire risk or other hazard. BCGA’s (2005) Guidance Note GN2 – ‘Guidance for the storage of transportable gas cylinders for industrial use’ gives separation distances for a range of gas types.

6.3.17 Ventilation
All cylinder stores should be covered and, when constructed of brick or other solid material, ventilated by means of high- and low-level vents. A ventilation area of 1.5% of the total area of walls and floor will ensure adequate ventilation.

6.3.18 Signage and labelling (including Hazchem signs)
The following signs should be posted:

a) Safety signage (Hazchem notices) in accordance with the requirements of the Health & Safety (Safety Signs & Signals) Regulations 1996, BS 5499-5:2002 and the Health and Safety at Work etc Act 1974 should be posted in and outside any area where cylinders are stored;

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

c) A store contents notice, clearly indicating the contents of the store;

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

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

6.3.19 Access
Clear and secure access to all cylinder stores is required, including adequate space for vehicular access and cylinder loading/unloading.
Access to the store should be key-controlled. A duplicate key should be kept in a locked box with a transparent front cover at the main fire entrance, gatehouse or equivalent building so that, in the event of a fire, a member of the fire brigade may obtain a key immediately he/she enters the hospital site. The transparent front of the box should be labelled: “Break cover to obtain key for emergency use only”.

Where this would not be desirable for security reasons, a prominent notice clearly stating the location of the key should be displayed.

The store should have easy access for trolleys. The cylinder bays should be arranged to allow trolleys to be safely manoeuvred and cylinders to be loaded and unloaded.

The doors should be large enough to facilitate cylinder loading/unloading and should be on an external wall. The emergency exit should be provided with a panic-release lock. Doors should open outwards.

**6.3.20 Emergency access/exit**

If the travel distance from the access doors to any part of the stores exceeds 15 m, additional emergency exits should be provided. The advice of the local fire safety officer should be sought.

**6.3.21 Fire protection**

All cylinder stores should be free from naked flames and all sources of ignition, and should be designated “no smoking” areas.

Appropriate fire-fighting equipment should be provided either within the store or at a convenient (signed) location nearby. The fire brigade should be notified of the location of the stores and any emergency access keys.

General fire precautions applicable to medical gas pipeline systems are given in the “Fire precautions”

Smoke/heat detectors should be installed in ready-to-use medical gas cylinder stores in hospitals with an automatic fire detection system in accordance with Health Technical Manual - HTM05.

**6.3.22 Electrical installations/lighting**

Electrical installations in gas storage areas are addressed by BS EN 60079-10:2003 and BS EN 60079-14:2003.

**Notes**

BS EN 60079-10:2003 is intended to be applied where there may be a risk of ignition due to the presence of flammable gas or vapour, mixed with air under normal atmospheric conditions.

It covers the classification of hazardous areas where flammable gas or vapour risk may arise. The standard also gives details about the protective measures that need to be applied to reduce the risk of explosions.
The standard sets out the essential criteria against which the risk of ignition can be assessed. It also gives guidance on the design and control parameters that can be used to reduce such a risk. Area classification is also a method of analysing and classifying the environment where explosive gas atmospheres may occur. This will facilitate the proper selection and installation of the apparatus to be used safely in that environment, taking into account gas groups and temperature classes.


In medical gas stores containing oxygen, nitrous oxide, nitrous oxide/oxygen mixtures, medical air, medical carbon dioxide, helium/oxygen mixtures and oxygen/carbon dioxide mixtures, electrical installations will not require gas-tight fittings. However, to ensure mechanical and environmental protection, electrical installations should be completed in “pyro” or SWA (steel wired armoured) cables, with suitably glanced fittings.

Some medical gas mixtures (for example lung function mixtures) may contain flammable agents (denoted by a red band on the cylinder shoulder). If these mixtures are stored with non-flammable medical gases in a well-ventilated store, the wiring techniques in paragraph 8.70 will still apply.

For all other flammable gases/gas mixtures (for example pathology/industrial gases and stores combining a medical/industrial or medical/pathology function), the degree of protection of the electrical system against gas ingress will require specialist assessment against the standards in paragraph 8.69.

6.3.23 Segregation of gases/cylinders
Cylinder stores for medical gases should only contain medical gas cylinders.

Industrial and pathology gases cylinders should be stored in a separate, appropriately designated store.

Separate, clearly identified bays should be provided for full and empty cylinders.

Separate areas for different gases should be provided, but it is not necessary to construct a physical barrier unless it is convenient to do so (see Figure 4).

6.3.24 Cylinder restraint
Adequate means of securing large cylinders should be provided to prevent falling.

Smaller cylinders should be stored horizontally on proprietary racks, suitably protected to prevent damage to cylinder paintwork.
Trolleys carrying cylinders may be stored in the area for immediate use, but care should be taken to ensure that cylinders are suitably restrained to the trolleys.

6.3.25 **Personal protective equipment**
Personal protective equipment/clothing should be provided and used. Any loss or damage should be reported immediately.

6.3.26 **Store temperature**
Stores are intended to be well-ventilated, and therefore may not offer the degree of protection needed to prevent the separation at low temperatures of an oxygen/nitrous oxide mixture into its components. It is important that cylinders of this gas mixture are kept above 10°C for 24 hours 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.

A hazardous situation could arise if cylinders are subjected to extremes of temperature. Cylinders should be kept away from sources of heat, including steam pipes and hot, sunny positions.

6.3.27 **Cleanliness**
The store must be kept clean, dry and free from flammable material. Rubbish, chemicals etc must not be stored with the cylinders. The area should be swept regularly and, where necessary, weeds removed from the immediate vicinity. Flammable weed killers must not be used.
6.3.28 Signage
Appropriate safety signage should be provided in all cylinder stores in accordance with HTM 02 Chapter 14, Part A.

6.3.29 Handling of cylinders
Cylinders can be heavy (for example, an empty J-size steel cylinder weighs approximately 70 kg) and bulky, and should therefore be handled with care only by personnel who have been trained in cylinder handling and who understand the potential hazards.

Cylinders should not be dropped, knocked, used as “rollers”, or be permitted to strike each other violently.

Cylinders and valves should be kept free from oil, grease and other debris.

**Note**
Oil and grease in the presence of high pressure oxygen and nitrous oxide are liable to combustion and should not be used as a lubricant on any gas cylinder or equipment. In particular, the cylinder valve, couplings, regulators, tools, hands and clothing should be kept free from these substances.

Cylinders should not be marked with chalk, crayon, paint or other materials, or by the application of adhesive tapes etc. A tie-on label indicating the content state may be attached to the cylinder.

Smoking and naked lights are prohibited in the vicinity of all cylinders.

Cylinders should always be secured during transportation and in use.

Safety devices, including pressure-relief devices, valves and connectors should not be altered or by-passed.

Repairs, alterations or modifications should not be undertaken.

Markings used for identification of cylinder contents, pressure-testing of cylinders, tare weights etc should not be defaced or removed. This also applies specifically to cylinder product labels.

Cylinders should not be painted or otherwise obscured in a manner that would prevent identification of their contents, and care should be taken to preserve their labels and surface finish.

Cylinders used for industrial purposes should not be used for medical applications. Similarly, medical gases should not be used for non-medical Applications.

Cylinder valves should not be dismantled or tampered with.
Leaking cylinders should be removed from service and returned to the gas supplier.

Cylinder valves should always be closed after use and when cylinders are empty.

6.3.30 Protective Clothing

Heavy protective gloves (preferably textile or leather) and protective safety footwear should be worn when loading or unloading cylinders to minimise the risk of injury. Gloves, protective boots and overalls should be clean and free from oil, grease and hand creams etc.

Additional precautions are required for handling cryogenic gases (see paragraphs related to this in chapter 9 HTM 02 part B)

Note
When handling smaller cylinders, the use of protective gloves may be inconvenient. Extra care should be taken to avoid injury and to make sure that hands are free from oil or grease before the cylinders are handled.

6.3.31 Trolleys, trucks and vehicles

A suitable trolley, conforming to BS 2718, should be used for transporting cylinders whenever they are moved.

Precautions should be taken to prevent cylinders falling from trolleys, trucks or vehicles.

Vehicles transporting gas cylinders and using public roads should, where applicable, be appropriately marked in accordance with the Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 2009.

6.3.32 Unloading equipment

The hoist or tail-loader used with the delivery vehicle should be as clean as is practicable, and mechanical parts shielded to prevent contamination of cylinders with oil, grease and hand creams etc. Care should be taken to avoid transfer of oil, grease and hand creams etc from the winch to cylinders.

Cylinders should not be lifted by their guards or valves unless specifically designed for that purpose.

Note
In some circumstances it may be necessary to lift cylinders with the aid of an electric winch. This may necessitate attaching a wire rope around the cylinder valve. Staff carrying out this operation must be properly trained, and the hoist should be subject to regular insurance inspection where applicable.
6.3.33 Transportation of cylinders with attached equipment

In some circumstances it may be necessary to transport cylinders with equipment attached. Unless it is essential for a patient to continue receiving a supply of gas, the cylinder valve should be closed and any gas contained in the equipment or regulator should be safely vented to atmosphere before transporting the cylinder.

Lung ventilators, oxygen therapy apparatus and other equipment for use with cylinders should be so designed as to render the entire assembly stable during storage, transportation and use. If castors are used, they should conform to BS 2099:1989.

Mobile equipment should be suitably buffered to reduce damage to the fabric of the healthcare buildings.

When serving a patient, equipment and cylinders must be secured during transportation to prevent injury and interruption of supply. For moving J-size cylinders, the use of trolleys with a third (or more) rear-mounted wheel(s) is strongly recommended.

Note
Specially designed cylinder carriers are available for both wheelchair and patient transport trolleys and these must be used.

6.3.34 Preparation of cylinders for use

To ensure patient and staff safety, Medical Device Alert (MDA) Safety Notice SN2000 (07) ‘Medical gas cylinders: risk of fire’ advises that:

a. porters and users should ensure a high standard of cleanliness when storing, transporting or connecting medical gas cylinders to regulators or other medical devices, particularly with respect to the presence of oil, grease and hand creams etc (for example barrier creams);

b. users should open medical gas cylinders slowly;

Note
When equipment is coupled to a cylinder, the cylinder valve should initially be opened as slowly as possible, as rapid opening can cause a sudden adiabatic increase in downstream gas pressure. The consequent temperature rise may result in ignition of combustible material in contact with the hot gas downstream. Only regulators designed for oxygen use should be used for this service, as they are constructed to prevent this occurrence.

Note
Serious incidents have occurred as a result of ignition occurring within the cylinder valve or regulator. This has been attributed to friction generated by particulate matter, such as dust or dirt, within the system when the cylinder valve is opened.
Cylinders and their associated equipment should be protected from contact with oil, grease and hand creams etc, bituminous products, acids and other corrosive substances.

Equipment should be subject to planned preventative maintenance.

Defective equipment should be notified to the appropriate body in accordance with the defect reporting system (see Chapter 3 HTM 02 part B).

Cylinder preparation checklist:

a. check the cylinder label to ensure the correct gas has been supplied;

b. the tamper-evident seal should be removed, and any plastic outlet cap removed and left attached to the valve for refitting after use;

c. cylinders should only be used in conjunction with equipment designed for their use;

d. Cylinder identification labels should not be removed or obscured. No permanent marking or painting should be made to the cylinder shell except by the manufacturer/supplier;

e. Lubricants, sealing or jointing compounds should not be used when connecting cylinders to pressure-reducing regulators. The cylinder valve, regulator and associated equipment should always be clean and free from oil, grease and hand creams etc and other debris;

f. Cylinder and equipment connection interfaces and their washers or O-ring seals should be inspected to make sure that they are in good condition. Damaged sealing washers and O-rings should be replaced. Not more than one sealing washer should be used at each interface;

g. Portable nitrous oxide/oxygen cylinders should ideally be stored at above 10°C before use; if cylinders are stored at temperatures lower than 0°C for long periods before use, they should be warmed above 10°C for three hours and then inverted at least three times to ensure the correct gas specification. Under no circumstances should cylinders be immersed in water before use;

h. In the case of large (G-size) nitrous oxide/oxygen mixture cylinders, they should be stored upright within the manifold room at a minimum temperature of 10°C for a period of 24 hours before connection to the manifold.

Note
Large cylinders of nitrous oxide/oxygen mixture brought to the manifold room from a cold cylinder store will not normally be used immediately, as enough cylinders for two complete manifold changes should be stored in the manifold room.

As most cylinder replacements take place at intervals longer than 24 hours, it will not be necessary to store manifold cylinders horizontally before use, provided that the manifold room is kept above 10°C.
6.3.35 Operating cylinder valves
Undue force should not be used to open or close cylinder valves, or to attach connectors to cylinders.

All cylinder valves should be opened gently. Tapping the operating key gently with a soft-faced (copper) mallet is acceptable, but undue force should not be used. If it is obvious that injury or damage could arise from trying to open a sticking valve, the cylinder should be removed from service and returned to the supplier as a faulty cylinder.

Opening cylinder valves slowly will prevent a sudden rise in pressure in the system. It is at this time when there will be most stress on components and when most explosions will occur due to adiabatic compression of any oil, grease or hand creams etc that may be present.

The cylinder valve should be fully opened (slowly, anticlockwise) using the appropriate cylinder key, or hand-wheel where fitted, and then turned clockwise a quarter turn.

If there is any leakage of gas, the cylinder should be removed from service and returned as faulty.

Do not attempt to tighten gland nuts etc, as this may cause damage to the valve.

To close the valve, turn the spindle or hand-wheel clockwise. Hand pressure only should be used to close the valve.

6.3.36 Connection and disconnection of cylinders
Porters with specific medical gas training are known as Designated Porters (MGPS).

Safety note
Only persons who have had specific training in the safety of medical gases, manual handling techniques and cylinder changing procedures should be allowed to change cylinders on medical gas manifolds or medical equipment.

The following procedure may be posted on the manifold room wall adjacent to the manifold:

6.3.37 Manifold cylinder-changing procedure (for Designated Porters (MGPS))
   a. Ensure that hands are clean and grease-free before handling any medical gas cylinders or equipment and, where cylinders are handled on a regular basis, that safety footwear is being worn
   b. Use heavy protective gloves (preferably textile or leather) and eye/face protection.
Important – when a bank of cylinders requires changing, all cylinders in that bank must be changed.

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

d. Check the name of the gas on the collar of each cylinder, the expiry date and the cylinder colour code. If in doubt, refer to the cylinder data sheet displayed in the manifold room.

e. Remove the plastic seal, but always retain the valve cover caps fitted to bull-nose cylinder valves for refitting after use.

f. Remove empty cylinders from the medical gas manifold one at a time, and replace each empty cylinder with a full cylinder immediately.

g. Connect the cylinder to the manifold and tighten firmly by hand or with an appropriate spanner. Do not put undue strain on the manifold tail-pipe and do not use any lubricant or sealing compounds.

h. Using the correct cylinder key (or hand-wheel/knurled knob where fitted), slowly open the cylinder valve anticlockwise to its fullest extent and then turn it back by a quarter turn.

i. Check that there are no leaks between the cylinder valve and the manifold. This can usually be determined by listening. If in doubt, leak-detection fluid can be used, but always wipe off excess fluid with a clean damp cloth.

Note
Only leak-detection fluid suitable for use with all types of medical gas should be used.

j. Once the bank has been fully changed, check that the contents gauge is reading 137/200 bar (137/200 kPa x 100) or full; and check the number of cylinders changed and readings on line pressure and contents gauges.

k. Remember to sign the register.

l. If a problem or fault is detected or suspected, inform the QE Facilities department immediately.

m. Ensure that any faulty cylinders (for example leaking or damaged) are not left in the manifold room. They must be labelled “faulty” and kept separate from all other cylinders. Pharmacy must be notified.

Additional guidance can be added to the above list. For example:

a. Outside normal working hours, it is the responsibility of the head porter to ensure that all appropriate portering staff comply with the above manifold cylinder-changing procedure.

b. The pressure of cylinders connected to emergency reserve manifolds (ERMs) must be recorded in the “cylinder change register” at each
cylinder change. If this pressure has fallen to 100 bar (30 bar for nitrous oxide), QE Facilities should be notified of a possible leak. If there is an obvious leakage of gas (for example a hissing sound) from ERM, QE Facilities should be informed immediately.

c. The handles attached to the nitrous oxide tail-pipes are not spanners. They are used to restrain the tail-pipe while the appropriate spanner is used to tighten the connecting nut. Using the handle as a spanner will cause serious damage to the tail-pipe and may result in personal injury.

d. To ensure ERM cylinders are not used beyond their refill date: every ten manifold cylinder changes, remove ERM cylinders and connect them to the main manifold as part of the cylinder-change routine. Fit the ERM with fresh cylinders.

6.3.38 Procedure for changing cylinders on medical equipment

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

Note
Always make sure that you are connecting equipment designed for the gas. Oxygen and medical air flow meters read differently if interchanged.

The threads connecting different gas flow meters to a regulator may be the same (for example oxygen and medical air).

Note
Nitrous oxide/oxygen mixture flow meters have a different thread from others.

Do not use a normal ward flow meter (0–15 L/min) when a paediatric type should be used (0–1.5 L/min).

Where a pressure-relief valve is fitted to protect downstream systems, it should be indelibly marked with its relief pressure value. Regulators should be indelibly marked with the maximum outlet pressure range. Pressure gauges should be in accordance with BS EN 837-1:1998.

Needle valves or similar devices should not be used in place of pressure-reducing regulators, as excessive pressure may develop downstream of such devices and result in possible injury to personnel and damage to equipment.

The connection procedure is as follows:

a. Prepare the cylinder for use as above.

b. Check the sealing washer at the valve/connector interface.

c. Connect the cylinder to the equipment and tighten firmly with the correct spanner or by hand (as appropriate). Do not use excessive force.
d. Before opening the cylinder, check that the equipment and other flow control valves are turned off.

e. For two-stage regulators, turn the outlet pressure control to “off”, usually fully anticlockwise.

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

g. Check for leaks, either by using leak-detection fluid, or by closing the cylinder valve and observing to see whether the high pressure gauge on the regulator starts to fall. If a leak occurs:

(i) between the cylinder valve and equipment:

- Carefully tighten the connecting nut. Close the cylinder valve, vent any gas trapped within the equipment and open the cylinder valve slowly. If the leak persists, turn off the cylinder valve, vent any gas safely to atmosphere and detach the cylinder from the equipment;
- Where the connection incorporates a seal (either O-ring or Bodok seal), this should be replaced and the cylinder reconnected to the equipment, following the procedure outlined above.

(If a leak still persists, the equipment may need to be replaced. The manufacturer and/or electro-biomedical equipment (EBME) department should be informed, as appropriate, in accordance with the operational policy.)

(ii) Via any part of the valve or between the valve and the cylinder:

- Where the leak appears to be caused by the cylinder valve, notify the supplier of the faulty cylinder and retain for return under the “faulty cylinder” procedure (see paragraphs 8.132–8.141).

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

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

**Safety notes**

- A naked flame or lighted cigarette should not be used to detect leaks.
- Only proprietary leak-detection fluids should be used and then wiped off with a clean damp cloth after use to avoid possible contamination of the fittings.
- Defective pressure-reducing regulators, gauges and equipment may be hazardous in use. A system should be set out in the operational policy to ensure that defective items are withdrawn from use and repaired or replaced as necessary.
- No attempt should be made to repair, alter or modify any cylinder or its valve.
- Sealing or joining compound should not be used to rectify leaks.
Cylinders with damaged or very stiff valves should be labelled appropriately and returned to the supplier.

The disconnection procedure is as follows:

a. Turn off the cylinder valve and vent excess gas from the equipment regulator and connecting hoses by opening the equipment flow control valves for a few seconds. On a manifold, gas from the tail-pipe will vent as the cylinder connection is loosened.

b. Shut off any equipment control valves.

c. Using the correct spanner (or by hand), disconnect the cylinder from the equipment or tail-pipe.

d. Do not vent the cylinder or leave the cylinder valve open.

e. Replace plastic valve covers on F- and G-size cylinders.

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

6.3.39 Defective cylinder classification
Gas suppliers usually classify defective cylinders under two categories: “faulty” and “incident”.

6.3.40 Faulty cylinders
These are described as those where the complaint is minor and the patient is not put at risk. Examples are:

<table>
<thead>
<tr>
<th>Contents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Empty or partially empty where the cylinder is not required for immediate use</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cylinders</th>
</tr>
</thead>
<tbody>
<tr>
<td>Faulty valve operation.</td>
</tr>
<tr>
<td>Damaged valve outlet.</td>
</tr>
<tr>
<td>Minor leak from valve</td>
</tr>
</tbody>
</table>

6.3.41 Incident cylinders
These are described as those where the complaint is serious and the patient is considered to have been at risk. Examples are:

<table>
<thead>
<tr>
<th>Contents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wrong gas in cylinder or wrong gas specification.</td>
</tr>
<tr>
<td>Gas contamination in cylinder.</td>
</tr>
<tr>
<td>Abnormal patient reaction to gas.</td>
</tr>
<tr>
<td>Cylinder empty when required for immediate use.</td>
</tr>
<tr>
<td>Doubts about gas identity.</td>
</tr>
<tr>
<td>Incorrect labelling.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cylinders</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shell failure/damage.</td>
</tr>
<tr>
<td>Ignition of shell or valve.</td>
</tr>
<tr>
<td>Discharge from safety valve or bursting disc.</td>
</tr>
<tr>
<td>Serious cylinder valve leak</td>
</tr>
</tbody>
</table>

Note: Cylinders involved in a fire or having ignited is also classified as incident cylinders.
6.3.42 Dealing with defective cylinders
The MGPS operational policy should contain an appropriate procedure. The general procedure outlined in paragraphs 8.137–8.146 can be used as the basis for the policy entry.

6.3.43 General procedure
Telephone the gas supplier and be prepared to give:
- customer name and address;
- the person you wish to receive the investigation report, if required;
- the number of cylinders involved;
- the batch number, filling date, expiry date, cylinder size code and gas for each affected cylinder;
- A description of the fault.

The cylinder should be stored away from all other cylinders and have a defective cylinder label attached (these can be made/purchased locally).

A replacement should be provided when the defective cylinder is collected.

Local reporting procedures (for example to pharmacy) should be followed, particularly in the case of incident cylinders, as the Department of Health may have to be notified.

The cylinder(s) should not be allowed back into general circulation.

When the replacement cylinder is delivered, the driver will leave a delivery note and will be carrying a faulty (yellow) or incident (red) cylinder label.

Check that the label details are correct and sign as requested.

Ensure that the driver attaches the label to the correct cylinder using the bag provided.

If the defective cylinder is not available for return, give reasons on the reverse side of the label and return it to the driver.

A copy of the investigation report, along with a covering letter, will be sent to a nominated person (usually the QC Pharmacist).

6.3.44 Stock control and receipt of cylinders into stock
The objective of stock control and accounting is to ensure that the correct cylinders are received and used, and that unnecessarily large stock holdings are avoided. It is also important to avoid excessive stock holdings of empty cylinders for which rental charges continue to apply. This may be achieved by using the gas supplier’s proprietary stock management system that utilises the bar-code information on cylinders to assist in efficient stock management control.
6.3.45 Ordering from suppliers
The written procedure detailing the method of ordering cylinders from commercial suppliers should be available in the appropriate departments.

An order should clearly specify that the gas is for medical purposes. It should also specify the gas required and the cylinder size, and indicate that the cylinders and valves should comply with BS 341-3:2002, BS EN ISO 407:2004 and the relevant parts of BS 5045.

Ordering and stock-control records should be maintained to suit local requirements. These records should include the name of the gas, date of receipt, expiry date, cylinder size, batch number of each cylinder and quantity of cylinders received.

Automatic replenishment systems may be used in conjunction with the gas supplier, provided that an agreed procedure is specified.

6.3.46 Returns to suppliers
Empty cylinders should not be retained longer than necessary in the main store, but returned at the earliest opportunity to the supplier to avoid unnecessary rental charges. This may also be covered by the automatic replenishment system described above.

6.3.47 Issue from stores
The following should be implemented:

a. A written procedure should detail the system by which cylinders are requisitioned for use;

b. A record of issues should be kept. The record should include the name of gas, size of cylinder, date of issue, expiry date, number of cylinders issued and the department, ward or name of recipient. This may be covered by the proprietary stock management system.

6.3.48 Return of cylinders to stores
A written procedure should also be used for the return of empty or unused cylinders to the main store and for return to the supplier.

Cylinders placed in, or returned to, the ready-to use store should be checked for leakage to ensure that the cylinder valve is turned off.

An adequate number of keys should be available.

6.3.49 Receipt of cylinders into stock
Cylinders that do not conform to the following requirements will not be accepted:

a. Each cylinder should have:
   (i) A product identity label;
   (ii) A batch label.
b. Cylinders should be clean and free from rust and scale, and the paintwork should be in a condition enabling easy identification from the colour-code chart (BS EN ISO 407:2004).

c. There should be a tamper-evident seal over the valve outlet.

6.3.50 Procedures for the rotation of stock
A written procedure should be prepared, giving details of a rotational stock-control system.

The main store should be large enough to permit the use of a rotational stock-control system. Racks for small cylinders should be designed to assist rotation of stock.

Where a system incorporating an in-use bay and a latest-delivery bay is used, the in-use bay should be emptied before a fresh delivery is loaded into it. Appropriate movable signs should be available.

6.3.51 Cylinder contents – status labels
Labels indicating the status of a cylinder’s contents as it progresses from cylinder store to manifold (or equipment) and back to the store are particularly useful when cylinder storage space is limited and full and empty cylinders are easily mixed. A typical label is shown in Figure 5...labels can be obtained from engineering dept Tel: 2591

Figure 5 Example of cylinder contents status label
Note
With the cylinder full and in store, the whole label is attached to the neck. On removal from store, the “full” section is cut or torn off and the cylinder is put into service. When it is empty (or used to its maximum useful capacity), the “in use” section is removed and the cylinder is returned to the store to await collection. Each section is dated accordingly.

6.3.52 Handling of cryogenic liquid equipment

General
For full safety instructions on liquefied atmospheric gases, the advice of the gas supplier should be sought.

Storage
Dedicated, well-ventilated and signed areas should be allocated to the storage of cryogenic liquids.

Dewars and larger vessels should not be stored in medical gas cylinder stores.

Note

6.3.53 Protective clothing

Protective clothing is only intended to protect the wearer from accidental contact with liquefied atmospheric gases or parts in contact with it.

Non-absorbent leather gloves should always be worn when handling anything that is, or has recently been, in contact with liquefied atmospheric gases. The gloves should be loose fitting so that they can be removed easily. Sleeves should cover the ends of gloves. Gauntlet gloves are not recommended because liquid can drip into them. Woven materials are best avoided, but if they are used for protective clothing, it is essential to ensure they do not become saturated with cold liquid.

Goggles or a face mask should be used to protect the eyes and face where spraying or splashing of liquid may occur.

Overalls, or similar type clothing, should be worn outside leather shoes. These should preferably be made without open pockets or turn-ups where liquid could collect.

Trousers should be worn outside shoes for the same reason.

If clothing becomes contaminated with liquefied atmospheric gases or vapour, the wearer should ventilate them for a minimum of five minutes by walking around in a well-ventilated area, avoiding exposure to naked flames.
**Safety notes – use of liquid nitrogen**

In addition to its low temperature hazard, liquid nitrogen will cause depletion of oxygen as it vaporises in a storage area. This hazard is exacerbated by spillage of the nitrogen with ensuing rapid vaporisation. Serious incidents involving liquid nitrogen spillage have occurred, and the BCGA’s Code of Practice (CP 30) detailing safety requirements and procedures in the storage, use and handling of liquid nitrogen dewars up to 50 L in capacity should be consulted before this gas is used. This document also gives advice on the safe transport of dewars in hospital lifts.

See also the Department of Health’s Estates and Facilities alert DH (2005) 13 – ‘Liquid nitrogen’.

**6.3.54 Deliveries of entonox & oxygen to Maternity patients home**

Where Maternity patients are planned to have the baby delivered at their home, a suitable supply of entonox and oxygen may be delivered to the patients home up to one month prior to the planned event. An assessment will be carried out by a Midwife prior to the delivery of the medical gases to ensure that there are no issues that might compromise the safety of the patient &/or their family members from the storage of entonox and oxygen in the home, and that there are reasonable measures in place to safeguard them.

A green NON-FLAMMABLE GAS sign should be displayed in any vehicle transporting medical gases.

The patient should be provided with information relating to entonox which provides information relating to the safe storage and handling of the cylinders.

**6.4 Shutdown of the MGPS for maintenance, extension etc**

The MGPS Permit to Work System will cover pre-planned work on the MGPS requiring isolation of a plant, or part of the system.

No isolation should take place without Full liaison between the Authorised Person (MGPS) and all other disciplines.

All necessary emergency / additional gas supplies should be in place before the work starts. This may involve the provision of portable emergency supply systems and / or additional provision of cylinder regulators from QE Facilities.

Attempts should be made to reduce gas consumption during the work.

In the case of a ward/department being closed for any reason, this will not require a nurse in charge to sign off a work permit.
6.5 Generator operation on mains failure

During changeover from electrical mains to emergency generator supplies, there is always a possibility that spurious MGPS alarms or changes in plant indications may be generated.

THIS ALARM MUST BE INVESTIGATED IMMEDIATELY, as they could represent real, rather than false conditions. The status of equipment such as compressors should also be checked, to ensure they are operating as selected: on / on stand-by / on duty mode / off.

Additionally it must be remembered that:

FAILURE OF GENERATOR AND MAINS SUPPLIES SIMULTANEOUSLY WILL RESULT IN FAILURE OF THE CENTRAL MEDICAL VACUUM SYSTEM.

It is important that clinical / nursing staff is aware of this risk to the vacuum system and any patients using it.

All relevant staff must undertake training in the use of emergency vacuum equipment.

In areas where vacuum supply is considered critical, locally generated vacuum will have to be provided. However with a failed electricity supply this will not be possible using the normal electrically driven portable suction units.

For critical care use, EJECTOR DRIVEN suction units can be used. These are usually powered from the main oxygen supply via a terminal unit, or from a separate compressed gas cylinder (oxygen or medical air).

An alternative would be a BATTERY DRIVEN suction unit but it is important that, with this type of unit the battery is maintained in a FULLY CHARGED condition.

To locate portable vacuum units call senior nurse on duty with Site responsibility.

Failure of both mains and electricity supplies will also mean that the medical air compressors will not function.

Emergency supplies of medical air will be provided from the automatic cylinder manifold unit but clinical staff must attempt to conserve air wherever possible, in order that essential supplies to patient ventilators are maintained.

QE Facilities staff must ensure that all plant equipment and alarms have reset to full operating conditions on restoration of power

6.5.1 Use of oxygen at high concentrations

Where oxygen is in use in large quantities and / or in higher than normal concentrations e.g. in oxygen tents and incubators, warning notices indicating:
‘HIGH CONCENTRATION OXYGEN IN USE - DANGER OF FIRE’

Should be posted at the treatment site.

The Trusts Fire Officer should be consulted on the use of toys in oxygen tents and a notice worded:

‘ONLY TOYS, COSMETICS ETC. APPROVED BY THE FIRE OFFICER ARE ALLOWED IN THIS AREA’

Must be posted at the entrance to the treatment area.

It is the responsibility of all staff in such areas to be vigilant in all aspects of the treatment and appropriate safety training must be given in the use of oxygen under these conditions.

6.6 Emergency procedures

6.6.1 Use of Emergency reserve manifolds

General statement

Emergency supply manifolds are attached to all medical gas systems.

6.6.2 Oxygen system

In the event of failure of the primary oxygen supply vessel, the secondary vessel supply will automatically provide the site with gas.

The supply system will change vessels automatically but will require replenishment as it empties.

Important: The back-up vessel has limited capacity in relation to the normal Trusts demand, so additional manpower may be required in an emergency situation of this kind, as there may be a need to connect an emergency manifold, 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 the Authorised Person 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.

6.6.3 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.

6.6.4 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 ERM will come on line automatically; it will not be necessary to open the ERM main isolating valve to ensure that gas supply is maintained.

When in use it will NOT change from left to right cylinder banks automatically.

Authorised Persons within QE Facilities and Portering staff should be fully trained in the operation of the ERM.

Detailed instructions identifying which valves to turn and in which order shall be posted adjacent to each ERM.

Due to the limited capacity of the ERM, 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.

NOTE: 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.

6.7 Emergency cylinder ordering procedure

NB Pharmacy 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. Pharmacy will telephone the emergency number of the medical gas supplier (see Appendix B).
Pharmacy will tell the medical gas supplier that ‘Emergency order’ is 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.

6.7.1 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.

6.7.2 In the event of failure of both mains and generator supplies
The oxygen system will continue to supply gas from its bulk storage vessels.

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 ESM.

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 QE Facilities will arrange for staff to monitor manifold gas consumption, replacing empty cylinders as necessary, until the electricity supply is restored.

The Authorised Person 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.

6.7.3 **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: i.e. the floor level, Department, room number, the gas or gases involved and if 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 DNO 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 DNO 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 Trusts Fire Policy.

The Duty Porter will remain on standby 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.

6.7.4 **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: i.e. floor level, Department, room number(s), the gas or gases involved and if patient ventilators are in use.

As a precautionary measure, the Telephonist will also notify critical areas e.g. ICU 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.

Portering staff will replenish cylinders at any emergency stations and at 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 re-instate the gas supply, using the Permit to Work system.

When the supply is fully restored, the Authorised Person (MGPS) will complete a Critical Incident Form and produce a full report, which will be given to the Chief Executive 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) on the need for transfer of critically ill patients to Trusts, as Department closure may be warranted in extreme events.

6.7.5 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 those involved with critical care.
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 HTM 02 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. The Form is to be sent to the (Risk Manager), so that the appropriate Nurse Manager can be informed and remedial action taken.

Decontamination of pipe work (if necessary) should be carried out in accordance with the procedure described in HTM 02 BEFORE filters are changed.

6.7.6 Failure of an anaesthetic gas scavenging system (AGSS)
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 exposed to the spilled gases will exceed the 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 (usually the Theatre Technician / ODP), 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.

6.7.7 Over or under pressurisation of one or more gas systems
Local alarms are designed to indicate when system pressure is more than 20% above 10% below or below its norm.
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.

6.7.8 Fire

Procedures in accordance with the Trusts Fire Policy should be followed in the event of a fire involving, or likely to involve the MGPS.

During a fire the Senior Brigade Officer will assume full control of the area(s) affected.

7. Training

As stipulated within ‘medical gases HTMO2-01’ training is a requirement for all those expected or required to utilise any application of the medical gas pipeline prior to unsupervised use. Training must include the essential elements of medical gas safety and emergency situations. Subsequent to initial competency based training the following requisites are obligatory

<table>
<thead>
<tr>
<th>Personnel</th>
<th>Retraining</th>
<th>Re-assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Authorising Engineer</td>
<td>Every 3 years</td>
<td>Every 3 years</td>
</tr>
<tr>
<td>Authorised Person</td>
<td>Every 3 years</td>
<td>Every 3 years</td>
</tr>
<tr>
<td>Competent person</td>
<td>Every 3 years</td>
<td>Every 3 years</td>
</tr>
<tr>
<td>Designated Nursing Officer</td>
<td>Every 3 years</td>
<td>Every 3 years</td>
</tr>
<tr>
<td>Designated medical Officer</td>
<td>Every 3 years</td>
<td>Every 3 years</td>
</tr>
<tr>
<td>Quality Controller</td>
<td>Every 3 years</td>
<td>Every 5 years</td>
</tr>
<tr>
<td>Designated Porter</td>
<td>Every 1 years</td>
<td>Every 1 years</td>
</tr>
<tr>
<td>General Nursing Staff</td>
<td>Every 1 years</td>
<td>Every 3 years</td>
</tr>
</tbody>
</table>

Initial training will consist of a 2 hour long competency based session, which incorporates a theory and practical test. Subsequent to this annual refresher training must be accessed via an e-learning programme until the next re-assessment is required as stated above.

Training records must be kept for all staff undertaking training, and made accessible to ward managers and medical devices clinical risk manager for central recording.

8. Equality and Diversity

The Trust is committed to ensuring that, as far as is reasonably practicable, the way we provide services to the public and the way we treat our staff reflects their individual needs and does not discriminate against individuals or groups on the grounds of any protected characteristic (Equality Act 2010). An equality analysis has been undertaken for this policy.
9. **Process for Monitoring Compliance with the policy**

It is a role of the external Authorising Engineer will carry out site wide annual auditing. This will include Record keeping, Permit book, site log, drawings, training Records, service logs for site compliance with this policy and HTM 02.

10. **Consultation and Review of the policy**

The Medical Gas Committee will meet every 6 months to discuss any problems/incidents that may arise or highlight any concerns or changes to the policy, unless any of the committee members feel that a meeting needs to be called. The members will feed any changes to the appropriate staff. Reviewing every 2 years.

11. **Implementation of this policy**

This policy will be circulated to all staff via the Trust internal email system. Its review will also be reported in the Trust’s internal communications.

12. **References**

Control of Substances Hazardous to Health Regulations 2002  
Electricity at Work Regulations 1989  
Health & Safety at Work, Etc Act 1974  
Management of Health and Safety at Work Regulations 1999 (SI 1999 No. 3242)  
Manual Handling Operations Regulations 1992  
Provision and Use of Work Equipment Regulations 1998  
Regulatory Reform (Fire Safety) Order 2005  
Reporting of Injuries, Diseases, Dangerous Occurrences Regulations 2013 (RIDDOR)  
Health Technical Manual HTM 05 and associated documents

13. **Associated documentation**

*(Note that this is NOT an exhaustive list).*

**Statutory requirements relevant to Medical Gas Pipeline Systems**

Health and Safety at Work etc. Act, 1974  
Management of Health and Safety at Work Regulations  
Work Place (Health, Safety and Welfare) Regulations  
Provision and Use of Work Equipment Regulations  
Reporting of Injuries, Diseases and Dangerous Occurrences Regulations  
Control of Substances Hazardous to Health (COSHH) Regulations  
Pressure Equipment Regulations  
Pressure Systems Safety Regulations,  
Highly Flammable Liquid and Liquid Petroleum Gas Regulations,  
Medicines Act  
Manual Handling Operation Regulations,  
Personal Protective Equipment at Work Regulations
Electromagnetic Compatibility Regulations
Electricity at Work Regulations

**Other Guidance Applicable to Medical Gas Pipeline systems**

Health Technical Memorandum (HTM) 02 ‘Medical Gas Pipeline Systems’
Volume 1, Design, Installation, Validation and Verification
Volume 2, Operational Management
Supplement No 1 ‘Dental Compressed Air and Vacuum Systems’ 2003
Supplement No 2 ‘Piped Medical Gases in Ambulance Vehicles’ 1997
European Pharmacopoeia Standards for medical gases, including medical compressed air
Trust Health and Safety Policy
Trust Fire Policy
Any other relevant local guidance
**Appendix A Contacts**

**Authorised Persons (MGPS)**

<table>
<thead>
<tr>
<th>Name</th>
<th>Contact number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mechanical Engineer – Steven Hancock</td>
<td>0191 445 2591</td>
</tr>
<tr>
<td>Electrical Engineer – <strong>David Jones</strong></td>
<td>0191 445 3473</td>
</tr>
<tr>
<td>Maintenance Supervisor – Jim Sloan</td>
<td>0191 445 2468</td>
</tr>
</tbody>
</table>

**Competent Persons (MGPS)**

<table>
<thead>
<tr>
<th>Name</th>
<th>Contact number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contact QEF Engineers for info</td>
<td></td>
</tr>
</tbody>
</table>

**Designated Medical / Nursing Officers**

<table>
<thead>
<tr>
<th>Name</th>
<th>Title</th>
<th>Contact Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Senior Nurse on duty at time</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Other important telephone numbers**

<table>
<thead>
<tr>
<th>Name</th>
<th>Contact number</th>
<th>Out of hours contact number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Portering</td>
<td>0191 445 2330</td>
<td>Via switchboard</td>
</tr>
<tr>
<td>Pharmacy</td>
<td>0191 445 2312</td>
<td>Via switchboard</td>
</tr>
<tr>
<td>Gas Supplier</td>
<td>B.O.C.</td>
<td>0800 111 333</td>
</tr>
<tr>
<td>Bulk liquid oxygen</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gas cylinders – contact Pharmacy</td>
<td>As above</td>
<td>As above</td>
</tr>
</tbody>
</table>
APPOINTMENT OF MEDICAL GAS AUTHORISING ENGINEER

Address(es) of premises for which appointment is made:

Queens Elizabeth Hospital

I hereby appoint Mr Peter Williams of MGPS Services Ltd to be Authorising Engineer (MGPS) for medical gas installations within the above premises.

Signed

[Signature]

Chief Executive/Director of Estates

Print name

[Signature]

Date 15/6/10

This appointment is to be recorded in the Trust Medical Gas Operational Policy and made known to all interested parties.

I the undersigned person agree to be the Authorising Engineer (MGPS) for the above site(s).

I confirm that my appointment is in accordance with the recommendations of HTM 02-01; 2006, ‘Medical Gas Pipeline Systems’ and I agree to fulfil the role of Authorising Engineer (MGPS) as required by Part B Chapter 4.16

Signed

[Signature]

Authorising Engineer (MGPS)

Print name

[Signature]

Date 28/1/2010

Chairman: Mr PJ Smith
Chief Executive: Mr ID Renwick

Medicine in Practice

Voting

2008

Chairman: Mr PJ Smith
Chief Executive: Mr ID Renwick

Medicine in Practice