# MEDICAL GAS POLICY

**Policy Number:** 434  
**Supersedes:** n/a  
**Standards For Healthcare Services No/s:** 1,5,16,22

<table>
<thead>
<tr>
<th>Version No</th>
<th>Date Of Review</th>
<th>Reviewer Name</th>
<th>Completed Action</th>
<th>Approved by</th>
<th>Date Approved</th>
<th>New Review Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>May 2015</td>
<td>Paul Evans</td>
<td>Completed</td>
<td>BP&amp;AC</td>
<td>24.5.16</td>
<td>24.5.19</td>
</tr>
</tbody>
</table>

**Brief Summary of Document:** The aim of this policy is to outline the necessary mandatory requirements for the management of medical gas pipeline systems (MGPS) installed within all HDUHB’s premises.

**To be read in conjunction with:**
- 144 – Maintenance Policy
- 341 – Prescription & Administration of Emergency Oxygen in Adults Policy
- 010 – Health & Safety Policy

**Classification:** Corporate  
**Category:** Policy  
**Freedom Of Information Status:** Open

**Authorised by:** Joe Teape  
**Job Title:** Deputy Chief Executive & Director of Operations  
**Signature:** A signed copy of this document is stored with corporate services
**Responsible Officer/Author:**
Paul Evans  
**Job Title:** Compliance Manager

**Contact Details:**
- **Dept:** Estates  
- **Base:** GGH  
- **Tel No:** 01827 2633  
- **E-mail:** Paul.evans@wales.nhs.uk

### Scope
- **ORGANISATION WIDE:** ✓  
- **DIRECTORATE ONLY:**  
- **DEPARTMENT ONLY:**  
- **COUNTY ONLY:**

### Staff Group
- **Administrative/Estates:** ✓  
- **Allied Health Professionals:** ✓  
- **Ancillary:** ✓  
- **Maintenance:** ✓  
- **Medical & Dental:** ✓  
- **Nursing:** ✓  
- **Scientific & Professional:** ✓  
- **Other:** ✓

### CONSULTATION

<table>
<thead>
<tr>
<th>Individual(s)</th>
<th>Authorising Engineer (NWSSP-FS Principal Mechanical Engineer) QC Pharmacist HDUHB</th>
<th>Date(s)</th>
<th>October 2013/May 2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group(s)</td>
<td>H&amp;S Managers HDUHB Senior Operational Site Managers HDUHB</td>
<td>Date(s)</td>
<td>March 2014 &amp; May 2015</td>
</tr>
<tr>
<td>Committee(s)</td>
<td>Infection Control Committee Health &amp; Safety &amp; Emergency Planning Sub-Committee</td>
<td>Date(s)</td>
<td>March 2015</td>
</tr>
</tbody>
</table>

### RATIFYING AUTHORITY
(in accordance with the Schedule of Delegation)

<table>
<thead>
<tr>
<th>NAME OF COMMITTEE</th>
<th>KEY</th>
<th>DATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>BP&amp;PAC</td>
<td>A</td>
<td>24.5.16</td>
</tr>
</tbody>
</table>

Please enter any keywords to be used in the policy search system to enable staff to locate this policy

- Maintenance
- Oxygen
- Medical gas
- Vacuum
## Document Implementation Plan

<table>
<thead>
<tr>
<th>How Will This Policy Be Implemented?</th>
<th>This policy will be implemented with the support of all key stakeholders, and the appropriate financial backing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Who Should Use The Document?</td>
<td>Estates and operational staff, appointed contractors, health and safety management</td>
</tr>
<tr>
<td>What (if any) Training/Financial Implications are Associated with this document?</td>
<td>IN order to adhere to the principles of this policy, a continual operational maintenance programme will be required to maintenance these critical assets. This will involve both capital and revenue expenditure commitments, furthermore continual training will be essential to ensure staff competency is adequately maintained at all times</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Action</th>
<th>By Whom</th>
<th>By When</th>
</tr>
</thead>
<tbody>
<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>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## What are the Action Plan/Timescales for implementing this policy?

<table>
<thead>
<tr>
<th>Action</th>
<th>By Whom</th>
<th>By When</th>
</tr>
</thead>
<tbody>
<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>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Database No: 434

Page 3 of 65

Medical Gas Policy

Version 1.0
HYWEL DDA UNIVERSITY HEALTH BOARD

Contents

1 Introduction .................................................................................................................. 7
2 Policy Statement ........................................................................................................ 7
3 Scope .......................................................................................................................... 7
4 Aim ............................................................................................................................... 7
5 Objectives .................................................................................................................. 8
6 Medical Gas Use ....................................................................................................... 8
7 Statutory Requirements ............................................................................................ 8
8 Relationship with Other Policies ............................................................................... 9
9 Responsibilities .......................................................................................................... 9

9.1 Employers Duties ................................................................................................... 9
9.2 Employes Duties .................................................................................................... 9
9.3 Responsibility ......................................................................................................... 9
9.4 Chief Executive’s Responsibilities (CEO) ............................................................ 9
9.5 Board Level Director (BLD) - Designated Person (DP) ........................................ 10
9.6 Senior Estates Management – Deputy Designated Persons (DDP) ....................... 10
9.7 Operations Manager (s) East and West Hard & Soft FM (OM - E/W) ................. 10
9.8 Authorising Engineer (AE (MGPS)) .................................................................. 10
9.9 Authorised Person (AP (MGPS)) ....................................................................... 11
10 Operations Compliance Manager (OCM) .............................................................. 12

10.1 Competent Person (CP (MGPS)) ..................................................................... 12
10.2 Quality Control pharmacist (QC (MGPS)) .......................................................... 13
10.3 Hospital Pharmacy Department ........................................................................ 14
10.4 Designated Nursing Officer (DNO) .................................................................... 14
10.5 Medical Gas Committee (MGC) ........................................................................ 15
10.6 Hotel Services - Designated Porter(s) ............................................................... 16
10.7 Appointed Contractor (s) ................................................................................ 17
10.8 Head of Capital Projects/Discretionary Project Manager (HCP) / (DPM) .......... 17
10.9 Management Hierarchy ...................................................................................... 18

11 Emergency work on the MGPS ............................................................................ 19
12 Normal Operation of the MGPS ............................................................................ 19
13 Medical Gas Training ............................................................................................ 19
14 Training Programme and Frequency .................................................................... 20
15 Training Content .................................................................................................... 20
16 Communications .................................................................................................... 21

16.1 Routine Planned Work ....................................................................................... 21
16.2 Emergency Works .............................................................................................. 21
16.3 Connection of New & Demonstration Equipment ............................................. 21
16.4 Permit to Work System ..................................................................................... 21
16.5 Definition of Level of Hazard .......................................................................... 21
16.6 HIGH Hazard .................................................................................................... 21
16.7 LOW Hazard ...................................................................................................... 22
16.8 Process Diagram High Hazard Work ................................................................. 23
16.9 Process Diagram Low Hazard Work ................................................................ 24

17 Documentation ........................................................................................................ 25
18 As-Fitted Drawings ............................................................................................... 25
19 Plant log-sheets ....................................................................................................... 25
20 Installation and Maintenance Specifications ......................................................... 25
21 Compliance Report and Risk Assessments ............................................................. 25
Appendix A: Names, Roles, Contacts

Appendix B: Signatories

Appendix C: Contractor Information

Appendix D: Log Sheets

Appendix E1: Reserve Standby Manifold (Manually Online)

Appendix E2: Reserve Standby Manifold (Automatic Online)

Appendix E3: Sample Signs and Notices

Appendix F: Equipment Schedule

Appendix G: Servicing and Maintenance

Appendix H: Faulty and Incident Cylinder Procedure
49.1 Faulty Cylinders........................................................................................................ 57
49.2 Incident Cylinders .................................................................................................... 57

50 Appendix I: Legislation and Guidelines..................................................................... 58
50.1 Statutory requirements - Medical Gas Pipeline Systems ....................................... 58
50.2 Specific Guidance Relevant to Medical Gas Pipeline Systems ............................... 58

51 Appendix J: Medical Gas Alarm Panels ..................................................................... 59
52 Appendix K: Oxygen in use label ................................................................................ 60
53 Appendix L: Action Cards – Cylinder Connecting ..................................................... 61
54 Appendix M Abbreviations ......................................................................................... 62
55 Appendix N – Cylinder Capacities (Courtesy of BOC) ................................................. 63
1 Introduction
The Hywel Dda University Health Board, hereinafter referred to as the HDUHB recognises its responsibility to implement in full, the safe management of the Medical Gases in accordance with the statutory requirements, current guidelines and best practice.

This policy and procedures document outlines the expectation of the HDUHB for the standards to be provided by the organisation. It also sets out how the organisation will meet its statutory duties to its stakeholders, and provide guidance to staff (both clinical and non-clinical) about how they should act in given situations.

The Medical Gas Pipeline Systems (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. This document sets out the system of control and assurance expected by the HDUHB of its MGPS management. All users of the MGPS and those responsible for its management within the organisation are to adhere to this standard for any related activity.

2 Policy Statement
The purpose of this policy is to enable the HDUHB to maintain a safe and consistent approach to the transportation, storage, setting to work and administration of medical gases and to provide assurance to the Board that a robust system is in place.

3 Scope
The scope of this policy comprises of all the buildings currently owned or occupied (under a full maintenance lease or otherwise) by the HDUHB. A full list of properties/buildings and status of occupation is available on request from the Health Board’s Estates Department.

This policy is designed for the use of all staff involved with MGPS and related equipment as defined in Health Technical Memorandum (HTM) 02-01. It applies throughout the HDUHB to all fixed medical gas pipeline and manifold systems, liquid oxygen storage plant, medical vacuum systems and anaesthetic gas scavenging systems as well as to medical gas cylinders; their storage, transportation and setting to work.

The management and responsibility of the MGPS infrastructure for the HDUHB resides with the Estates 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. The user departments and the EBME department are responsible for the specification, purchase, maintenance and mode of use of any equipment connected to the MGPS and covered elsewhere.

4 Aim
The aim of this policy is to empower a structured procedure and reporting process, for the management and control of the HDUHB’s medical gas infrastructure, in order to satisfy current legislation and guidance, such as Health Technical Memorandum 02-01 Medical Pipeline Systems – Operational Management (HTM) and other relevant Health Building Notes (HBN’s). This will involve the continued implementation and communication of a multi-disciplinary group to be known as the Medical Gas Committee (MGC) and all relevant participating stakeholders.
To achieve the aim of this policy and as required by Health Technical Memorandum best practice NHS engineering guidance 02-01 the HDUHB will undertake to:

- Make appointments for responsibility such as Authorised Persons and Competent Persons.
- Identify and assess sources of risk through effective management arrangements.
- Remove sources of risk whenever possible and only manage risk appropriately if it becomes the only option.
- Prepare appropriate written maintenance documentation for managing the medical infrastructure for minimising risk.
- Train staff to understand the risks and how to fulfil their roles and responsibilities as appropriate.
- Only use service providers that can demonstrate capability and competence.
- Maintain records in accordance with guidance of all training, policies, associated procedures, risk assessments and monitoring and testing.
- Regularly review performance and provide information to promote continued diligence on compliance.
- To enable standardisation in the provision of safe systems of work for patients, staff and public by defining training requirements and standardising the medical gas permit to work the system.
- To ensure that all HDUHB employees understand their specific roles and responsibilities with regard to medical gases.

5 Objectives

The objectives of this policy are to implement appropriate arrangements and management protocols, in order to ensure that the HDUHB’s medical gas infrastructure remains safe and fully functioning for the use of patient services.

6 Medical Gas Use

Any 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 of safety embodied here should be applied to all compressed gas and vacuum systems.

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

This policy must also be read in connection with the individual operational system requirements and system descriptions for each main hospital acute site and any site within that locality with a MGPS installation, Vol 1: Withybush General Hospital, Vol 2: Prince Philip Hospital, Vol 3: Glangwili General Hospital, Vol 4: Bronglais General Hospital.

7 Statutory Requirements

It is the HDUHB’s policy to fully comply with statutory requirements with respect to Health and Safety. The HDUHB considers mandatory all specific guidance by DoH Estates and Facilities Dept., European or ISO standards authorities in particular with regard to MGPS or associated services.

he main guidance relevant to this Policy is listed in Appendix I:
8 **Relationship with Other Policies**

This Policy should not be considered in isolation. The following Policies should also be taken into account:

- Health and Safety
- Asbestos Policy
- Fire Safety Policy
- Maintenance Policy
- Confined Space Policy
- Infection Control
- Near Patient Equipment
- Manual Handling
- Policy For Prescribing, Storage, Dispensing and Administration of Medicines to Patients.
- Prescription and Administration of Emergency Oxygen in Adults

9 **Responsibilities**

9.1 **Employers Duties**

The HDUHB as employers have a general duty under The Health and Safety at Work etc. Act (HSWA), in particular Section 2, to ensure that, so far as is reasonably practicable, the health, safety and welfare of all their employees and others who may be affected by their undertaking e.g. Patients

9.2 **Employees Duties**

Under Section 7 of the HSWA, employees have a duty to take reasonable care for their own health and safety and of others who may be affected by their acts or omissions at work. Section 7 also requires the employee’s co-operation with their employer to enable the employer to comply with statutory duties for health and safety.

9.3 **Responsibility**

Responsibility for the effective implementation of this policy principally resides with a collection of staff as referred to in the management hierarchy diagram section 10.9 on Page 22.

9.4 **Chief Executive’s Responsibilities (CEO)**

The CEO has ultimate management accountability for MGPS, including the allocation of resources and the appointment of key personnel. Day to day management and control of the MGPS is delegated to the nominated medical gas Authorised Person’s (AP’s) (MGPS) respectively.

The CEO (or appointed deputy) will appoint in writing all AP’s (MGPS) after recommendation by the Authorising Engineer (AE) (defined below). The CEO will also appoint in writing one or more Quality Controllers (QC)(MGPS) on recommendation of the Head of Medicine Management

The CEO has delegated specific responsibilities as follows:

- The AP’s at each acute site are responsible for the day to day management of the MGPS and implementation of this policy.
9.5 Board Level Director (BLD) - Designated Person (DP)
A board level director responsible for Estates and Facilities Services will be assigned as the Designated Person (DP) with responsibilities Medical Gas as defined under HTM 02-01 Part B and is therefore responsible for ensuring that an appropriate Estates Structure has been formulated to professionally support and deliver the requirements of this policy. Furthermore, is required to communicate all relevant issues to the Board that may impact on the delivery and effectiveness of this policy.

9.6 Senior Estates Management – Deputy Designated Persons (DDP)
The Assistant Director – Facilities, Estates & Capital Planning (ADFECP) and The Head of Operations (HoO) are collectively responsible within the estates department for ensuring that adequate trained resources and expertise is made available to formulate an estates structure. They will also collectively act as Deputy Designated Persons (DDP) and are therefore responsible as directed by the DP for nominating in writing, Authorised Persons (AP’s) whose duties will be to implement and manage the Health Board’s Policy for Medical Gas Services. This will be an official appointment in writing following assessment and recommendation from the externally appointed Authorising Engineer for Medical Gas Services.
The operational estates structure must ensure that effective and robust medical gas safety management arrangements are in place in order to meet the legal requirements.

9.7 Operations Manager (s) East and West Hard & Soft FM (OM - E/W)
The OM – E/W are responsible for the day to day management of all operational functions including the full integration of Hard and Soft FM services within their regions. They are fully responsible for the staff within their management control, including that of monitoring of competency levels and training requirements in order that staff can undertake their roles appropriately and effectively in accordance with published guidance.

9.8 Authorising Engineer (AE (MGPS))
The AE is an appropriately qualified engineer with a minimum of incorporated engineer status (I.Eng), equipped with at least 5 years relevant professional experience, together with attendance at an accredited Authorising Engineer course and Authorised Person (MGPS) course within the last 3 years.
This person will have specialist knowledge of MGPS, in particular the MGPS for which an Authorised Person (MGPS) will assume responsibility on appointment. He/she acts, and is employed, independently of organisations submitting potential Authorised Persons (MGPS) for assessment.

Duties and Responsibilities:
• To assess the suitability of prospective Authorised Persons, for appointment within the HDUHB.
• Reviewing the management systems of the MGPS, including the Permit to Work System annually.
• To hold summary details of plant pipeline and site records for each hospital within the organisation.
• Monitoring the implementation of the Operational Policy and Procedures.
• Recommending after satisfactory evaluation to the Chief Executive or his nominate representative, those persons deemed suitable to be Authorised Persons (MGPS).

9.9 Authorised Person (AP (MGPS))
The HDUHB must be fully supported by trained and authorised staff, based at each of the acute hospital sites. This will ensure that operationally resources are available to cover core times, as well as during on call arrangements. The HB must therefore ensure that there is a minimum of three nominated AP’s located at each of the acute sites.

One of the AP’s will be designated as the co-ordinating senior AP for MGPS, as a consequence they will be the responsible officer for the day to day management of the MGPS and implementation of this policy for the sites they control. The decision to nominate the senior AP will rest with the individual operations managers (east and west). A further two AP’s will be available to operationally support the department.

The AP Credentials
The AP (MGPS) is an appropriately qualified engineer to a minimum of HNC level or equivalent in an engineering discipline and at least 3 years relevant professional experience. He/she will also have successfully completed an accredited AP (MGPS) training course. In addition, will have been assessed as suitable by the AE and appointed in writing by the CEO (or appointed deputy).

A minimum of three APs (MGPS) are required at each acute site. The AP’s (MGPS) are listed in Appendix A. Each AP (MGPS) must have sufficient site knowledge and experience together with adequate resources (as-fitted drawings, key registers, key safe, permit to work system (MGPS), etc) to manage the systems safely.

The AP (MGPS) is the primary lead in all matters relating to the MGPS. Specifically his duties and responsibilities will include:
• The safe and efficient day-to-day management of the MGPS system, in accordance with the statutory requirements, current guidelines and best practice.
• To be responsible for 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.
• To establish and maintain a Register of Competent Persons (MGPS) and Specialist Contractors after assessing their suitability for inclusion.
• To annually review each Contractor’s and Person’s continued inclusion in the register. (The register is to be appended to this document as appendix C).
• To be responsible for the supervision of work carried out by Competent Persons (MGPS), for the standard of that work and the documentation provided.
• To ensure that the Hospital’s MGPS maintenance specification and schedule of equipment (including all plant, manifolds, pipework, valves, terminal units and alarm systems) are kept up to date.
• To ensure that appropriate safety warning signs are prominently displayed in accordance with current requirements, guidelines, best practice and to ensure these include emergency contact numbers appropriate to the area and MGPS installation.
• To ensure that all valves and AVSUs are correctly labelled and that any changes to departmental names, functions or details are recorded as soon as changes have
taken place both on the valve/AVSU label and the corresponding as fitted drawings and valve charts.

- To liaise closely with Designated Medical/Nursing 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 that will be connected to the MGPS, in order to avoid problems with capacity and flow rates.
- In accordance with the HDUHB’s policy on provision of services, to provide advice on the provision and/or replacement of MGPS central plant and associated systems (The Estates Department holds overall responsibility for the provision and maintenance of MGPS services within the HDUHB).
- To organise such training of Estates staff (and other staff if requested) and/or transfer of MGPS information as required.
- To prepare or commission compliance surveys of the MGPS and associated risk assessments. To propose remedial actions arising from such surveys and risk assessments. To monitor compliance and risks and repeat surveys and assessments as necessary. A summary of outstanding non-compliances are to be tabled at the Medical Gas Working Group Meetings.
- To appoint after due examination, hospital based Competent Persons (MGPS)
- To follow incident and accident reporting procedures as defined by any relevant NHS, MHRA and/or statutory guidance (RIDDOR, Device Alerts, Hazard Notices etc).

With regard to work carried out under a permit to work, the AP (MGPS) will:

- Liaise with all other departments in sufficient time prior to work commencement, to establish temporary supply requirements and contingencies.
- Assess the Level of Hazard and prepare a suitable permit.
- Obtain permission for interruption to supplies/work on system.
- Explain the detail of work to the competent person.
- Affix “Do Not Use” or other prohibition notices/devices to affected terminal units.
- Supervise the isolation of the system or part that work is to be carried out on.
- Supervise appropriate engineering validation and verification tests.
- Supervise the final connection and purging with working gas.
- Witnessing the QC testing/carry out identity tests.
- Removal of “Do Not Use” or prohibition notices.
- Obtain acceptance for system re-instatement/completion of work.

10 Operations Compliance Manager (OCM)
The OCM has a strategic involvement within the Operational Management Structure to support and assist the HoO and relevant Site Operational Managers on legislation, governance and policy arrangements in order to achieve compliance as far as reasonably applicable. This will also include the management of risk registers and the bidding of statutory capital funding to address actions.

Furthermore, he/she is required to make the necessary changes to these policies and working practices following any revisions in legislation and advise the operational management team of such changes.

10.1 Competent Person (CP (MGPS))
All Competent Persons (MGPS) are Craft Persons, either directly employed by the HDUHB, or registered and employed by specialist contractors.
HYWEL DDA UNIVERSITY HEALTH BOARD

All CP’s (MGPS) directly employed by the HDUHB shall have satisfactorily completed an appropriate training course and be sufficiently experienced and familiar with the MGPS before being appointed by the AP (MGPS) responsible for that particular site. Training and appointment should be refreshed every 3 years.

All CP’s (MGPS) employed by specialist contractors shall have satisfactorily completed an appropriate training course, be sufficiently experienced and familiar with MGPS before being appointed by their line manager. Training and assessment shall be refreshed every 3 years. In addition, all contractors shall be evaluated and selected by the site Authorised Person (MGPS). They shall ensure that they are registered to BS EN ISO 9000:2001, BS EN ISO 13485 with clearly defined registration criteria relevant to the services provided. All personnel responsible for managing a specialist contractor’s Competent Persons shall have completed the same training and evaluation as Authorised Persons (MGPS). Copies of contractor information, as detailed in Appendix C, shall be kept and maintained by the AP (MGPS).

Duties and Responsibilities:

• To report to the Authorised Person (MGPS) prior to commencement of work on the MGPS each day.
• To carry out work on the MGPS in accordance with the relevant installation and maintenance specifications.
• To carry out repair, alteration or extension work, as directed by the Authorised Person (MGPS) in accordance with the Permit to Work System and HTM 02-01.
• To perform engineering tests appropriate to all work carried out and prove to the Authorised Person (MGPS) all test results.
• To carry out all work in accordance with the Health and Safety Policy.
• To carry out cylinder changes on primary supply manifolds and associated ESM’s.
• Ensure that the manifold room is kept clean and tidy, reporting any inappropriately stored items to the AP. Ensure that all removed cylinder seats and other rubbish are promptly taken from the stores and properly disposed of.
• On completion of a change of cylinders on a manifold, record the activity on the log sheets provided.

With regard to work carried out under a permit to work, the CP (MGPS) will:

• Accept instruction from the AP and acknowledge responsibility for the work.
• Acknowledge familiarity with site fire and safety requirements.
• Isolate systems only under direct supervision of the AP.
• Confirm that only the intended section(s) of pipework are isolated.
• Carry out only such work as detailed on the permit including final connections.
• Confirm completion of work and notification to AP.
• Carrying out appropriate engineering validation and verification tests as required by and under direct supervision of the AP (MGPS).

10.2 Quality Control pharmacist (QC (MGPS))

It is the responsibility of the CEO to appoint, in writing, on the recommendation of the Head of Medicines Management, one or more Quality Controllers with MGPS responsibilities.

The QC (MGPS) will be an appropriately qualified and experienced individual and shall be appointed by the regional quality control pharmacist and entered on to the Quality Controller (MGPS) register.
The QC (MGPS) shall have received specific post graduate training covering the responsibilities and duties required with regard to MGPS, which shall be refreshed every five years. The QC (MGPS) should also attend part of, or the entire Authorised Person training course.

The AP (MGPS) is responsible for informing a QC (MGPS) of any planned or emergency high hazard works and organising attendance as required.

Duties and Responsibilities:
- To assume responsibility for the quality control testing of the medical gases throughout the MGPS as required.
- To liaise with the AP (MGPS) in carrying out specific quality and identity tests on the MGPS in accordance with the Permit to Work System and relevant Pharmacopoeia Standards.
- Carrying out final identity and quality tests on the system witnessed by the AP.
- Declaring that testing is complete and that satisfactory results have been obtained.
- Advising the Medicines Management Lead that gases under his/her control meet specification.
- To advise the Head of Medicines Management of the results of all tests carried out on the MGPS and any other findings that could affect the integrity or performance of the MGPS.
- To carry out quarterly tests for quality and identity of any medical gases manufactured on site in liaison with the AP (MGPS).

10.3 Hospital Pharmacy Department
Duties and Responsibilities of the Hospital Pharmacy:
- Order supplies of cylinders of medical gases and special gas mixtures for the hospital.
- Receive delivery notes for compressed gas cylinders, check against invoices, received and pass invoices for payment.
- Maintain a record of cylinder rental charges and pass rental invoices for payment.
- To examine and archive any “Certificates of Analysis” for medical liquid oxygen and unlicensed medical gases as are made available to the HDUHB by medical gas suppliers.
- To ensure that cylindered and piped medical gases purchased by the HDUHB are prepared under an appropriate MHRA manufacturing authorisation.
- Ensure that other gases and gas mixtures comply with manufacturers’ product licences.
- To assume responsibility for the quality control of medical gases throughout the MGPS.
- To ensure clinicians or authorised prescribers prescribe medical gases appropriately.
- Pharmacy department are also responsible for auditing the quantity of cylinders on site at all times.

10.4 Designated Nursing Officer (DNO)
The DNO is the most senior trained member of nursing staff on site or responsible for a selected area, and will need to liaise with the AP (MGPS) on any matters affecting MGPS within their area of responsibility. ALL planned work on the MGPS will have been
Previously agreed with the DNO and must be carried out under the MGPS Permit to Work System.

Depending on the level of hazard, the DNO could be:

<table>
<thead>
<tr>
<th>DNO</th>
<th>Authority Level for Hazard</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Clinical Site Manager (Day or Night)</td>
<td>Planned work requiring a “Low or High” Hazard permit to work and emergency isolation.</td>
</tr>
<tr>
<td>Senior Duty Nurse in charge of a Ward or Department</td>
<td>Planned work requiring a “Low Hazard” permit to work</td>
</tr>
<tr>
<td>Ward Manager or Deputy</td>
<td>Planned work requiring a “Low Hazard” permit to work</td>
</tr>
</tbody>
</table>

The DNO will give permission via the Permit to Work Form, provided by the AP (MGPS) for any planned works.
- The Permit to Work will be signed by the DNO, at the start and end of the work.
- The DNO will act as coordinator in the event of more than one ward/department being involved in a planned work.

The DNO should ensure that:
- Arrangements are made where required, for the sufficient temporary cylinders to cover the period of the permit to work.
- Patients are not put at risk by any interruption to the MGPS.
- All affected terminal units are appropriately labelled to prevent use as directed by the AP (MGPS).
- On completion of the work the DNO will accept the MGPS back into use and advise other affected clinical areas.

Senior nursing staff on duty that are not acting as DNO shall also ensure that clinical staff under their control are aware of any MGPS work that may affect them and shall understand the clinical/service implications.

10.5 Medical Gas Committee (MGC)
The Medical Gases Committee (MGC) shall report any medical gas compliance discrepancies to the Health and Safety Co-ordinating Group and/or the Strategy and Planning Sub Committee to ensure effective communication is maintained, the MGC should meet at annually or as required by circumstance and consist of the following individuals:

- Operational Compliance Manager (Chair)
- Quality Controller (QC MGPS)
- The nominated AP (MGPS)
- Head of Nursing or nominated representative
- Director of Estates and Capital Planning or nominated representative
- Portering Manager or nominated representative
- Patient and Risk Manager
- Health and Safety Manager
- Appointed AE Authorising Engineer
Other signatories or advisors to this document shall also be invited to join the body when appropriate.

The purposes of this body shall be to determine, communicate and monitor the MGPS policy to enable the effective management of MGPS activities. This will include but not be limited to:

**Strategy**
- Operational policy development, distribution and review
- Medical gas safety reports
- Review of systems compliance
- Risk register elements arising from compliance
- Cylinder management
- Training needs evaluation
- Medical Gas Training Programme
- MGPS upgrade projects (to comply with strategy)

**Operational**
- Planned shutdowns
- Equipment selection
- Cylinder management
- Emergency actions

**10.6 Hotel Services - Designated Porter(s)**
A Designated Porter is a Porter with particular responsibilities that has received specialist training in the identification, safe handling, storage and management of medical gas cylinders. Annual refresher training courses shall be attended.

**Duties and Responsibilities:**
- Deliver full gas cylinders from the Cylinder Stores to wards and theatres as requested.
- Return empty cylinders to the empty cylinder storage area as part of the same job of delivery. To maintain a reduced stock level of cylinders as required.
- Ensure that the delivered cylinders are stored in the correct locations in the Cylinder Store, as per the store labelling.
- Ensure that the delivered cylinders are stored safely in the store and are properly secured by chains where appropriate.
- Handover gas delivery notes from the delivery driver to the Pharmacy for payment authorisation.
- Change cylinder regulator/flowmeter combinations on cylinders as required.
- Label and remove from service any “faulty” or “incident” cylinders, subsequently follow procedure for dealing with such cylinders (Appendix H)
- Apply stock rotation principles on a first out basis to ensure that all cylinders are delivered to users are within the “Use before date” as specified by the gas supplier.
- Ensure that all flowmeters and regulators that are found to be damaged or out of service are returned to the relevant EBME/Estates Department for repair or replacement.

It is essential that the Designated Porter is trained and works safely at all times, using the appropriate Personal Protective and Manual Handling Equipment. Personal Protective or
Manual Handling Equipment found to be missing, or defective in any way, must be reported to the relevant Operations Manager or relevant deputy.

The Porters will:
- Perform a weekly check on cylinder stocks and report findings to pharmacy.
- Accept requests from wards and departments for replacement gas cylinders, and arrange for Designated Porters to deliver cylinders to the point of use and at the same time, return the empty cylinders to the appropriate cylinder store.

In order to comply with cylinder management arrangements, each morning, the theatre porter must check the stock of cylinders in the theatre cylinder store and arrange with the portering department to replenish as necessary.

10.7 Appointed Contractor(s)
A contractor is the person or organisation designated by management to be responsible for the supply, installation, validation and verification of MGPS for the HDUHB. It is essential to ensure that individuals employed have suitable qualifications necessary to undertake the work appropriately and safely.

10.8 Head of Capital Projects/Discretionary Project Manager (HCP) / (DPM)
The HCP and or DPM must ensure that appointed designers and installers of MGPS utilise only approved materials in accordance with published British Standards (BS) as described in HTM 02-01.

Collectively, they must consult with the appointed AE as well as the AP (MGPS) on all schemes where adjustments are made to the MGPS infrastructure.

The appointed AE will provide input advice to the design process in respect to the construction phase and for the subsequent operational service thereafter.
10.9 Management Hierarchy

CHIEF EXECUTIVE OFFICER – (CEO)

DESIGNATED PERSON (DP)
BOARD LEVEL DIRECTOR (BLD)
MEDICAL GAS

EXTERNAL AUTHORISING ENGINEER (AE)
MEDICAL GAS

HEAD of CAPITAL PROJECTS
/DISCRETIONARY PROJECT MANAGER (HCP)

APPOINTED CONTRACTORS

SENior ESTATES MANAGEMENT
DEPUTY DESIGNATED PERSON (DDP)
ASSISTANT DIRECTOR OF FACILITIES,
ESTATES & CAPITAL PLANNING (ADFECP)
&
HEAD OF OPERATIONS (HoO)

OPERATIONS MANAGER (S)
EAST & WEST (OM – E/W)
HARD & SOFT FM

AUTHORISED PERSONS (AP’s)

ESTATES COMPETANT PERSONS MEDICAL GAS (CP)

QUALITY CONTROL PHARMACIST (QC) & PHARMACY

QUALITY CONTROL PHARMACIST (QC) & PHARMACY

SEniOR NURSE MANAGER (SNM)

DESIGNATED NURSING OFFICER OR MEDICAL OFFICER (DNO)

MEDICAL GAS COMMITTEE (MGC)

MEDICAL GAS COMMITTEE (MGC)

OPERATIONS MANAGER (S)
EAST & WEST (OM – E/W)
HARD & SOFT FM

SEniOR NURSE MANAGER (SNM)

DESIGNATED NURSING OFFICER OR MEDICAL OFFICER (DNO)

MEDICAL GAS COMMITTEE (MGC)

MEDICAL GAS COMMITTEE (MGC)

QUALITY CONTROL PHARMACIST (QC) & PHARMACY

QUALITY CONTROL PHARMACIST (QC) & PHARMACY

SEniOR NURSE MANAGER (SNM)

DESIGNATED NURSING OFFICER OR MEDICAL OFFICER (DNO)

MEDICAL GAS COMMITTEE (MGC)

MEDICAL GAS COMMITTEE (MGC)

OPERATIONS MANAGER (S)
EAST & WEST (OM – E/W)
HARD & SOFT FM

SEniOR NURSE MANAGER (SNM)

DESIGNATED NURSING OFFICER OR MEDICAL OFFICER (DNO)

MEDICAL GAS COMMITTEE (MGC)

MEDICAL GAS COMMITTEE (MGC)

QUALITY CONTROL PHARMACIST (QC) & PHARMACY

QUALITY CONTROL PHARMACIST (QC) & PHARMACY

SEniOR NURSE MANAGER (SNM)

DESIGNATED NURSING OFFICER OR MEDICAL OFFICER (DNO)

MEDICAL GAS COMMITTEE (MGC)

MEDICAL GAS COMMITTEE (MGC)

OPERATIONS MANAGER (S)
EAST & WEST (OM – E/W)
HARD & SOFT FM

SEniOR NURSE MANAGER (SNM)

DESIGNATED NURSING OFFICER OR MEDICAL OFFICER (DNO)

MEDICAL GAS COMMITTEE (MGC)

MEDICAL GAS COMMITTEE (MGC)

QUALITY CONTROL PHARMACIST (QC) & PHARMACY

QUALITY CONTROL PHARMACIST (QC) & PHARMACY

SEniOR NURSE MANAGER (SNM)

DESIGNATED NURSING OFFICER OR MEDICAL OFFICER (DNO)

MEDICAL GAS COMMITTEE (MGC)

MEDICAL GAS COMMITTEE (MGC)

OPERATIONS MANAGER (S)
EAST & WEST (OM – E/W)
HARD & SOFT FM

SEniOR NURSE MANAGER (SNM)

DESIGNATED NURSING OFFICER OR MEDICAL OFFICER (DNO)

MEDICAL GAS COMMITTEE (MGC)

MEDICAL GAS COMMITTEE (MGC)

QUALITY CONTROL PHARMACIST (QC) & PHARMACY

QUALITY CONTROL PHARMACIST (QC) & PHARMACY

SEniOR NURSE MANAGER (SNM)

DESIGNATED NURSING OFFICER OR MEDICAL OFFICER (DNO)

MEDICAL GAS COMMITTEE (MGC)

MEDICAL GAS COMMITTEE (MGC)

OPERATIONS MANAGER (S)
EAST & WEST (OM – E/W)
HARD & SOFT FM

SEniOR NURSE MANAGER (SNM)

DESIGNATED NURSING OFFICER OR MEDICAL OFFICER (DNO)

MEDICAL GAS COMMITTEE (MGC)

MEDICAL GAS COMMITTEE (MGC)

QUALITY CONTROL PHARMACIST (QC) & PHARMACY

QUALITY CONTROL PHARMACIST (QC) & PHARMACY

SEniOR NURSE MANAGER (SNM)

DESIGNATED NURSING OFFICER OR MEDICAL OFFICER (DNO)

MEDICAL GAS COMMITTEE (MGC)

MEDICAL GAS COMMITTEE (MGC)

OPERATIONS MANAGER (S)
EAST & WEST (OM – E/W)
HARD & SOFT FM

SEniOR NURSE MANAGER (SNM)

DESIGNATED NURSING OFFICER OR MEDICAL OFFICER (DNO)

MEDICAL GAS COMMITTEE (MGC)

MEDICAL GAS COMMITTEE (MGC)

QUALITY CONTROL PHARMACIST (QC) & PHARMACY

QUALITY CONTROL PHARMACIST (QC) & PHARMACY

SEniOR NURSE MANAGER (SNM)

DESIGNATED NURSING OFFICER OR MEDICAL OFFICER (DNO)

MEDICAL GAS COMMITTEE (MGC)

MEDICAL GAS COMMITTEE (MGC)

OPERATIONS MANAGER (S)
EAST & WEST (OM – E/W)
HARD & SOFT FM

SEniOR NURSE MANAGER (SNM)

DESIGNATED NURSING OFFICER OR MEDICAL OFFICER (DNO)

MEDICAL GAS COMMITTEE (MGC)

MEDICAL GAS COMMITTEE (MGC)

QUALITY CONTROL PHARMACIST (QC) & PHARMACY

QUALITY CONTROL PHARMACIST (QC) & PHARMACY

SEniOR NURSE MANAGER (SNM)

DESIGNATED NURSING OFFICER OR MEDICAL OFFICER (DNO)

MEDICAL GAS COMMITTEE (MGC)

MEDICAL GAS COMMITTEE (MGC)

OPERATIONS MANAGER (S)
EAST & WEST (OM – E/W)
HARD & SOFT FM

SEniOR NURSE MANAGER (SNM)

DESIGNATED NURSING OFFICER OR MEDICAL OFFICER (DNO)

MEDICAL GAS COMMITTEE (MGC)

MEDICAL GAS COMMITTEE (MGC)

QUALITY CONTROL PHARMACIST (QC) & PHARMACY

QUALITY CONTROL PHARMACIST (QC) & PHARMACY

SEniOR NURSE MANAGER (SNM)

DESIGNATED NURSING OFFICER OR MEDICAL OFFICER (DNO)

MEDICAL GAS COMMITTEE (MGC)

MEDICAL GAS COMMITTEE (MGC)

OPERATIONS MANAGER (S)
EAST & WEST (OM – E/W)
HARD & SOFT FM

SEniOR NURSE MANAGER (SNM)

DESIGNATED NURSING OFFICER OR MEDICAL OFFICER (DNO)

MEDICAL GAS COMMITTEE (MGC)

MEDICAL GAS COMMITTEE (MGC)
11 Emergency work on the MGPS
In the case of an emergency such as fire or a major escape, the DNO shall first determine the usage of medical gases and where necessary make alternative arrangements before arranging/authorising local isolation at the AVSU.

There is no requirement to follow the permit to work procedure to isolate the supply in an emergency, however following such an event, the AP (MGPS) will require the DNO to accept the system back into use by signing a permit to that effect.

If the MGPS is isolated in an emergency it should never be returned to service without the required tests being carried out by the AP (MGPS) and the QC (MGPS) if appropriate.

12 Normal Operation of the MGPS
Medical gases are to be administered according to the prescription or by hospital agreed protocol and the DNO will ensure that the staff within his/her responsibility are aware of this.

Nursing Management shall ensure that training is provided and that their staff are competent prior to staff taking clinical responsibility for the use of the MGPS.

Refresher courses are to be arranged annually. Elements to be covered are detailed elsewhere in this policy and within HTM02-01 part B Chapter 7.

13 Medical Gas Training
The HDUHB’s objective is to control work related risks and ensure safe working practices. All training needs relevant to medical gas will be identified by the OM-E/W and a programme of training, monitoring and control will be followed as detailed below. It is essential that personnel at all levels have a sound general knowledge of the principles, design and functions of MGPS, further, that all staff will be trained in relationship to their particular responsibilities.

The relevant line manager for staff within the areas of responsibility should ensure that all staff have received this training prior to using the MGPS, and that refresher courses are arranged in accordance with Table 1 below.

Individual training records will be held and used to determine future training events and requirements.
14 Training Programme and Frequency

Table 1:

<table>
<thead>
<tr>
<th>Position</th>
<th>Safe use and application of medical gases</th>
<th>Emergency procedures and Permit to work system</th>
<th>Management of the MGPS</th>
<th>Installation and maintenance of MGPS</th>
<th>Medical gas quality control and testing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Authorised Person</td>
<td>3 yearly</td>
<td>3 yearly</td>
<td>3 yearly</td>
<td>3 yearly</td>
<td>-</td>
</tr>
<tr>
<td>Competent Person</td>
<td>3 yearly</td>
<td>3 yearly</td>
<td>-</td>
<td>3 yearly</td>
<td>-</td>
</tr>
<tr>
<td>Designated Medical/Nursing Officer</td>
<td>3 yearly</td>
<td>3 yearly</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Nursing Staff</td>
<td>Annually</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Designated Porter</td>
<td>Annually</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Quality Controller (MGPS)</td>
<td>5 yearly</td>
<td>5 yearly</td>
<td>5 yearly</td>
<td>5 yearly</td>
<td>5 yearly</td>
</tr>
<tr>
<td>ODP/Theatre Staff</td>
<td>Annually</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

15 Training Content

The training requirements outlined above should cover all, but not be limited to the topics as detailed and comply with the course content and training outcomes as detailed in HTM02-01.

The Safe Use and Application of Medical Gases

- Properties and hazards of medical gases
- Safe use of equipment
- Cylinder safety, handling and management

Emergency Procedures and Permit to Work System

- Emergency supply provision
- Actions in the event of an emergency
- Responsibilities and application of the permit to work system

Management of the MGPS

- Design and application of MGPS
- Installation practice
- Validation and verification of MGPS
- Maintenance requirements of components

Medical gas quality control and testing

- Requirements of medical gas testing
- Test equipment and protocols for use
- Statutory requirements for medicines management
16 Communications

16.1 Routine Planned Work
A minimum of two weeks notice in writing shall be given prior to all routine work on the MGPS which could result in an interruption of supply, with copies to all affected stakeholders.

16.2 Emergency Works
Communications subsequent to emergency action shall be made as soon as practically possible after the event and confirmed in writing within 24 hours.

16.3 Connection of New & Demonstration Equipment
The relevant Authorised Person (MGPS) shall be notified prior to any new or demonstration equipment being connected to the MGPS.

16.4 Permit to Work System
A Permit to Work (PTW) Scheme is primarily a system for the safety of patients and is designed to safeguard the integrity of the medical gas system.

Before any work can be undertaken on any area of the organisations MGPS, consideration must be given to other areas that might be affected or interrupted by the work, the time to be taken, the level of risk and back up systems required. The issue of a PTW and the way in which the work is carried out must follow the directions of HTM02-01, unless otherwise defined in this Policy.

The effectiveness of the PTW scheme relies on the training and thorough understanding of the signatories. Each individual has a defined responsibility.

16.5 Definition of Level of Hazard
The following section defines the level of hazards that the Authorised Person should attribute to varying categories of work on the MGPS. If there is any doubt as to the hazard level of a particular Permit to Work, advice should be sought from the AP (MGPS) or appointed Authorising Engineer. If appropriate advice is not available then the hazard should be escalated to High Hazard.

16.6 HIGH Hazard
HIGH Hazard work is defined as any work on the MGPS that can introduce hazards of cross-connection or pollution and/or cross-connection or isolation of a patient supply other than for servicing terminal unit second second-fix components. It therefore follows that work on any part of the MGPS that requires cutting or brazing will be classified as HIGH HAZARD.

High hazard work may be limited to a planned interruption of a single ward or could be as major as the shut down of a system for the whole site.

As a minimum, cross-connection, performance, identity and quality tests shall be required before the MGPS is taken back into use.
16.7 LOW Hazard

This applies to all work on the MGPS that does not give rise to a high hazard situation. Low Hazard work is defined as work on the MGPS which will not introduce any hazard of cross-connection or pollution. Accordingly this limits the permissible work to that on an individual terminal unit (in addition to vacuum) that does not comply, or multiple terminal units that do comply with BS 5682:1984/BS EN ISO 7396.

Low hazard permits will cover all PPM inspections, but some remedial work may require issue of a high hazard permit; for example, examination of a leaking terminal unit may reveal that the supply to the ward will require isolation in order to allow replacement of a damaged first-fix component.

As a minimum, a performance test will be required before the MGPS is taken back into use.
16.8 Process Diagram High Hazard Work

1. Authorised Person AP (MGPS)
   - Prepare Permit
   - Prepare temp supply & liaises with portering dept. for transportation of cylinders.

2. Request permission to commence work by obtaining DNO permit signature.

3. Affix “DO NOT USE” Notices to terminal units out of service.

4. Describe works and Site Safety to Competent Person

5. On completion of work, determine tests and supervise CP (MGPS)
   - Sign off engineering tests on Permit to work form
   - Witness QC testing and sign off permit with QC

6. Obtain acceptance of system re-instatement by DNO signing Permit
   - Remove “DO NOT USE” Notices from terminal units back in service

7. CP accepts instructions and signs permit to commence work
   - CP isolates system as detailed on Permit, supervised by the AP
   - CP carries out work and advises AP on completion

8. CP carries out required tests under supervision of the AP
   - QC carries out tests detailed, witnessed by the AP. QC signs off tests.

9. Critical Path
16.9 Process Diagram Low Hazard Work

MEDICAL GAS MEETING (Overview of works and if interruptions will take place)

Authorised Person liaises with DNO, Pharmacy and Contractors (CP (MGPS)) as necessary.

- **Authorised Person AP (MGPS)**
  - Prepare Permit
  - Prepare temp supply & liaises with portering dept. for transportation of cylinders.
  - Where required, request permission to commence work by obtaining DNO permit signature.
  - Fix “DO NOT USE” Notices to terminal units out of service as necessary
  - Describe works and Site Safety to Competent Person
  - On completion of work, determine tests and supervise CP (MGPS)
  - Sign off engineering tests on Permit to work form
  - AP sign off permit
  - Obtain acceptance of system re-instatement by DNO signing Permit
  - Remove “DO NOT USE” Notices from terminal units where necessary back in service

- **Designated Nursing Officer - DNO**
  - Identify temporary gas supply requirements to Pharmacy.
  - Notify staff of work or interruption in supply (in writing / memo / E-mail)
  - Where necessary, sign permit to allow work to commence.

- **Pharmacy (Cylinder Ordering)**
  - Order additional cylinders as required.
  - Porters receive cylinders, source additional regulators and trolleys to suit.

- **Contractor CP (MGPS)**
  - Produce method statement and safety plan for AP approval.
  - Provide detail of work and issue instructions to CP.
  - CP Accepts instructions and signs permit to commence work
  - CP isolates system if necessary as detailed on Permit, supervised by the AP
  - CP carries out work and advises AP on completion
  - CP carries out required tests under supervision of the AP
  - Critical Path

- **Porters**
  - Porters distribute cylinders as DNO requires.

**Critical Path**

**Project Identified and Defined**

**Low Hazard**

*HYWEL DDA UNIVERSITY HEALTH BOARD*

*Medical Gas Policy*

Database No: 434

Page 24 of 65

Version 1.0
17 **Documentation**

It will be the responsibility of the AP’s for each site to maintain up to date copies of all relevant standards and guidance, together with items defined by HTM02-01. The operational compliance manager will also communicate with the AP’s on any related changes in legislation.

18 **As-Fitted Drawings**

As fitted drawings are the primary tool of the AP (MGPS) and should be maintained by the AP’s or nominated deputies at all times. In addition to the master electronic versions drawings, hard copies must be available and accessible at all times within the respective operational maintenance departments for reference.

19 **Plant log-sheets**

Should be completed at every occasion it is necessary to visit plant or manifold installations (e.g. routine maintenance checks or changing cylinders). The completed sheets should be returned to the AP (MGPS) for analysis and stored as a record.

Blank log sheets are provided in Appendix D.

20 **Installation and Maintenance Specifications**

Specifications for work to be completed should be derived by the hospital from the needs of the installed equipment. See sample maintenance contract HTM02-01 Part B that should be used as the basis of the Hospital’s maintenance contract.

21 **Compliance Report and Risk Assessments**

Although HTM02 is not retrospective in its requirements, it does necessitate a compliance report detailing the whole system and the action plan intended to bring the system up to standard.

In all areas of non-compliance, there will be a risk, either to patients, staff, public or financially. These risks have been itemised and formulised enabling a remedial action plant the upgrade plant to be put into a prioritised list.

This has been completed as a part of the audit and risk assessment process, which should be updated as a regular part of the medical gas committee meeting.

22 **Permit to work book and copies**

New copies of the permit to work books for HTM02 are obtainable from TSO on the following ISBN numbers.

HIGH Hazard permits 0-11-322739-6
LOW Hazard permits 0-11-322738-8
Bacteria filter change permit 0-11-322740-X

23 **Operating Procedures – Wards and Departments**

All ward-based equipment is serviced and maintained by the Estates or EBME Department (except equipment that is serviced by an appointed external provider i.e. on contract) for ease of use by nursing staff, however no person should operated medical gas systems or equipment unless they are adequately trained or supervised.
The equipment at ward and department level is diverse, of varying age and manufacture, it is therefore not possible within the scope of this document to advise on the operational aspects of every piece of equipment.

With regard to medical gas systems, the ward equipment covered by this document falls into two main categories.

1. Normal Operating Equipment – terminal units and connections, cylinders and regulators.
2. Emergency Equipment – Alarms and Area Valve Service Units (AVSU)s

**24 Terminal Units (Medical Gas Outlets)**

Although there are a number of different types of terminal units used within the hospital, the operation is generally the same.

Terminal units are designed to be gas specific and matched to a probe of the same type. In this way, gases are not able to be cross-connected. As terminal units cannot accept any probe for which they have not been designed, it prevents the wrong gas from being given to the patient. Attempting to force a wrong connection should never be attempted as it could cause damage to the equipment and result in malfunction or leakage.

Terminal units are either horizontally (wall or trunking) mounted, where the probe enters from the front, or vertically (pendant) mounted where the probe enters from below. At the top of the terminal unit, when it is horizontally mounted, is a locating pin that ensures that probe, which has a mating cut-out, enters the terminal unit in an upright position, ensuring that any equipment is located correctly.

Where a terminal unit is mounted in a pendant assembly, it is used with remote (hose) equipment only and therefore the locating pin is not required.

In both cases a probe is engaged in the terminal unit by squarely pushing it into position until the probe is felt to “click” into position. As this happens, an automatic valve is opened in the rear of the terminal unit allowing gas to pass into the probe and associated equipment.

Once a probe has been connected to a terminal unit, ensure that the connected equipment is turned off and listen for leaks. If a leak is suspected, change the probe for another, and listen for leaks again. If a leak is suspected, change the probe for another, and listen for leaks again. If a leak can still be heard this would indicate that the leak is on the terminal unit itself and should be reported to the AP (MGPS). If no leak can be detected with the new probe engaged, then it would indicate that the probe or equipment connection is leaking which should be reported to the EBME department for repair or replacement.

To remove the probe from a terminal unit, the probe should be cupped in the palm of the hand and pressure exerted on the outer ring on the terminal unit with the thumb and forefinger; this will unlock the probe and close the automatic valve. You might hear a slight hiss of gas at this time but it is nothing to worry about. As the ring depresses, the probe will be released from the front of the terminal unit into the hand, at the same time the automatic valve is closed preventing any further escape of gas.

This is the same operation for all gases (with the exception of the AGSS, which is a screwed connection).
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.

When oxygen is in use a suitable label must be displayed advising staff, patients and the public of the dangers involved. An example is given in Appendix K.

**25 Flowmeters and Regulators**

Flowmeters and regulators should be connected to the corresponding medical gas outlet as detailed above and adjusted in accordance with manufacturers instructions.

For oxygen and medical air flowmeters with rotometer tubes, there is a ball or bobbin inside the tube, which will rise and fall to indicate the level of gas being delivered, as the control know on the front of the unit is turned anti-clockwise or clockwise respectively. It is important to understand where on the ball or bobbin the reading should be taken from, as this can differ from manufacturer to manufacturer.

Some flowmeters are operated with a click stop arrangement, where a dial up reading on the front of the flowmeter determines the flowrate of the gas. Again there are a number of different manufacturers of this type of equipment, and care should be taken on the operation. Some units will not pass gas when the reading is in between flowrate indications.

It is important to select the correct flowmeter for the application. Paediatric oxygen flowmeters are very sensitive and control the amount of oxygen to very fine limits within the range 0-5l/m, whereas adult flowmeters normally have a range of up to 15 l/m.

**26 Prevention of Waste**

Where patients are being administered oxygen, it is normally for extended periods. Some patients have the ability and option to apply and remove facemasks when needed. Care should be taken to ensure that facemasks that are not being used are not left on the bed and passing high oxygen concentrations into the bedding and mattress. Not only is this an extremely dangerous practice from flammability point of view, it is wasteful and will mean that oxygen supplies will need replenishing more frequently than they would otherwise.

Patients should be advised that if they want to stop the administration of oxygen for any reason they should inform a member of the nursing staff. Patients should not be allowed to operate the flowmeters themselves.

**27 Suction regulators**

Suction regulator sets are made up of a number of components that need to be assembled at the bedside, comprising:

- The regulator itself, which can either be directly connected and plugged into a terminal unit, or connected by a remote hose and rail mounted.
- A bacterial trap, which is designed to guard the equipment from internal contamination and protect any maintenance workers.
- A collection jar to receive any fluids extracted from patients.
- Connection hoses to connect the regulator to the collection jar and the collection jar to the patient.
- Some collection jars are also fitted with a disposable liner.
It is essential that all staff are familiar with the operation and assembly of these components and that all manufacturer’s products are catered for in this familiarisation.

If the components are not assembled correctly, the float traps and bacterial traps could be compromised allowing contamination or even blockage of the medical vacuum pipeline system.

Once correctly assembled, the normal method of operation is to turn the regulator on or off with the lever type switch, and adjust the level of vacuum to the desired level by operating the round suction control dial.

Suction regulators can be very specific for the clinical application and a variety exist for high or low vacuum, paediatric, thoracic or intermittent use. It is important that the correct suction regulator is used for the specific application.

28 Hoses, connection and inspection
Sometimes, especially in theatre environments, medical gas outlets are connected to items of equipment by means of flexible connection hoses. These hoses can carry relatively high pressure and care should be taken to ensure that the hoses are sound and clean before inserting the probe into the outlet.

Where hoses are in environments where they could be damaged, for example by having heavy equipment wheeled over them, a full examination of the hose should be made every week. Any cuts or abrasions would necessitate the hose being replaced.

Because of the amount of pressure contained in the length of a hose, their removal from terminal units should be a two-handed operation to prevent the hose “whipping” and causing damage. This is especially important on 7 bar surgical air hoses in theatres.

29 Cylinder use in wards and departments
When using cylinders the nursing staff concerned should be aware of the individual requirements of the patient, the contents of the cylinder and the time available within the cylinder. It is the responsibility of nursing staff to ensure that the medical gases are administered correctly.

30 Ordering and delivery of medical gas
The nurse in charge of the ward or department should indicate the requests for cylinders to the Portering Department on the relevant extension number.

Where a cylinder is not a direct replacement, i.e. an addition to ward stock levels the requisition must be made by the ward sister in charge or senior nurse manager.

All requests for cylinders should detail:
- The gas required.
- The size of cylinder
- If a replacement or extra regulator is required.
- If a cylinder trolley or support is required.
- The number of cylinders needed.
To ensure patient and staff safety, it is essential that all users ensure a high standard of cleanliness when storing, transporting or connecting medical gas cylinders to regulators or other medical devices, particularly with respect to oil and/or grease (e.g. barrier creams) and alcohol gel products. **If hand creams or gels have been used, wash hands before connecting regulator or flowmeters.**

Users should ensure that they open medical gas cylinder valves slowly: If resistance to opening of the cylinder is excessive, the cylinder should not be used and should be returned to the supplier labelled to indicate the problem as either faulty or incident cylinder. (Follow suppliers procedure)

Cylinders should be transported in a purpose made trolley suitable for the size of cylinder. Small cylinders can be carried, although no more than one at a time.

A manual handling risk assessment should be carried out on each cylinder size, specific to the task to be completed and the person involved. This is even more important where the cylinder position itself is confined, e.g. positioning cylinders in manifold racks or under A&E patient trolleys.

Portering staff will deliver cylinders to the wards/departments in accordance with the order of request or priority, change regulators as required and return the empty cylinders to store.

The Porter will leave the cylinder:
- Secured in a suitable trolley or restraint.
- With the regulator and flowmeter connected where required.
- Having tested the regulator connections for leaks.
- With the cylinder valve and flowmeter turned off.
- At the nominated cylinder parking area.

If required for immediate use, the cylinder can be positioned with the patient the cylinder valve can be left on, but the nurse must still follow procedure below.

**31 Use of Medical Cylinders**

Medical gases in cylinders have a number of hazards that staff, patients and public need to be aware of. In ward areas these relate primarily to the risks associated with oxidizing substances, pressure and manual handling although in other areas (theatres) asphyxiant and cryogenic properties also need to be considered, all of which should be covered during training.

In every department cylinders should be parked in specific (and signed) parking areas. Regulators should be turned off when cylinders are left in a ward or department. Keys, if required, should be available in the agreed ‘parking area’ for local use if required.

Any damaged, faulty or out of date regulators replaced should not be used and returned to EBME department by the portering staff.

**32 Responsibilities of Staff Issuing Medical Gas to Patients**
- Check to ensure for the correct gas and matching regulator.
- Check to ensure the gas is in date.
Connect the face mask and low pressure tubing between the flowmeter and the patient.

Advise the patient of the particular dangers.

Turn on the cylinder valve and adjust the regulator to give the correct flowrate according to the % required and prescription.

Cylinders should be replaced when level is in the red sector of the contents gauge and treatment should not start if the cylinder is less than quarter full. However, cylinders should never be emptied deliberately to reach these levels.

When oxygen is in use a suitable label must be displayed advising staff, patients and the public of the dangers involved. An example is given in Appendix K.

### 33 Cleaning Routines

Cleaning of all equipment should follow infection control guidelines. Medical gas equipment including cylinders, should only ever be wiped down with a damp cloth with warm water containing no solvents.

All patient connected equipment (hoses and facemasks are designed to be single use only and should be disposed of appropriately after use).

Closed disposable suction jar liners are normally used, which when full should be sealed, double bagged and disposed of as clinical waste in the normal manner. Suction tubing and catheters should be classified as single use and changed between each patient or daily when in constant use and disposed of as clinical waste.

Where glass or multi use jars are used, wear protective clothing (aprons, visor/spectacles and gloves). Empty contents down sluice, wash with detergent and warm water, dry thoroughly and return to CSSD for processing.

Suction jars do not normally require disinfection additives.

### 34 Medical Gas Alarm Systems

There are generally two types of alarm system within the hospital: The plant or central alarm system that monitors the supply units for failure or imminent failure of supply, and the local alarm systems that monitor the condition (pressure) of gas at the point of use.

Both local area and main plant alarm panels are designed for the use of the staff within the department. Staff should be aware of their location and the senior nurse in the department should ensure that the systems display “Normal” on a daily basis.

If an alarm occurs, pressing the “Mute” button on the front of the panel can silence the condition. If the alarm panel has been muted, it will reset itself after 15 minutes.

### 35 Main Plant Alarms

Main Plant Alarm Panels are located as detailed in Appendix J.

These alarm panels are designed to relay any faults occurring on the supply units (manifolds, compressors etc) to the alarm system, and then transmit that information to all areas where a panel is situated. It is essential that a daily check be made to ensure that the alarm panel is displaying an illuminated “Normal” legend at the top of each gas column.
If any of the gas alarms are activated the alarm panel will display a flashing light accompanied by a two-tone audible signal, corresponding to the problem. Please refer to “Alarm System Indications” section for indications and actions of alarm displays.

Pressing the “Mute” button on the front panel, which will also stop the light flashing and provide a “Steady” signal, will silence the alarm. If the supply plant problem is not rectified within 15 minutes, the alarm panel will reset itself and the audible signal will be re-instated.

Regularly, individual alarm indications will occur with a single flashing alarm signal. These warnings are normal and could only indicate that the oxygen vessel (VIE) needs to be refilled. If two or more alarm indications are displaying in the same gas column of an alarm panel, this would normally be an emergency, (Section 38 onwards “Emergency Operating Procedures”.)

36 Local Area Alarm Panels
Local alarm panels are situated in most wards and theatres areas, either at the nurse base or adjacent to the AVSUs. Staff should be aware of the exact location of these items. They are provided for nursing staff that need to be aware of what is happening to the medical gas systems, and the condition of the gas being delivered to the patient.

These units work by monitoring the gas supply inside each ward or department, so that if an alarm occurs, the fault has already happened. There is no time allowance, and no forewarning, you will need to act immediately as this could be an emergency.

The first condition, as with the main alarm panels, is the most important and indicated by a green “Normal” light at the top of each column. This advises you that everything is OK and safe to use. Nursing staff should make a point of checking this every day.

37 Area Valve Service Units (AVSUs)
AVSUs are primarily intended for use in times of emergency, the emergency operation of these units are covered in section 39.2 “Emergency Procedures – Wards and Departments”.

Any routine use of the AVSU not constituting an emergency, including maintenance, needs to have a permit signed by the DNO responsible for that area.

Labelling of AVSUs should be clear, unambiguous and should be engraved trafalite or similar durable materials. The label should be mounted on the wall adjacent to the AVSU and not on the AVSU cover or door and display the name of the ward as known by the local staff. Nursing staff must be aware of the AVSUs serving their own areas.

Labelling example as Appendix E3.

38 Emergency Procedures – Wards & Departments
It is impossible to list here all possibilities or scenarios where an emergency might occur. The following is a selection of emergencies that might arise and the relevant actions to be taken as a result.
38.1 Medical Gas Alarms
There are two separate types of medical gas alarm and staff should be aware of the differences and the meanings of each. Where there are both types within one department, additional care should be taken over the meaning and interpretation of the signals. The panels are relatively easy to identify.

38.2 Main Plant Alarm Panels
These panels constitute an array of gas legends with, in each column, a “Normal” condition followed by 4 alarm conditions. They are normally only installed in high acuity areas such as theatres, ICU, PICU etc. As well as the telephone exchange, and are designed to monitor the condition of the supply units feeding the medical gas pipeline systems, they provide forewarning of imminent failure and under normal circumstances will display a first level alarm when things start to require attention (such as oxygen requiring refilling on the VIE).

The first legend is the most important and advises staff that everything is OK and safe to use. Nursing staff should make a point of checking this every day. Additionally, an individual alarm condition might occur at position 3 on the panel and this would indicate that the second source of supply, the reserve system, was only 50% full. These would not normally constitute an emergency.

However if any other alarm indication arises, or if two or more alarm indications are displaying within the same column, then follow procedures as detailed in “Alarm System Indications”.

38.3 Local Area Alarm Panels
These panels constitute an array of gas legends with, in each column, a “Normal” condition followed by only 2 alarm conditions that indicate “High Pressure” and “Low Pressure”. The first legend, as with the main alarm panels, is the most important and advises you that everything is OK and safe to use. Nursing staff should make a point of checking this every day. The panel could be located at or near the nurse station or the entrance to the area. It should be noted that if a local area alarm panel is activated then the condition has already occurred and emergency procedures should be instigated immediately.

The first real alarm condition on this panel indicates that the pressure in the pipeline is high. This could mean that the flowrate to patients has increased. Check to ensure what is being delivered. It may need to be adjusted to compensate and additionally if the alarm system reverts back to normal, then the individual flowrates to patients will need to be checked and adjusted again.

The second (final) alarm conditions refers to a low pressure condition, this could be just below the recommended pressure (normally 4 bar) or it could actually mean that the gas has been exhausted completely, you must immediately check which patients are being supplied with the relevant gas and make alternative provisions (cylinders) then follow emergency procedures.

38.4 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).
Medical Gas Policy

The vacuum plant and the medical gas alarm systems are connected to the “essential” electricity supply and will continue to provide and monitor gas supplies as normal.

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

- The oxygen system will continue to supply gas from the primary VIE or reserve manifold.
- 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 available and where vacuum provision is essential for critical care.
- Alarm panels will display a “System Failure” red warning light and emit an audible alarm; gas supplies will not be affected.

In any of these circumstances:

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

38.5 Serious Leak of Medical Gases

In these circumstances:

- The Duty Porter and the on call engineer should be contacted by the Telephonist/Designated Senior Nurse/Clinical Site Manager.
- If there is likely to be a requirement for large numbers of cylinders, Hotel Services must therefore be contacted.
- 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. During out of hours working – the on call engineer should notify the AP (MGPS).

It is the responsibility of the DSN to authorise 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 DSN shall notify the Health & Safety Manager and Fire Officer when a serious leak of medical gas occurs.
- The DSN will issue appropriate instructions to make the situation safe, such as to open windows in the affected area and close doors. If necessary, evacuation will be considered.
- 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) to be carried out under the Permit to Work system.

38.6 Total or Partial Failure of Medical Gas Supply

In these circumstances:

The person discovering the failure will inform the Telephonist/Designated Senior Nurse/Clinical Site Manager immediately.
HYWEL DDA UNIVERSITY HEALTH BOARD

- The Clinical Site Manager, the Duty Porter and the Duty AP (MGPS) will be informed of the leak by the telephonist.
- Details of the failure should be confirmed (i.e. floor level, department room number(s), the gas involved and if the patient ventilators are in use.
- As a precautionary measure, the Telephonist will also notify critical areas (e.g. Theatres) 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. These departments will also be telephoned as a matter of course if it is immediately evident that the fault is affecting the whole system.
- It is the responsibility of the DNO 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 AP (MGPS) will decide the most appropriate method of long-term emergency gas provision. This may involve establishing locally regulated cylinder supplies at ward/departamental entrances.
- Nursing and medical staff should attempt to reduce gas consumption to a minimum during the emergency.
- Portering staff will be required to monitor/replenish cylinders at any emergency stations and at plant room emergency supply manifolds.
- Pharmacy/Portering will arrange emergency cylinder deliveries as necessary.

The AP (MGPS) will liaise with the approved contractor and 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 AP (MGPS) will produce a full report which will be given to the Executive Director within 24 hours of the incident.

In situations where it is envisaged that there will be long term loss of oxygen service, the Clinical Site Manager will liaise with clinical colleagues, including the Director of Nursing, the Medical Director and the Authorised Person (MGPS) on the need for transfer of critically ill patients to other hospitals, as department closure may be warranted in extreme circumstances.

38.7 Contamination of a Medical Gas Supply
(Evidenced by unusual fumes coming from connected equipment)

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 uses 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 or if any patient suffers an adverse reaction to the provision of medical gas, 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 and steps taken to prevent others from using the same supply.

In this event the fault should be treated as a complete gas failure to that area and the actions described above taken IMMEDIATELY.
The AP should be informed immediately, who will advise the telephonist to relay information and guidance on the problem to all departments, starting with the critical care areas.

38.8 Contamination of Medical Vacuum System

Contamination of the medical vacuum system can occur where the vacuum regulators or jars are incorrectly assembled. This will usually be detected during routine maintenance inspection and evidenced by the presence of liquid in the on-line bacteria filled drain flask, however contamination in sufficient quantity can also cause a blockage of the pipeline system. The Infection Control Nurse should be informed immediately where any contamination has been found or suspected; who should advise on any additional precautions required and to effect bacterial filter changes 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 Nurse.

It is the responsibility of the approved Competent Person (MGPS) to change the filter in accordance with the procedure described in HTM 02-01 taking into consideration any additional advice from the Infection Control Nurse.

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 Clinical and Non-Clinical Risk Managers so that the appropriate Nurse Manager can be informed and remedial action taken.

Decontamination of pipework (if necessary) should be carried out in accordance with the procedure described in HTM 02-01 before filters are changed.

38.9 Failure of the AGSS System

Failure of the anaesthetic gas scavenging system will result in spillage of gaseous/vaporised anaesthetic agents into the area of the use of the system. In Theatres, ventilation rates are generally quite high (about 20 air change per hour) and the effects of this spillage will be minimised. However, 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.

Theatre O.D.P or Theatre Technician will be the first to notice AGS failure who should immediately inform the Authorised Person (MGPS) and the Theatre Manager. All attempts should be made to limit or 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 Manger, 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.

39.0 High or low pressure of one or more systems

All medical gas systems are protected by the use of pressure safety valves. However, these units operate at pressures 25% above the normal system working pressure. Although all connected equipment should be designed to withstand this (and higher) excess pressures, it is not good practice to operate with system pressures higher than
normal. In some instances, gas-mixing devices may give incorrect mixtures if one gas supply to the mixer is subjected to higher than normal pressures.

A similar effect can take place with lower than normal pressures but a more serious consequence of the latter is the inability of some equipment e.g. ventilators and surgical tools to operate below certain pressures. Be especially aware that a low-pressure alarm could actually that there is no pressure and that no gas is getting to the equipment/patient.

High or low pressure problems are signalled on both main and local alarm display and should be reported in accordance with this Policy.

39.1 Fire

Procedures in accordance with the Hospital Fire Policy should be followed in the event of a fire involving, or likely to involve the MGPS. During a fire the Fire Service Incident Commander will assume full control of the area(s) affected.

If a fire occurs in a ward of department covered by the piped medical gas system the DNO or Senior Nurse must evaluate the oxygen usage within that area, and wherever possible isolate the medical gases at the area valve service unit (AVSU).

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

39.2 AVSU Emergency Isolation Procedure

The location of the Area Valve Service Unit (AVSU) varies from department; in some instances it is located at the nurses station, whereas in other areas it is at or near the entrance to the ward. In some instances more than one AVSU will control a ward.

Staff must be aware of the location of the particular AVSU and the method of operation for their ward or department.
The Area Valve Service Unit (AVSU) valve operating handle (shown here in red) is shown in the “on” position supplying gas to the ward or department.

Adjacent to each AVSU there should be a sign detailing which areas/beds will be isolated. If the sign is not perfectly clear detailing the exact extent of supply from that particular AVSU, the valve should not be operated.

Before isolation of a gas supply it is essential that patients connected to the system be provided with alternative supplies. Be aware that ISOLATION CAN KILL. ENSURE THAT ESSENTIAL LIFE SUPPORT IS MAINTAINED.

To isolate a gas supply:

Type 1 with glass door.
- Break the glass window in the valve box door with a hard/heavy object.
- Be sure that all glass shards are out of the opening before reaching in.
- Turn the valve quarter-turn from fully on to fully off (i.e. to the vertical position, as shown below.
- Beware of splintering glass and any shards that may be left in the door aperture.

Type 2 with plastic pull out front.
- Push in the valve box door and extract the plastic cover.
- Reach into the valve housing and turn the valve quarter-turn from fully on to fully off (i.e. to the vertical position, as shown below.

Typical Area Valved Service Unit in normal supply condition.

Typical Area Valved Service Unit in emergency isolated condition
Usually, the valve box contains an arrow showing the direction of the gas flow. The handle should be inline with the gas flow arrow under normal circumstances (usually the vertical position, as shown in the diagrams above). There may be other markings present which show which way to turn the handle. Familiarity with different types of valve and their operating methods is essential and may differ from ward to ward.

Note: If the gas supply has ever needed to be isolated in an emergency, it should only be re-established by the AP (MGPS) after the system has been proved safe and possibly given clearance by the Quality Controller.

The hexagonal “nuts” either side of the valve operating handle are known as NIST connections and can be used to provide temporary supplies to an area or for taking gas samples.

Staff should ensure:

- They know which gases are to be isolated (usually all of them in the event of a fire in the ward).
- They are aware of valves that control these gases and their location(s).
- They understand the method of operating the valve(s).
- That the Authorised Person (MGPS) is told immediately that the valve has been closed. (This may be when the emergency is over).

39.3 Emergency Cylinder Request Procedure

In the event of a shortage of cylinders the Nursing Officer should contact Hotel Services Porters (contact available via the main switchboard ext 100) who will arrange further cylinder deliveries.

Where there is a general emergency and a complete medical gas system has been lost to a number of ward areas, priority of supply will be determined by the Designated Nursing Officer.
The following lists are template examples, highlighting specific names, roles and contact information of key staff who are involved with the MGPS. Please note that as this information is likely to change frequently, completed versions of these documents are held in the site specific operational medical gas folders at each acute site.

### Management

<table>
<thead>
<tr>
<th>Job Title</th>
<th>Name</th>
<th>Tel/Contact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chief Executive</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nursing Officer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lead for Pharmacy and Medicines Management</td>
<td></td>
<td></td>
</tr>
<tr>
<td>QC Pharmacist</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Assistant Director of Facilities, Estates &amp; Capital Planning</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hotel Facilities Supervisors</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heads of Infection Control</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clinical Governance &amp; Risk Manager</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HDUHB Health &amp; Safety Manager</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Medical Gas Policy

### Authorised Persons & Designated Nursing Officers (MGPS)

<table>
<thead>
<tr>
<th>Job Title</th>
<th>Name</th>
<th>Tel/Contact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Senior Estates Officer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Estates Officer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Estates Officer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Duty on Call Nurse Manager</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nursing Officer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nursing Officer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nursing Officer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Authorising Engineer (MGPS)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### External Contacts:

<table>
<thead>
<tr>
<th>Emergency Maintenance Contractor</th>
<th>MGPS</th>
<th>Penlon</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liquid Oxygen System (VIEs)</td>
<td>BOC Customer Eng’ Services (24hr) 0800 222 333</td>
<td></td>
</tr>
<tr>
<td>Medical Gas Supplies</td>
<td>Liquid Deliveries</td>
<td>BOC Medical (24hr) 0800 111 333</td>
</tr>
<tr>
<td>Medical Gas Supplies</td>
<td>Cylinder Deliveries</td>
<td>BOC Medical (24hr) 0800 111 333</td>
</tr>
<tr>
<td>Authorising Engineer (MGPS)</td>
<td>tbc</td>
<td></td>
</tr>
</tbody>
</table>
Appendix B: Signatories

Training needs associated with the policy will be co-ordinated by the relevant line manager. This policy is accepted by:

xxxxxxx  Date:
Chief Executive

xxxxxxx  Date:
AP (MGPS)

xxxxxxx  Date:
Head of Medicines Management

xxxxxxx  Date:
Director of Nursing (Senior DNO)

xxxxxxx  Date:
Heads of Infection Control

xxxxxxx  Date:
Health and Safety Manager

xxxxxxx  Date:
Operational Services Manager
Appendix C: Contractor Information

Maintenance Contractor Details

The Maintenance Contractor should provide details of the following and re-issue this information every year.

- Qualifications & Accreditation of Senior Officers in the Company.
- BS EN IAO 9001/BS EN ISO 13485 registration certificates detailing scope of registration.
- Copies of Certificates of AP and CP training.
- Details of product training for installation and maintenance of MGPS equipment.
- Calibration certificates for test equipment used.
- Copies of Insurance held:
  - Public Liability
  - Professional Indemnity

Installation Contractor Details

As above if different company to C1

Register of Competent Persons

The following lists can also be held in the site specific operational medical gas folders at each acute site.

<table>
<thead>
<tr>
<th>Name</th>
<th>Company</th>
<th>Level/Ability</th>
<th>Training Due</th>
<th>Approved &amp; Date</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Appendix D: Log Sheets

Plant log sheets are an essential element to monitoring the condition of the supply plant and manifolds, and should be completed on schedule and analysed weekly to detect any trends.

The following (D1-D5) are examples of the log sheets to be completed by the hospital.
## VIE log sheet

<table>
<thead>
<tr>
<th>Date</th>
<th>Vessel 1</th>
<th>Reserve</th>
<th>Line Pressure (Bar)</th>
<th>Audible Leaks Y/N</th>
<th>Tanker Access Clear Y/N</th>
<th>Compound Clean Y/N</th>
<th>Significant Icing Y/N</th>
<th>Proximity of other hazards</th>
<th>General Condition</th>
<th>Alarm Function</th>
<th>Signature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conts</td>
<td>Press</td>
<td>Conts</td>
<td>Press</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
# Medical Gas Manifold

<table>
<thead>
<tr>
<th>Date</th>
<th>Cylinders Changed Y/N</th>
<th>Duty Bank</th>
<th>L/H Bank Contents</th>
<th>R.H Bank Contents</th>
<th>ESM Contents</th>
<th>Spare Cylinders Present</th>
<th>Line Pressure</th>
<th>Valved Correctly Y/N</th>
<th>Simulated Changeover OK Y/N</th>
<th>Panel Indication OK Y/N</th>
<th>Alarm Function Y/N</th>
<th>Room Cleaned Y/N</th>
<th>Signature</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Section to be completed at every cylinder replacement
Both sections to be completed at weekly maintenance checks

Report any anomalies to Authorised Person – DO NOT make any adjustments without completed permit to work.
### Medical Air Plant Log Sheet

**Hospital** _______________  **Location** _______________  **Manifold Ref:** _______________  **Days Capacity** _______________

<table>
<thead>
<tr>
<th>Date</th>
<th>Duty Pump</th>
<th>Hours Run Pump</th>
<th>Running Amps</th>
<th>Oil Level/Cond</th>
<th>Receiver</th>
<th>Line Press</th>
<th>Auto Blowdowns Operating</th>
<th>Filters Condition</th>
<th>Signature</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td></td>
</tr>
</tbody>
</table>

*Report any anomalies to Authorised Person – DO NOT make any Adjustments without completed permit to work*

---

### Medical Vacuum Plant Log Sheet

- **Database No:** 434
- **Page:** 46 of 65
- **Version:** 1.0

*Medical Gas Policy*
<table>
<thead>
<tr>
<th>Date</th>
<th>Duty Pump</th>
<th>Hours Run Pump</th>
<th>Running Amps</th>
<th>Oil Level/Cond</th>
<th>Vessel</th>
<th>Line Press</th>
<th>Bact. Drains Pumps Mains</th>
<th>Filters Condition</th>
<th>Signature</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>Press In</td>
<td>Cut Out</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Report any anomalies to Authorised Person – DO NOT make any Adjustments without completed permit to work
Appendix E1: Reserve Standby Manifold (Manually Online)

In normal circumstances valve A will be open with Valve B closed. The RH cylinder(s) will be turned on, whilst the LH cylinder will be isolated.

In the event of the main manifold failing to supply gas. Close valve A and open valve B. The gas will immediately be supplied from the RH cylinder.

Monitor the cylinder contents continuously whilst in operation as you will need to switch over to the LH cylinder once the RH cylinder becomes empty and then repeat the procedure for as long as the main manifold is unable to supply.

To be operated by trained staff only.
Appendix E2: Reserve Standby Manifold (Automatic Online)

In normal circumstances valve A will be open with Valve B closed. The RH cylinder(s) will be turned on, whilst the LH cylinder will be isolated.

_In the event of the main manifold failing to supply gas, this manifold will automatically supply and the alarm sound._

Monitor the cylinder contents continuously whilst in operation as you will need to switch over to the LH cylinder once the RH cylinder becomes empty and then repeat the procedure for as long as the main manifold is unable to supply.

_To be operated by trained staff only._
Appendix E3: Sample Signs and Notices

Sample AVSU Label appx size 75 x 50mm

UN107
2

MEDICAL GAS
Oxygen

Compressed Gas
Oxidising Agent

IN AN EMERGENCY
PLEASE CONTACT:

Authorised
Persons Only

Sample gas cylinder store sign appx size
300 x 200mm

OXYGEN
Priestley Ward
Serves Beds 1 – 6
16 outlets
Appendix F: Equipment Schedule

Equipment schedules will be retained by the respective maintenance departments at each acute hospital site. These can be made available on request.
Appendix G: Servicing and Maintenance

Note 1: All work on the MGPS will require the use of a Permit to Work, signed by the Authorised Person (MGPS).

Note 2: Before any maintenance work is carried out on any medical equipment, including portable suction units, the equipment should be decontaminated if necessary and accompanied by an appropriate decontamination certificate.

48.1 Cylinder Stores
It is the responsibility of the Portering services to make sure that cylinder stores are clean and that restraints for larger cylinders and shelving are suitable for supporting and separating cylinders as appropriate.

48.2 Oxygen Plant
VIE Plant (Primary and Secondary Supply Vessels)
Maintenance of the VIE installation is the responsibility of BOC Gases Ltd. It is the responsibility of the Estates Department to carry out the following daily checks.

Primary/Secondary Vessels, Control Panel and Compound(s).

- Vessel contents are adequate for expected use.
- Check that the operating pressure for the Primary VIE is between 10.5 and 16 bar g.
- Look and listen for any leaks.
- Ensure that there is no build-up of rubbish or flammable materials within the vessel compound.
- Check for anything within the compound that could interfere with the correct operation of the installation.
- Check that all safety notices are in place and legible.
- Check that the delivery area is clear of vehicles and obstructions.

Vaporisers

- Look and listen for any leaks.
- Check for excessive ice build up, defrost or switch to alternative vaporiser if necessary.
48.3 Compressed Air Plant

It is the responsibility of the Estates Department to ensure that the medical compressed air receivers, protective devices and pipework are examined by a Competent Person, i.e. by an engineering survey or of an approved insurance company, in accordance with the statutory requirements of the Pressure Systems Safety Regulations 2000. These items of equipment will be included in the Written Scheme of Examination held by the Authorised Person (MGPS).

The QC (MGPS), under the co-ordination of the Authorised Person (MGPS) is responsible for:

- Testing the quality of surgical and medical air every 3 months, in accordance with HTM 02 and Ph.Eur.Standards. (Note: Microbiological quality of delivered air).
- Although the compression/drying/filtration process will remove much of the microbiological burden of the delivered air it cannot be guaranteed as sterile. If sterility is required for a particular process, contact Infection Control/Pharmacy.

Estates are responsible for:

- Providing appropriate tools and personal protective equipment.
- Ensuring that all cylinders are supported and secured by restraints.

Portering are responsible for:

- Replacing ESM cylinders when the central medical gas alarm panel indicates “Reserve Low”
- Ordering replacement cylinders.
- Replacing the ESM cylinders before the cylinder expiry date has been reached.
- Ensuring that the manifold room is kept tidy.

It is the responsibility of The Authorised Person to ensure that the following items of weekly Planned Preventative Maintenance (PPM) on the surgical and medical air systems are undertaken.

**Weekly**

- Check both compressor and dryer control panels to ensure there are no alarm conditions.
- Check and record hours for each pump.
- Visually check both compressors for security and any sign of oil leakage.
- With compressor stationary, check that oil level is in the normal range. Inform Authorised Person (MGPS) if more than 0.5 litres of liquid is drawn off.
- Change over dryer and compressor duty selector switch and ensure correct operation by monitoring during compressor running on line.
- Other (emergency, quarterly and annual) maintenance, in accordance with the Hospital Maintenance Specification.
48.4 Central Medical Vacuum

It is the responsibility of the Authorised Person to ensure that the following items of weekly Planned Preventative Maintenance (PPM) on the Medical Vacuum plant are undertaken.

Weekly

- Check all pump control panels to ensure there are no alarm conditions.
- Check and record hours run for each pump.
- Visually check all vacuum pumps for security and any sign of oil leakage.
- Ensure vacuum pump oil level is within the normal working range, Inform the Authorised Person (MGPS) if the oil level is not correct or oil appears cloudy.
- Check bacteria filter and vacuum pump exhaust drainage flasks to ensure no liquid is present. Inform the Authorised Person (MGPS) if there is liquid present.
- Check and record pressure drop across bacteria filter is acceptable. Inform the Authorised Person (MGPS) if this is not the case. NB: to carry out this check, one of the vacuum pumps should be on line.
- Ensure pump and duty select panels are in correct mode.

Other (emergency, quarterly and annual) maintenance, in accordance with the Hospital Maintenance Specification.
48.5 Nitrous Oxide Manifold

It is the responsibility for the **Authorised Person** to ensure that all (emergency, quarterly and annual) maintenance will be carried out by the Approved Competent Person (MGPS) in accordance with the Hospital Maintenance Specification.

**Estates** are responsible for:

- Providing appropriate tools and personal protective equipment.
- Ensuring that all cylinders are supported and secured by restraints.
- The following weekly checks:
  - Recording the pressure gauges on the manifold and its reserve.
  - Ensuring that all indicators are functioning.
  - Replacing ESM cylinders when the central medical gas alarm panel indicates “Reserve Low”. Undertaken by trained CP’s only.
  - Replacing the ESM cylinders before the cylinder expiry date has been reached.
  - Ensuring that the manifold room is kept tidy.

**Pharmacy** is responsible for:

- Ordering replacement cylinders.

48.6 Entonox Manifold

It is the responsibility of the **Authorised Person** to ensure that all (emergency, quarterly and annual) maintenance will be carried out by the Approved Competent Person (MGPS) in accordance with the Hospital Maintenance Specification.

**Estates** are responsible for:

- Providing appropriate tools and personal protective equipment.
- Ensuring that all cylinders are supported and secured by restraints.
- The following weekly checks:
  - Recording the pressure gauges on the manifold and its reserve
  - Ensuring that all indicators are functioning
  - Replacing ESM cylinders when the central medical gas alarm panel indicates “Reserve Low”
  - Replacing the ESM cylinders before the cylinder expiry date has been reached
  - Ensuring that the manifold room is kept tidy.
  - Ensuring temperatures are appropriate for safe storage.

**Pharmacy** are responsible for:

- Ordering replacement cylinders.
48.7 Anaesthetic Gas Scavenging System (AGSS)

It is the responsibility of the Authorised Person to ensure that the following items of weekly Planned Preventative Maintenance (PPM) are undertaken on the plant:

- Visually inspect all motor units.
- Ensure that the units are running smoothly and free from any unusual noise.
- Visually inspect the end of the exhaust pipe as it exits the plant room to ensure there are no obstructions.
- Ensure the control panel is in “Auto” mode.
- Other (emergency, quarterly and annual) maintenance, in accordance with the Hospital Maintenance Specification.

48.8 Performance Testing

It is the responsibility of the Theatre Manager to provide evidence that the concentrations of pollutants in the areas served by AGS systems comply with COSHH Regulations.

NB: A new risk assessment may be necessary in some circumstances.

48.9 Alarms

On a weekly basis, all panels will be tested by a Competent Person (MGPS) operating the “test” function button to confirm operation of all displays and the audible alarm. Hospital Engineers will advise Clinical and Nursing staff of this test.

All other (emergency, quarterly and annual) maintenance will be carried out by the Approved Competent Person (MGPS), in accordance with the Hospital Maintenance Specification.

Valves and Valve Boxes

All (emergency, quarterly and annual) maintenance will be carried out by the Approved Competent Person (MGPS), in accordance with the Hospital Maintenance Specification.

Terminal Units

All other maintenance will be carried out by the Approved Competent Person (MGPS), in accordance with the Hospital Maintenance Specification.

IMPORTANT: Users should be aware that terminal units carry gas at high pressures. When released from the automatic locking mechanism of the terminal unit, equipment may be ejected with some considerable force.

This is particularly possible with high-pressure equipment hoses, which may cause serious injury if not held firmly while being disconnected.
Appendix H: Faulty and Incident Cylinder Procedure

49.1 Faulty Cylinders
Faulty Cylinders are those that can be described as having a minor problem such as:

- Being empty or part full
- Faulty valve operation
- Damaged valve outlet
- Minor leaks from valve

On discovering a faulty cylinder it must be removed from service immediately and identified by attaching a label to the cylinder (made locally). The cylinder should then be segregated from other cylinders. The Pharmacist must be informed that a faulty cylinder has been found who will contact the supplier to report the fault.

The following information will be required:

- Customer Name, Address and Account Number
- The details of the person to receive the investigation report (if required)
- The number of cylinders involved
- The Batch Number, Fill Date, Cylinder Size Code and Gas Type for EACH cylinder involved
- A description of the fault

The Pharmacist will arrange for the cylinder to be segregated from the main stocks and ensure that the temporary label contains a brief description of the problem and also identifies the cylinder as: DEFECTIVE CYLINDER DO NOT USE.

Under no circumstances should the cylinder be let back into general circulation.

49.2 Incident Cylinders
Incident Cylinders are those that can be considered as being potentially more dangerous. This could be due to:

- Wrong gas or wrong specification
- Gas contamination
- Doubts about gas identity
- Incorrect labelling
- Cylinder empty when needed for immediate use
- Shell failure/damage
- Discharge from safety valve or bursting disc
- Serious cylinder valve leak
- Ignition of cylinder shell or valve
- Cylinder involved in a Road Traffic Accident
- Cylinders involved in a fire
In addition to segregating the cylinders as detailed with faulty cylinders above, extra care should be taken to ensure that if the incident could be related to the manufacturing process, e.g. if the gas is contaminated or if the gas is to the wrong specification. ALL OTHER CYLINDERS IN THE SAME BATCH MUST BE COLLECTED AND SEGREGATED FOR COLLECTION AND INVESTIGATION.

Where a cylinder has been involved in a fire or accident, the emergency services should remove the cylinder(s) to a safe area for collection.

50 Appendix I: Legislation and Guidelines

Although this is not intended to cover all relevant legislation and codes of practice, the following elements should be considered as a minimum when dealing with medical gas systems.

50.1 Statutory requirements - Medical Gas Pipeline Systems

Health and Safety at Work 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 Regulation
Electromagnetic Compatibility Regulations
Electricity at Work Regulations

50.2 Specific Guidance Relevant to Medical Gas Pipeline Systems

Health Technical Memorandum (HTM) 02-01 “Medical Gas Pipeline Systems”
Volume 1, Design, Installation, Validation and Verification
Volume 2, Operational Management

Supplements within Health Technical Memorandum (HTM) 08 “Specialist Services”, No 1 “Dental Compressed Air and Vacuum Systems” 2003
No 2 “Piped Medical Gases in Ambulance Vehicles” 1997
European Pharmacopoeia Standards for medical gases, including medical compressed air
BS EN 737 1-4, 6
Appendix J: Medical Gas Alarm Panels

Main Plant Alarm Panels
Located at: Various Locations

Switchboard

Local Area Alarm Panels
Located at nurse bases or ward entrances adjacent the AVSUs. It is imperative that all staff are aware of the location of the AVSU and alarm system serving their area.
52 Appendix K: Oxygen in use label

HTMO2 is very clear regarding the dangers that are present when using oxygen as a result of an oxygen-enriched atmosphere. It states that:

9.10 When oxygen therapy equipment is in use, fire and safety warning signs/labels should be conspicuously displayed at the site of administration to alert the patient, healthcare staff and visitors that oxygen is being used and that appropriate precautions need to be taken.

9.11 When oxygen is being administered in paediatric departments, the text should include the precaution: “Only toys approved by the hospital fire officer may be given to the child.”

This applies to oxygen being used from cylinders or from medical gas pipeline systems and whenever oxygen is used (including when used in 50/50% mixtures of Oxygen and Nitrous Oxide).

Disposable labels such as the example shown should be posted clearly at the point of use. These should not be left positioned when the gas is not being used to avoid complacency with the label and the dangers involved.

When Oxygen is used:
- It should be administered by trained authorised staff only.
- It should not be left running when not in use.

You should not use:
- Alcohol based handrubs
- Hand Creams
- Oil based products
- Smoking or naked flames are NOT PERMITTED

Only toys and electrical equipment approved by the hospital/site may be used.
Appendix L: Action Cards – Cylinder Connecting

Cylinder Connecting Procedure

- Ensure hands and equipment are free from oil, grease or alcohol gel residue – wash hands with soap and water if unsure.
- Check you have the correct gas and cylinder size – check the cylinder collar, shoulder colour and tickopress label.
- Check the gas is in date – check the expiry date on the tickopress label.
- Secure the cylinder in a cylinder trolley or bracket.
- Remove the seal from the cylinder, retain the plastic cap.
- Check you have the correct regulator for the gas.
- Check the regulator expiry date.
- Check the seal on the regulator for damage.
- Make sure no oil, grease alcohol gel or dirt is on the regulator.
- Attach the regulator to the cylinder – screw in hand tight.
- Turn the gas on slowly at the valve.
- Turn gas off at the valve; watch the gauge to ensure no leaks – if there is a leak the needs on the gauge will move.
- Assuming there are no leaks, open the valve fully, then turn back ¼ turn.
- Set the correct flow rate for the patient – medical staff only. To be confirmed by senior medical and nursing colleagues.

Taking a Cylinder Out of Use

- Ensure hands and equipment is free from oil, grease or alcohol residue – wash hands with soap and water if unsure.

- Close flow meter if left open.
- Close cylinder valve.
- Release pressure from the valve – open flow meter.
- Unscrew regulator from cylinder.
- Replace plastic cap on cylinder valve.
- Return empty cylinder to store.
### Appendix M Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGSS</td>
<td>Anaesthetic gas scavenging system</td>
</tr>
<tr>
<td>AP</td>
<td>Authorised Person</td>
</tr>
<tr>
<td>AVSU</td>
<td>Area valve service unit</td>
</tr>
<tr>
<td>BS5682</td>
<td>British Standard 5682: 1984</td>
</tr>
<tr>
<td>C11</td>
<td>Model Engineering Specification C11 – 1999</td>
</tr>
<tr>
<td>DMO</td>
<td>Designated Medical Officer</td>
</tr>
<tr>
<td>DNO</td>
<td>Designated Nursing Officer</td>
</tr>
<tr>
<td>ESM</td>
<td>Emergency Standby Manifold</td>
</tr>
<tr>
<td>HCM</td>
<td>Hundred Cubic Centimetres</td>
</tr>
<tr>
<td>HTM 02</td>
<td>Health Technical Memorandum 02-01</td>
</tr>
<tr>
<td>Kw</td>
<td>Kilowatt</td>
</tr>
<tr>
<td>LLV</td>
<td>Lockable Line Valve</td>
</tr>
<tr>
<td>MGPS</td>
<td>Medical Gas Pipeline System</td>
</tr>
<tr>
<td>N₂O</td>
<td>Nitrous Oxide</td>
</tr>
<tr>
<td>NIST</td>
<td>Non Interchangeable Screw Thread</td>
</tr>
<tr>
<td>NWH</td>
<td>Normal Working Hours</td>
</tr>
<tr>
<td>O₂</td>
<td>Oxygen</td>
</tr>
<tr>
<td>ONWH</td>
<td>Outside Normal Working Hours</td>
</tr>
<tr>
<td>Ph Eur</td>
<td>European Pharmacopoeia</td>
</tr>
<tr>
<td>PPE</td>
<td>Personal Protective Equipment</td>
</tr>
<tr>
<td>PPM</td>
<td>Planned preventative maintenance – could also refer to parts per million</td>
</tr>
<tr>
<td>QC</td>
<td>Quality Control</td>
</tr>
<tr>
<td>RSM</td>
<td>Reserve Standby Manifold</td>
</tr>
<tr>
<td>VIE</td>
<td>Vacuum Insulated Evaporator</td>
</tr>
</tbody>
</table>
## Appendix N – Cylinder Capacities (Courtesy of BOC)

### Integral Valve

<table>
<thead>
<tr>
<th>Cylinder code</th>
<th>CO</th>
<th>ZD</th>
<th>HK</th>
<th>ZX</th>
<th>Zf(4)</th>
<th>df(5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cylinder order code</td>
<td>101-CO</td>
<td>101-ZD</td>
<td>101-HK</td>
<td>101-ZX</td>
<td>101-Zf</td>
<td>101-df</td>
</tr>
<tr>
<td>Nominal contents (litres)</td>
<td>600</td>
<td>600</td>
<td>2100</td>
<td>2100</td>
<td>3040</td>
<td>2400</td>
</tr>
<tr>
<td>Nominal cylinder pressure (bar)</td>
<td>230</td>
<td>300</td>
<td>230</td>
<td>300</td>
<td>300</td>
<td>137</td>
</tr>
<tr>
<td>Nominal outlet pressure (bar)</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Valve outlet flow connection</td>
<td>mm female</td>
<td>mm female</td>
<td>mm female</td>
<td>mm female</td>
<td>mm female</td>
<td>mm female</td>
</tr>
<tr>
<td>Valve outlet pressure connection</td>
<td>Oxygen/Schade (BS 5862)</td>
<td>Oxygen/Schade (BS 5862)</td>
<td>Oxygen/Schade (BS 5862)</td>
<td>Oxygen/Schade (BS 5862)</td>
<td>Oxygen/Schade (BS 5862)</td>
<td>Oxygen/Schade (BS 5862)</td>
</tr>
<tr>
<td>Valve operation</td>
<td>Handwheel</td>
<td>Handwheel</td>
<td>Handwheel</td>
<td>Handwheel</td>
<td>Handwheel</td>
<td>Handwheel</td>
</tr>
<tr>
<td>Flow rate (litres/min)</td>
<td>50 l/min</td>
<td>50 l/min</td>
<td>50 l/min</td>
<td>50 l/min</td>
<td>50 l/min</td>
<td>50 l/min</td>
</tr>
<tr>
<td>Dimensions (L x W x H mm)</td>
<td>525 x 100</td>
<td>525 x 100</td>
<td>590 x 140</td>
<td>590 x 140</td>
<td>590 x 140</td>
<td>590 x 140</td>
</tr>
<tr>
<td>Weight capacity (gms)</td>
<td>200</td>
<td>200</td>
<td>180</td>
<td>180</td>
<td>180</td>
<td>80</td>
</tr>
<tr>
<td>Nominal weight full (kg)</td>
<td>3.5</td>
<td>4.06</td>
<td>19.0</td>
<td>14.0</td>
<td>14.0</td>
<td>12.0</td>
</tr>
</tbody>
</table>

### Standard Valve

<table>
<thead>
<tr>
<th>Cylinder code</th>
<th>A2</th>
<th>B2</th>
<th>2C(4)</th>
<th>A2(4)</th>
<th>D0(4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cylinder order code</td>
<td>101-A2</td>
<td>101-B2</td>
<td>101-2C</td>
<td>101-A2</td>
<td>101-D0</td>
</tr>
<tr>
<td>Nominal contents (litres)</td>
<td>300</td>
<td>300</td>
<td>300</td>
<td>300</td>
<td>300</td>
</tr>
<tr>
<td>Nominal cylinder pressure (bar)</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Nominal outlet pressure (bar)</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Valve outlet flow connection</td>
<td>mm female</td>
<td>mm female</td>
<td>mm female</td>
<td>mm female</td>
<td>mm female</td>
</tr>
<tr>
<td>Valve operation</td>
<td>Handwheel</td>
<td>Handwheel</td>
<td>Handwheel</td>
<td>Handwheel</td>
<td>Handwheel</td>
</tr>
<tr>
<td>Flow rate (litres/min)</td>
<td>0.5 - 15</td>
<td>0.5 - 15</td>
<td>0.5 - 15</td>
<td>0.5 - 15</td>
<td>0.5 - 15</td>
</tr>
<tr>
<td>Dimensions (L x W x H mm)</td>
<td>390 x 85</td>
<td>390 x 85</td>
<td>390 x 85</td>
<td>390 x 85</td>
<td>390 x 85</td>
</tr>
<tr>
<td>Weight capacity (gms)</td>
<td>2.7</td>
<td>2.7</td>
<td>2.7</td>
<td>2.7</td>
<td>2.7</td>
</tr>
<tr>
<td>Nominal weight full (kg)</td>
<td>1.75</td>
<td>1.75</td>
<td>1.75</td>
<td>1.75</td>
<td>1.75</td>
</tr>
</tbody>
</table>

### Notes:

- (4) The indicated cylinders are for specialized applications and availability is restricted.
- (5) For domestic use only.

### Key Notes:

- (f) The indicated cylinders are for specialized applications and availability is restricted.
- (d) For domestic use only.

**Medical Gas Policy**

Database No: 434
Page 63 of 65
<table>
<thead>
<tr>
<th>Medical Gas Policy</th>
</tr>
</thead>
</table>

### Special gas mixtures

**Lung Function mixtures Types 1-4**

<table>
<thead>
<tr>
<th>Cylinder code</th>
<th>AV</th>
<th>AK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medical Gas Code</td>
<td>Various</td>
<td>Various</td>
</tr>
<tr>
<td>Nominal contents (litres)</td>
<td>110</td>
<td>150</td>
</tr>
<tr>
<td>Nominal cylinder pressure (bar)</td>
<td>5/6 BHP (F)</td>
<td>5/6 BHP (F)</td>
</tr>
<tr>
<td>Valve outlet specification</td>
<td>BS 341 No.3</td>
<td>BS 341 No.3</td>
</tr>
<tr>
<td>Valve operation</td>
<td>Hand/wheel</td>
<td>Hand/wheel</td>
</tr>
<tr>
<td>Dimensions (L x W x H) (mm)</td>
<td>660 x 100</td>
<td>1540 x 230</td>
</tr>
<tr>
<td>Water capacity (litres)</td>
<td>10.0</td>
<td>45.0</td>
</tr>
<tr>
<td>Nominal weight full (kg)</td>
<td>18.0</td>
<td>59.0</td>
</tr>
</tbody>
</table>

### Carbon dioxide/air mixtures (5% CO2/95% Air)

<table>
<thead>
<tr>
<th>Cylinder code</th>
<th>AV</th>
<th>L</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medical Gas Code</td>
<td>Various</td>
<td>Various</td>
</tr>
<tr>
<td>Nominal contents (litres)</td>
<td>150</td>
<td>6750</td>
</tr>
<tr>
<td>Nominal cylinder pressure (bar)</td>
<td>5/6 BHP (F)</td>
<td>5/6 BHP (F)</td>
</tr>
<tr>
<td>Valve outlet specification</td>
<td>BS 341 No.3</td>
<td>BS 341 No.3</td>
</tr>
<tr>
<td>Valve operation</td>
<td>Hand/wheel</td>
<td>Hand/wheel</td>
</tr>
<tr>
<td>Dimensions (L x W x H) (mm)</td>
<td>660 x 100</td>
<td>1540 x 230</td>
</tr>
<tr>
<td>Water capacity (litres)</td>
<td>10.0</td>
<td>50.0</td>
</tr>
<tr>
<td>Nominal weight full (kg)</td>
<td>18.0</td>
<td>52.0</td>
</tr>
</tbody>
</table>

### Carbon dioxide/oxygen mixtures (21% O2/95% Air)

<table>
<thead>
<tr>
<th>Cylinder code</th>
<th>AV</th>
<th>L</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medical Gas Code</td>
<td>Various</td>
<td>Various</td>
</tr>
<tr>
<td>Nominal contents (litres)</td>
<td>150</td>
<td>6750</td>
</tr>
<tr>
<td>Nominal cylinder pressure (bar)</td>
<td>5/6 BHP (F)</td>
<td>5/6 BHP (F)</td>
</tr>
<tr>
<td>Valve outlet specification</td>
<td>BS 341 No.3</td>
<td>BS 341 No.3</td>
</tr>
<tr>
<td>Valve operation</td>
<td>Hand/wheel</td>
<td>Hand/wheel</td>
</tr>
<tr>
<td>Dimensions (L x W x H) (mm)</td>
<td>660 x 100</td>
<td>1540 x 230</td>
</tr>
<tr>
<td>Water capacity (litres)</td>
<td>10.0</td>
<td>50.0</td>
</tr>
<tr>
<td>Nominal weight full (kg)</td>
<td>18.0</td>
<td>51.0</td>
</tr>
</tbody>
</table>

### Helium/oxygen/nitrogen mixture (56% N2/35% O2/9% He)

<table>
<thead>
<tr>
<th>Cylinder code</th>
<th>AV</th>
<th>L</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medical Gas Code</td>
<td>Various</td>
<td>Various</td>
</tr>
<tr>
<td>Nominal contents (litres)</td>
<td>1310</td>
<td>6600</td>
</tr>
<tr>
<td>Nominal cylinder pressure (bar)</td>
<td>5/6 BHP (F)</td>
<td>5/6 BHP (F)</td>
</tr>
<tr>
<td>Valve outlet specification</td>
<td>BS 341 No.3</td>
<td>BS 341 No.3</td>
</tr>
<tr>
<td>Valve operation</td>
<td>Hand/wheel</td>
<td>Hand/wheel</td>
</tr>
<tr>
<td>Dimensions (L x W x H) (mm)</td>
<td>660 x 100</td>
<td>1540 x 230</td>
</tr>
<tr>
<td>Water capacity (litres)</td>
<td>10.0</td>
<td>50.0</td>
</tr>
<tr>
<td>Nominal weight full (kg)</td>
<td>18.0</td>
<td>61.0</td>
</tr>
</tbody>
</table>

**Key notes:**

- The indicated cylinders are for specialist applications and availability is restricted.
- For domestic use only.
Cylinder types

- AZ
- EA
- ZA/ZB
- ZC
- C
- AD
- ED
- CD/DD
- ZD
- D
- E
- AF
- DF
- F
- LF
- VF
- AV
- EX
- HX
- ZK
- G
- AK
- J
- L/H/L

Valve types

- For cylinder valve
- Integral valve
- Hinged valve
- Ballcock valve
- Pin index valve
- Hinged pin valve

Pin index valves

- BOC Healthcare
  Customers Service Centre, Priestley Road, Worsley, Manchester, M28 2DF
  Tel: 0161 957 3333, Fax: 0161 957 5555, Email: boc@bochomecare.com, www.bochealthcare.co.uk

The name BOC and the letters BOC are registered trade marks of the BOC Group Limited. BOC Healthcare is a member of the BOC Group, the parent company of which is BOC PLC. Reproduction or use of this material is strictly prohibited. © Copyright 2019