### Medical Gas Policy

<table>
<thead>
<tr>
<th>Version Number</th>
<th>2</th>
<th>Version Date</th>
<th>19/09/2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>Policy Owner</td>
<td>Mr David Harris AP MGPS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Original Author</td>
<td>Authorised Person MGPS Fire, Health &amp; Safety Manager</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Date last reviewed</td>
<td>September 2013</td>
<td>By whom</td>
<td>DH</td>
</tr>
<tr>
<td>Staff/Groups Consulted</td>
<td>Fire, Health &amp; Safety Manager Authorised Person MGPS Medical Gas Committee Chief Pharmacist Director of Facilities</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agreed by Medical Gas Committee</td>
<td>v1.2 reviewed 8 Dec 08. Amended sect 4.6 &amp; 7.4 then version number changed to v1.3 (12 Dec 08)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Further Updates</td>
<td>v1.4 updated Medical Cylinder Data Chart p45 v1.5 revised sect 4.10 (request from D. Dodd) v1.6 revised, after review by Policy Committee on 21 May 2009 V1.7 Review by Med Gas Committee V1.8 Review by Chief Pharmacist August 2009 V2.0 Review and update DH August &amp; September 2013</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Draft agreed by Policy Owner</td>
<td>September 2013</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Discussed by Policy Group</td>
<td>Agreed by Chair of Policy Group October 2013</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Next Review Due</td>
<td>October 2016</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Policy Audited</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equality Impact Assessment Completed</td>
<td>21/08/2013</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>No</th>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>RATIONALE</td>
<td>4</td>
</tr>
<tr>
<td>2.</td>
<td>AIM</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Links</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Relevant Legislation</td>
<td>5</td>
</tr>
<tr>
<td>3.</td>
<td>DEFINITIONS</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>3.1 Medical Gas Pipeline System (MGPS)</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>3.2 Executive Manager</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>3.3 Estates Operations Manager</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>3.4 Authorising Engineer (AE MGPS)</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>3.5 Authorised Person (AP MGPS)</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>3.6 Competent Person (CP MGPS)</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>3.7 Quality Controller (QC MGPS)</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>3.8 Responsible Person</td>
<td>6</td>
</tr>
</tbody>
</table>

## RESPONSIBILITIES

4.

| 4.1 Chief Executive and Board of Directors | 7    |
| 4.2 Chief Pharmacist                       | 7    |
| 4.3 Medical Gases Committee                | 8    |
| 4.4 Facilities Maintenance Manager         | 8    |
| 4.5 Authorised Person                      | 8    |
| 4.6 Medical Services Officer               | 9    |
| 4.7 Competent Persons                      | 9    |
| 4.8 Designated Nursing Officer (DNO)       | 9    |
| 4.9 Designated Medical Officer (DMO)       | 10   |
| 4.10 Porters, Head Porter and Designated Porters | 10   |
| 4.11 Nursing Staff                         | 11   |
| 4.12 Authorised Staff                      | 12   |
| 4.13 Switchboard Staff                     | 12   |
| 4.14 Procurement Staff                     | 12   |

5. **MEDICAL GAS SUPPLY**

6. **CONTROL OF MEDICAL GAS**

7. **MAINTENANCE OF PLANT AND EQUIPMENT**

| 7.1 Isolation of MGPS                      | 14   |
| 7.2 Permit to Work (PTW)                  | 15   |
| 7.3 Repairing Medical Gas Flexible Hoses  | 15   |
| 7.4 Inspection and Maintenance of Regulators and Flowmeters | 15   |
| 7.5 Inspection and Maintenance of Terminal Units | 15   |
| 7.6 Contamination of Vacuum Plant         | 16   |
| 7.7 Contractor Maintenance of MPGS        | 16   |

8. **MANAGEMENT OF CONTRACTORS**

9. **TRAINING**

| 9.1 Guidance on Training Standards        | 17   |
| 9.2 Guidance on Retraining and Re-assessment Frequencies | 17   |

10. **OCCUPATIONAL HEALTH MONITORING**

11. **POLICY IMPLEMENTATION, MONITORING & EVALUATION**

12. **LIMITATIONS**

13. **DATE OF REVIEW**

14. **EQUALITY IMPACT ASSESSMENT**
<table>
<thead>
<tr>
<th>TABLE OF APPENDICES</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Appendix 1</strong> Medical Gas Committee Terms of Reference.</td>
<td>19</td>
</tr>
<tr>
<td><strong>Appendix 2</strong> Types of Medical Gas in use at Yeovil District Hospital</td>
<td>21</td>
</tr>
<tr>
<td><strong>Appendix 3</strong> Control of Medical Gas</td>
<td>26</td>
</tr>
<tr>
<td><strong>Appendix 4</strong> Cylinder Storage Location</td>
<td>34</td>
</tr>
<tr>
<td><strong>Appendix 5</strong> Manifold Room Location</td>
<td>35</td>
</tr>
<tr>
<td><strong>Appendix 6</strong> Central Vacuum and Compressed Air Plant Location</td>
<td>36</td>
</tr>
<tr>
<td><strong>Appendix 7</strong> Anaesthetic Gas Scavenging Systems AGSS Location</td>
<td>37</td>
</tr>
<tr>
<td><strong>Appendix 8</strong> Switchboard Procedure for Medical Gas Incidents and Alarms</td>
<td>38</td>
</tr>
<tr>
<td><strong>Appendix 9</strong> Procedures for handling and Changing Cylinders</td>
<td>39</td>
</tr>
<tr>
<td><strong>Appendix 10</strong> Procedures for issuing Permit MGPS and List of Authorised Persons</td>
<td>52</td>
</tr>
<tr>
<td><strong>Appendix 11</strong> Procedure for Filter Changing on Vacuum Plant</td>
<td>53</td>
</tr>
<tr>
<td><strong>Appendix 12</strong> List of Contractors for Maintenance of MPGS</td>
<td>54</td>
</tr>
<tr>
<td><strong>Appendix 13</strong> Medical Electronics Process Sheet 44</td>
<td>55</td>
</tr>
<tr>
<td>Annex A – Equality Impact Assessment</td>
<td>59</td>
</tr>
</tbody>
</table>
MEDICAL GAS POLICY

1. RATIONALE

Medical Gases are generally Prescription Only Medicines (POMs). They are supplied to patients one of two methods, either through the medical gas pipeline systems (MGPS) or direct via local cylinders.

In order to safeguard patients the supply of medical gases must be uninterrupted and continuous, be adequate for the use and of agreed good quality (British Pharmacopeia). In an emergency situation staff must understand how to respond to failure of supply through pipeline damage, leakage of gas or other untoward incident.

Gases should be prescribed safely to avoid misadministration; operation of the MGPS may lead to serious health and safety incidents for staff or patients if staff are not suitably trained and competent.

Standards for better health require the Trust to have robust systems for the safe and secure supply of medicines, including medical gases.

Health Technical Memorandum (HTM) 02-01 requires the Trust to ensure all fixed medical gas pipelines systems and medical gas cylinders are managed in accordance with statutory requirements and British Standards (BS) EN 737.

In addition the HTM states the need for a Medical Gas Operational Policy to operate within organisations providing medical gas to patients.

2. AIM

This policy defines the roles and responsibilities of healthcare staff who work at Yeovil District Hospital in relation to the management of all medical gas issues through use of the MGPS or through the use of medical gas cylinders. Appendices provide detail about medical gases, how the use of medical gas systems is managed and the risks associated with medical gases. It is important that responsibilities are clearly defined so that each responsible person recognises the requirements to act safely within a particular sphere of activity.

2.1 Links

This policy should be adhered to in conjunction with the following NHS Guidance and Trust Policies and Procedures:

- Health Technical Memorandum (HTM) 02-01, Part A, Design, Installation, Validation and Verification
- Health Technical Memorandum (HTM) 02-01, Part B, Operational Management
- Occupational Health & Safety Policy
- Hazardous Substances Safety Policy
- Medicines Management Policy
- Procedure for Repairing Medical Gas Flexible Hoses
- Couriers Guidelines
2.2 Relevant Legislation

This policy combines the requirements from the following legislation and statutory instruments but is not a replication of these documents. Reference to them may be required on occasions:

- The Medicines Act 1968
- The Health and Safety at Work Act 1974
- The Management of Health and Safety at Work Regulations 1999
- The Workplace (Health, Safety and Welfare) Regulations 1992
- The Control of Substances Hazardous to Health (COSHH) Regulations 2002
- The Pressure Equipment Regulations 1999
- The Pressure Systems Safety Regulations 2000
- BS EN 737-1:1998
- BS EN 737-2:1998
- BS EN 737-3:1998
- BS EN 737-6:2003
- European Directive 93/42/EEC
- ISO 7396
- BS EN ISO 11197:1998
- BS EN 739:1998
- BS EN 738-1:1997
- BS EN 738-2:1999
- BS EN 738-3:1999
- BS EN 738-4:1999
- BS EN 13221:2000
- ISO 7396-1:2002
- BS EN ISO 14114:1999
- Provision and Use of Work Equipment Regulations 1998
- Personal Protective Equipment at Work Regulations 1992
- Reporting of Injuries, Diseases and Dangerous Occurrences Regulations (RIDDOR) 1995
- Electromagnetic Compatibility Regulations 2005
- BSI Quality Assurance Schedule QAS 37320.1/206/A
- BS EN ISO 13485:2003

3. DEFINITIONS

3.1 Medical Gas Pipeline Systems (MGPS): The MGPS is a convenient and low cost solution to enable the supply of medical gases, Medical/Surgical Air, AGSS and Medical Vacuum throughout the hospital site. The system comprises a main source of supply (generally with a secondary and tertiary source to ensure continuity of service) connected via a permanent fixed pipeline system to appropriate terminal unit outlets in relevant locations across the site.

Plants and system status is monitored continuously by a series of alarms which sound at designated locations to indicate faults or low pressure.

3.2 Executive Manager: The Executive Manager is defined as the person with ultimate management responsibility, including allocation of resources and the
appointment of personnel, for the organisation in which the MGPS is installed. This role is fulfilled by the Chief Executive Officer

3.3 Estates/Operations Manager: The Estates or Operations Manager holds responsibility for the integrity of the MGPS. This responsibility is shared by the Director of Estates and Facilities, and the Maintenance Manager

3.4 Authorising Engineer (AE) MGPS: The Authorising Engineer is appointed by the Executive Manager and must be suitably qualified as per chapter 7 of HTM02-01. This role is fulfilled by a specialist consultant, currently Steve Goddard from MGPS

3.5 Authorised Person (AP) MGPS: The Authorised Person is appointed in accordance with HTM 02-01 by the Director of Estates and Facilities on the recommendation of the Authorising Engineer, and has responsibility for day to day management of the MGPS. If more than one AP MGPS is appointed then a Lead AP MGPS shall be nominated

3.6 Competent Person (CP) MGPS: The Competent Person is appointed in accordance with HTM 02-01 by the Authorised Person. This role is fulfilled by various staff or contractors as deemed appropriate by the AP MGPS

3.7 Quality Controller (QC) MGPS: The Quality Controller has the professional responsibility for the quality control of the medical gasses at the terminal units and certifies any gas before it can be passed to patients. This role is fulfilled as required by a specialist registered on the Quality Controller (MGPS) register maintained by the NHS Pharmaceutical Quality Assurance Committee or the Hospital's own QC if available

3.8 Responsible Person (RP): The Responsible Person is a generic term used to identify any person or manager either employed directly or as a contractor, who has the responsibility for managing any project being undertaken on Trust premises (or which the Trust is responsible for) that involves installation, modification or addition to MGPS. It is the RP’s responsibility to ensure that any and all information is made available to the AP MGPS before during and after a project, and to liaise with the AP MGPS on all aspects of the project relating to the MGPS or systems and services which may affect the MGPS. The Responsible Person should refer to the AP MGPS on all aspects relating to the MGPS

4. RESPONSIBILITIES

4.1 Chief Executive and Board of Directors: The Chief Executive has the overall authority and responsibility for ensuring the safety of staff and other persons within the Trust for the safe use of Medical Gases in line with HTM 02-01, Part B

The Chief Executive delegates responsibility to the Chief Pharmacist as the Officer

Responsible for medical gases and the Director of Facilities for ensuring that the MGPS is maintained in accordance with HTM 02-01

The Chief Executive and the Board of Directors are responsible for ensuring that sufficient funds and resources as required are available as detailed in HTM 02-01.
4.1.1 **Chief Pharmacist:** The Chief Pharmacist is responsible for overseeing the administrative control of Medical Gas throughout the Trust including Purchase, Ordering and Quality Control
Responsibilities include:

- Monitoring the implementation of this Policy and associated procedures. This process will be carried out through the auspices of the Medical Gases Committee and in conjunction with the AP MGPS
- Compiling an annual report to the Medicines Management Group, for onward submission to the Non Clinical Risk Assurance Committee (NCRAC) on the management of medical gases for the previous financial year
- Monitoring the quality control checks for delivery of medical gases within the Trust as detailed in HTM 02-01, Part B
- Have a good understanding of their role as described by HTM 02-01

4.2 **Director of Estates and Facilities:** The Director of Estates and Facilities is responsible for ensuring the integrity of the MGPS in conjunction with the Facilities Maintenance Manager
Responsibilities include:

- Monitoring the implementation of this Policy and associated procedures
- Integrity of the MGPS
- Appointment of the Authorising Engineer MGPS
- Appointment of the AP MGPS
- Have a good understanding of their role as described by HTM 02-01

4.3 **Medical Gases Committee:** This committee has the responsibility to ensure that risks from Medical Gases are minimised across the Trust and provide support and set standards for handling, storage and maintenance of the MGPS. In addition the MGC will endeavour to improve efficiency and compliance with the requirements of HTM 02-01.

Terms of Reference for the Medical Gases Committee can be found at Appendix 1

4.4 **Facilities Maintenance Manager:** The Facilities Maintenance Manager has the shared responsibility for the integrity of the MGPS in accordance with HTM 02-01, Part B.
Responsibilities include:

- Ensuring that an Authorised Person is suitably trained
- Ensuring that cover for the Authorised Person is always available
- Ensuring that documented maintenance procedures are detailed
- Ensuring that all Estates Maintenance staff that may be required to work on medical gas systems are given appropriate training
- Maintaining training records for all facilities staff
- Ensuring that a site risk assessment is documented for all medical gas storage facilities
• Reporting defects and failures to internal management and the Department of Health’s (DH) Estates and Facilities Division
• Have a good understanding of their role as described by HTM 02-01

4.5 Authorised Person MGPS: A Facilities Maintenance Technical Officer has the responsibility of ensuring all maintenance activities and day to day management of the MGPS is carried out in accordance with HTM 02-01, Part B. Responsibilities include:

• Ensuring that the MGPS is operated safely and efficiently in accordance with HTM 02-01
• Appointing the CP MGPS and maintaining an up to date register of staff who are qualified as CP MGPS
• Ensuring that only qualified and appointed CP MGPS works on the system and arranging training for CP MGPS when necessary
• Issuing of Permits to Work for Competent Persons (MGPS) for all work carried out on the existing MGPS as detailed in HTM 02-01
• Supervising of the work carried out by Competent Persons (MGPS)
• Ensuring that the MGPS maintenance is kept up to date
• Contacting and liaising with the Quality Controller when testing is required
• Liaising with clinical staff and others who need to be informed of any proposed works on the MGPS to ensure continuity of supply and clinical needs are met
• Providing technical advice to those responsible for the purchase of any medical equipment which will be connected to the MGPS
• Conducting a risk assessment for all MGPS maintenance and servicing activities
• Managing contractors working on MGPS on Trust premises
• Reporting defects and failures promptly to the Estates and Operations Manager
• Have a good understanding of their role as described by HTM 02-01

4.6 Medical Services Officer: The medical services officer is responsible for maintaining and servicing hoses, equipment, flow meters and regulators.

4.7 Competent Persons MGPS: Competent persons are those from the Facilities Maintenance team who are deemed competent through training, skills and experienced to work on MGPS including contractors brought in through Facilities. Responsibilities include:

• All Competent Persons MGPS must undergo appropriate training to ensure their competence is maintained
• Reporting defects and failures promptly to line management
• Work under the direction of the AP MGPS as required
• Liaise with clinical and ward staff to minimise disturbance during works and ensure that sufficient Medical Gas Cylinders are provided whilst works take place
• Have a good understanding of their role as described by HTM 02-01
• Agree that they will not work on or allow others to work on the MGPS without the issuing of a relevant PTW MGPS by the AP MGPS

4.8 Designated Nursing Officer (DNO): The senior duty ward/department nurse carries out the role of Designated Nursing Officer (MGPS) under HTM 02-01, Part B. They are responsible for formal approval for works or interruption of MGPS to their area of responsibility. In the event of a planned interruption involving more than one department, e.g. for a major shutdown, formal approval of the Designated Medical Officer under the HTM is required after making any necessary consultation. Responsibilities include:

• Giving appropriate approval after any necessary consultation, for works on the local MGPS or planned interruption to the supply by signing the relevant sections of the Permit to Work
• Conducting a risk assessment for patients/visitors who may be affected by works on ward/department level to ensure that they are not exposed to hazardous works
• Informing clinical colleagues of any changes to medical gas availability
• Ensuring sufficient supplies of emergency medical gases are maintained at ward level
• Isolating piped medical gases in the department at emergency valves in the event of serious and imminent danger such as fire or evacuation
• Supervising safe patient treatment using medical gases as required
• Ensuring cylinders are stored in a safe location within fixed storage systems
• Taking action to resolve any unsafe storage of cylinders
• Authorising specific workers to handle medical gas cylinders
• Reporting defects and failures promptly to line management

4.9 Designated Medical Officer (DMO): Similar to the DNO the Designated Medical Officer is the Senior Medical Officer within the Trust but who authorises medical gas isolations or works under the permit to work system which affects more than one department. In practice for works affecting a large area this role is likely to be filled by a number of clinical representatives, each with responsibility for an area or department which will be affected by the works and only when all areas have been signed off (on a multiple sign off sheet) will the requirement be considered as being fully satisfied.

4.10 Porters: Porters are responsible for ensuring that cylinder medical gas supplies are delivered to departments and cylinders changed over in manifold rooms as required. They are not responsible for patient application of medical gases. The head porter is to ensure that all porters are adequately trained to handle medical gas cylinders and to change cylinders in manifolds.

4.10.1 Head Porter: It is the responsibility of the Head Porter to conduct the following duties relative to medical gas cylinder management:

• Conduct and maintain risk assessments for porters handling medical gas cylinders
• Liaising with Pharmacy Dept. and AP MGPS regarding the ordering of further cylinders as required. Pharmacy will actually order further cylinders as gases are prescription only medicines (POMs)
• Replacing cylinders when the central medical gas alarm panel indicates Change Cylinders
• Replacing the Emergency Supply Manifold (ESM) cylinders before the cylinder expiry date has been reached
• Ensuring that stores and manifold areas are kept clean and tidy
• Providing appropriate tools and personal protective equipment
• Ensuring that all cylinders are stored in a supported manner to reduce or eliminate health and safety issues and secured correctly to appropriate structures
• Taking action with departments to resolve any unsafe storage problems
• Ensuring that empty cylinders picked up by porters are returned to the store
• Reporting defects and failures promptly to appropriate line managers

4.10.2 **Designated Porter:** A Designated Porter is a Porter with specific responsibilities for handling medical gases who will have undergone specialist training in the identification and safe handling and storage of medical gas cylinders, including relevant manual handling training.
Responsibilities include:

• Attending annual training on cylinder safety and handling
• Delivering in date full gas cylinders from the cylinder store to wards, Theatres and manifold rooms and returning empty cylinders to the main Medical Gas Cylinder store
• Transferring gas delivery notes from the delivery driver to the Head Porter, who will arrange transfer of these notes to Supplies Dept.
• Connecting to and removing from cylinders, medical equipment regulators or regulator/flow meter combinations as requested by clinical staff
• Identifying and removing from service, faulty (e.g. leaking) cylinders and subsequently reporting any faulty or damaged cylinders using the appropriate reporting systems
• Wearing appropriate safety equipment, protective footwear, goggles and gloves as necessary and using manual handling equipment according to written procedures or formal risk assessments
• Performing a weekly check on cylinder stocks and reporting any deficiencies to 4444
• Reporting Personal Protective or Manual Handling Equipment found to be missing, or defective in any way; report, must be made immediately to the Head Porter
• Storing cylinders in a safe location within fixed storage systems
• Taking action to resolve any unsafe storage of cylinders with the Supervisor or Head Porter.
• Turning off cylinders at the valve when not in use
• Reporting defects and failures promptly to line managers

4.11 **Nursing Staff:** Nursing staff are to ensure that medical gases are administered safely and handled in a way that does not cause harm to themselves or others.
Responsibilities include:

• Closely applying/supervising the use of patient applied masks
• Checking terminal outlets and flexible hoses for any faults before fitting etc.
• Reporting and taking out of service any unsafe terminal outlets or damaged flexible hoses
• Using all appropriate manual handling equipment for moving medical gas cylinders
• Ensuring safe fitting of valves and patient applied masks following safe practices
• Storing cylinders in a safe location within fixed storage systems and arranging for the removal of empty cylinders to the cylinder store area
• Turning off cylinders at the valve or flow meter (as appropriate) when not in use
• Reporting defects and failures promptly to line management

4.12 Authorised Staff: Staff who are authorised by their line managers and have specific responsibilities for handling and changing medical gas cylinders. They must undergo specialist training in safe handling and storage of medical gas cylinders. Responsibilities include:

• Attend regular training on cylinder safety and handling at least annually
• Connecting to and removing from cylinders, medical equipment regulators or regulator/flow meter combinations as requested by clinical staff
• Wearing appropriate safety equipment, protective footwear, goggles and gloves as necessary and use of manual handling equipment according to risk assessments.
• Ensuring cylinders are stored in departments safely
• Reporting Personal Protective or Manual Handling Equipment found to be missing, or defective in any way
• Storing cylinders in a safe location within fixed storage systems
• Taking action to resolve any unsafe storage of cylinders with the department line manager
• Turning off cylinders at the valve when not in use
• Reporting defects and failures promptly to line management

4.13 Switchboard Staff: Switchboard staff are responsible for reporting medical gas alarm incidents indicated on warning alarm panels located in Switchboard. Incidents are to be reported following the procedure detailed in appendix 8.

4.14 Procurement Staff Procurement staff should ensure that any requests for the purchase of equipment that is to be connected to the MGPS has been reviewed by the Medical Electronics Dept. and AP MGPS.
5. MEDICAL GAS SUPPLY

Basic Principles of Design:
- **Identity**: This is assured by the use of gas-specific connections and NIST (Non-Interchangeable Screw Thread) connections throughout the pipeline system, including terminal units, connectors etc. and by the adherence to strict testing and commissioning procedures of the system.

- **Adequacy**: Adequacy of supply depends on an accurate assessment of demands and the selection of plant with capacity appropriate to the clinical or medical demands on the system.

- **Continuity**: Continuity of supply is achieved by the specification of systems that have primary, secondary and tertiary (third) means of supply. (In the case of vacuum, the emergency reserve provision necessitates the use of portable suction devices.)

- **Alarms**: The entire MGPS is monitored continually by alarms which indicate audibly and visually if any issues develop which could affect the supply. Alarm panels are located in various key areas and also centrally at the 24hr manned switchboard in Main Reception at YDH.

Quality of Supply: Quality of supply is achieved by:

- The use of gases purchased to the appropriate European Pharmacopoea requirements or produced by plant performing to the specified standards
- The maintenance of the MGPS installation
- The implementation of various testing and commissioning procedures in accordance with HTM 02-01 and general good practice

Appendix 2 contains details related to the SUPPLY of medical gases under the following headings:

- details of the types of medical gases
- classification of gas by physical type
- the fixed pipeline system
- cylinder supplies
- central cylinder stores
- cylinder manifold rooms
- central vacuum and compressed air plant
- anaesthetic gas scavenging system
- liquid oxygen installations
- medical gas alarm systems
- area valve service units (AVSUs)
- terminal gas units
- flexible hoses
6. CONTROL OF MEDICAL GASES

Appendix 3 contains details of the management of equipment used to provide patients with medical gases. This includes the following topics:

- Patient Applied Equipment
- Changing Cylinders, Handling and Fitting Valves
- Medical Gas Hazards & BOC Material Safety Data Sheets (MSDS)
- Control of Gas Cylinders
- Storage of Cryogenic Gases (Liquid Nitrogen)
- Responding to Medical Gas Incidents
- Contract Delivery & Supply of Medical Gas Cylinders
- Transporting Medical Gases
- Identification and Reporting of Faulty/Damaged Cylinders and Valves

7. MAINTENANCE OF PLANT AND EQUIPMENT

Planned Preventative Maintenance (PPM) including statutory inspections are conducted for all plant and fixed systems up to and including terminal units. This will be the responsibility of Facilities through the Operations/Maintenance Manager and Authorised Person.

The work includes both planned maintenance and breakdown repair provided by contract or direct labour dependant on the competence required.

Facilities Management are to maintain documented maintenance schedules for all plant and systems under HTM 02-01.

7.1 Isolation of MGPS

No works that could affect continuity of supply of medical gases shall take place without:

- The formal approval of the senior nurse in charge (Designated Nursing Officer) of the area(s) that could be affected and any other senior clinical staff as deemed appropriate by the AP MGPS who is issuing the permit
- Issue by the AP MGPS of a Permit to Work MGPS
- Being carried out by a Competent Person (MGPS) and subject to the requirements and limitations of that Permit to Work and in accordance with an approved procedure identified in HTM 02-01, Part B
7.2 Permit to Work (PTW) MGPS

A permit to work will be required for all works directly affecting any aspect of the MGPS or equipment forming part of the MGPS. This not only includes all works directly on the system itself such as maintenance or repair, but also works on electrical supplies or other external services which may have a direct impact on the continuity of supply or integrity of MGPS alarms systems.

Only installation (not connection to existing) of new systems, QC testing and cylinder changes or refilling of cryogenic vessels may take place without the need to issue a permit HTM 02-01 Part B chapter 6.

Additionally emergency isolation due to fire or similar would not require a permit; however the AP must be informed ASAP after the isolation has taken place.

The permit controls the safe procedures and authorisations to carry out work on the MGPS. Responsibilities for issuing a PTW are identified in HTM 02-01, Part B, Section 6.

**Procedures for issuing the Permit to Work can be found at Appendix 10**

7.2.1 Key Controls/Security for PTW System

All keys for isolation of component parts of the systems under control of the Permit To Work are held in Facilities Management and controlled by the AP MGPS.

7.3 Repairing Medical Gas Flexible Hoses

The repairing of medical gas flexible hoses is carried out by the Medical Electronics Department. For more information refer to the relevant medical electronics process sheet (MEPS 44). A copy can be found in Appendix 13.

7.4 Inspection and Maintenance of Regulators and Flowmeters

Inspection and maintenance of cylinder regulators is carried out by the Medical Electronics Department under the guidance outlined in the HTM. The maintenance of flowmeters has been reviewed by the Medical Gas Committee (meeting dated 8th Dec 08). It was decided that there was no intrinsic requirement to carry out planned preventative maintenance of flowmeters as failure did not represent a risk to patient care.

7.5 Inspection and Maintenance of Terminal Units

The HTM defines the frequency of inspection with a recommendation of quarterly examinations as a minimum. Through assessment of the outcomes of these inspections, the frequency of inspection can be reduced accordingly. Results of inspections to be reviewed by the Authorised Person and managed accordingly with reports and recommendations made to the Medical Gas Committee for implementation.
7.6 Contamination of Vacuum Plant

The usual causes are misuse of the vacuum system by medical/nursing staff or failure of filtration/isolation units.

In such cases, liquid will be detected in the vacuum plant separator flask. The Competent Person should report this fact to the Authorised Person (MPGS). Under no circumstances should the vacuum filter separator unit be dismantled without the advice and guidance of the Infection Control Officer and or Consultant Microbiologist. The AP MGPS should be notified before any works take place to any MGPS equipment including Vacuum plant and filters etc.

A copy of procedure for filter changing (HTM 02-01 Good Practice Guide) can be found at Appendix 11.

7.7 Contractor Maintenance of MPGS

Details of contractors used by the Trust for maintenance and installation can be found in Appendix 12.

8. MANAGEMENT OF CONTRACTORS

All contractors working on MGPS must be appropriately trained Authorised or Competent Persons MGPS.

Contractors will come under the MGPS permit to work system employed at YDH and must comply with contractors safety guidance for working on Trust premises.

The Responsible Person employing contractors to work on MGPS will be responsible for passing all relevant information to them and the AP MGPS (YDH).

The AP MGPS should be consulted before any MGPS works are ordered and will need to liaise with the project team for any MGPS related activity, issuing of permits and QC testing etc.

9. TRAINING

All staff that have duties under this policy are to receive appropriate training on MGPS and cylinder handling as applicable. They should also be trained on any associated product or equipment attached to that cylinder.

This training shall be identified and detailed from a Training Needs Analysis (TNA) held by the Yeovil Academy with records monitored by the Medical Gas Committee.

A central record of training must be maintained within the Yeovil Academy and records of individual training kept in staff personal records.
9.1  Guidance on Training Standards

Training following the guidelines laid down in HTM 01-01, Part B, Section 7 should be followed for the following staff groups:

- Quality Controller (MGPS)
- Senior Ward/Dept Nursing Staff (Designated Nursing Officer)
- Authorised Person (MGPS)
- Competent Person (MPGS)
- Porters
- Nursing Staff

9.2  Guidance on Retraining and Re-assessment Frequencies

Refresher training and reassessment schedule for personnel working with medical gas systems (as a recommendation within HTM 02-01, Part B):

<table>
<thead>
<tr>
<th>Personnel</th>
<th>Retraining</th>
<th>Re-assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Authorising Engineer</td>
<td>Every 3 years</td>
<td>Every 3 years</td>
</tr>
<tr>
<td>Authorised Person</td>
<td>Every 3 years</td>
<td>Every 3 years</td>
</tr>
<tr>
<td>Competent Person</td>
<td>Every 3 years</td>
<td>Every 3 years</td>
</tr>
<tr>
<td>Designated Medical Officer</td>
<td>Every 3 years</td>
<td>Every 3 years</td>
</tr>
<tr>
<td>Designated Nursing Officer</td>
<td>Every 3 years</td>
<td>Every 3 years</td>
</tr>
<tr>
<td>Quality Controller</td>
<td>Every 5 years</td>
<td>Every 5 years</td>
</tr>
<tr>
<td>Porters</td>
<td>Every year</td>
<td>Every year</td>
</tr>
<tr>
<td>General Nursing staff</td>
<td>Every year</td>
<td>Every Year</td>
</tr>
</tbody>
</table>

10.  OCCUPATIONAL HEALTH MONITORING

The control of occupational exposure to waste anaesthetic gas (nitrous oxide) is a legal requirement under the Control of Substances Hazardous to Health (COSHH) Regulations 2002. Where nitrous oxide is provided for anaesthetic purposes, scavenging systems are installed. Potential exposure to anaesthetic gases is to be risk assessed to identify the likely exposure to staff in departments where this gas is used. Monitoring and recording is the responsibility of the department management which is to be coordinated with the Trust Health & Safety Manager.

Department managers where anaesthetic gases are being used are to hold an in date risk assessment identifying the hazards, risks and controls in place to ensure that all actions are being taken to reduce the likelihood of exposure to anaesthetic gases and to identify any potential breaches of occupational exposure levels as laid down in EH 40.
11. **POLICY IMPLEMENTATION, MONITORING & EVALUATION**

This policy will be implemented, monitored and evaluated in line with the Policy on Policies. The Effectiveness of this Policy and the Management Plan will be subject to yearly reviews or as legislation changes require. This is to be undertaken by means of audit by senior management or independent review. The audit findings are to be recorded and recommendations actioned with dates and signatures of those concerned.

12. **LIMITATIONS**

This policy will form part of the Standing Orders of the Trust and will be included in the Schedule to the written particulars of employment of all staff employed by the Trust.

13. **DATE OF REVIEW**

This policy is to be reviewed by the Nominated Officer every 2 years or sooner if the circumstances deem it necessary. The actual date for review can be found on the front version control page of this policy.

14. **EQUALITY IMPACT ASSESSMENT**

This policy has been assessed and implemented in line with the policy on procedural documents and an equality impact has been carried out to ensure the policy is fair and does not discriminate any staff groups. A completed Equality Impact Assessment can be found at Annex A at the end of this policy.
Appendix 1 – Medical Gas Policy

YEOVIL DISTRICT HOSPITAL NHS FOUNDATION TRUST

MEDICAL GAS COMMITTEE

TERMS OF REFERENCE

1. Overview

The YDH Medical Gas Committee provides a forum for discussion on the management of medical gas systems and related issues throughout the Trust. The group is multi-disciplinary and members are involved in all aspects of the use of medical gas and associated equipment.

2. Medical Gas Committee Aims

The main aims of this group are to improve the efficiency and safety of the Medical Gas Infrastructure, Policies and Procedures at Yeovil District Hospital and any site which we may have responsibility for. Also to improve compliance with any current regulations and in particular HTM 02-01 parts A and B while maintaining quality and continuity of supply.

The group is to be actively involved in:

- Trust Medical Gas Pipeline Systems (MGPS) policy and implementation
- Training issues relevant to medical gas management
- Incident reporting and investigation
- Risk register input with respect to medical gas issues
- Identification of improvement works program
- Maintenance of medical gas systems
- Risk assessments for locations and equipment which involve medical gas
- Reviewing Terms of Reference and committee attendance

As part of the above, the group also raises awareness of medical gas issues as well as direct contact with other Trust groups and staff etc.

3. Membership

The Medical Gas Committee membership has recently been reviewed and currently comprises the following regular members:

- Lead AP MGPS and other AP MGPS if they are available
- Chief Pharmacist

Other personnel as deemed appropriate or necessary

For Example:

- Clinical Director for Critical Care
- Director of Nursing
- Facilities Department
- YDH Fire Health Safety Officer
4. Quorum

Currently the Medical gas Committee has two regular members with other personnel co-opted as required. Changes to policy and procedure will only be made with the full agreement and co-operation of relevant clinical, medical and facilities staff as appropriate and it is accepted that this number will vary significantly during the lifetime of this policy.

5. Meetings

Routine meetings are held at least annually or as required, with minutes and action points published to members.

The chair person is responsible for:

- Production and distribution of an agenda at least one week prior to a routine meeting
- Production and distribution of draft minutes of meetings not more than one week after the meeting
- Finalising and publication of agreed minutes within one month of the meeting
- Distribution of minutes to include all parties present at any given meeting and
  - Clinical Director for Critical Care
  - Director of Nursing
  - Facilities Maintenance Manager
  - Director of Facilities
  - YDH Fire Health Safety Officer

6. Reporting and accountability

The Medical Gas Committee is primarily accountable and provides reports in the form of the minutes of meetings to the Director of Facilities and Estates.

Members of the group report back and are accountable to the professional groups that they represent as well as to the Medical Gas Committee for actions that they agree to undertake.

7. Review

The Terms of Reference and committee membership shall be reviewed and approved by the committee as deemed necessary by the committee.
## Appendix 2 – Medical Gas Policy

### A.2.1 Types of Medical Gas and Clinical Gas in Use at Yeovil District Hospital

#### Types of Medical Gas

<table>
<thead>
<tr>
<th>Type of Gas</th>
<th>Uses</th>
<th>Delivery System</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Medical Air 4Bar MA4</strong></td>
<td>MA4 - used for life support and patient applied device</td>
<td>• Fixed pipeline system supplied from dedicated compressor and dryer system with cylinder ERM rated at 7Bar (700kPa) feeding 4Bar (400kPa) system via pressure regulation equipment</td>
</tr>
<tr>
<td><strong>Surgical Air 7Bar SA7</strong></td>
<td>SA7 - used for power tools and related equipment</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Primarily found in theatres and ICU</td>
<td></td>
</tr>
<tr>
<td><strong>Oxygen (O₂)</strong></td>
<td>Oxygen therapy for use by ward and theatre staff</td>
<td>• Fixed pipeline system from VIE bulk storage with cylinder ERM</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Portable cylinders</td>
</tr>
<tr>
<td><strong>Nitrous Oxide (N₂O)</strong></td>
<td>Anaesthetic gas</td>
<td>• Fixed pipeline system via cylinder MSM and ERM</td>
</tr>
<tr>
<td></td>
<td>Theatres</td>
<td>• Portable cylinders</td>
</tr>
<tr>
<td><strong>Entonox® Blend of 50% Nitrous Oxide and 50% Oxygen (N₂O₂ 50/50)</strong></td>
<td>Used in Theatres and Emergency Department (cylinders) and Yeovil Women’s Hospital via MGPS</td>
<td>• Fixed pipeline system via cylinder MSM and ERM</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Portable cylinders</td>
</tr>
<tr>
<td><strong>Medical Vacuum</strong></td>
<td>Piped vacuum is provided in most clinical areas by means of centrally located vacuum pumps</td>
<td>• Fixed pipeline system</td>
</tr>
<tr>
<td></td>
<td>Safe removal of bodily fluids, Clinical Areas and Wards</td>
<td>• Portable emergency backup</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Medical Vacuum at a pressure of 400 mm Hg (53 kPa) below atmospheric pressure</td>
</tr>
</tbody>
</table>

#### Types of Clinical Gas

<table>
<thead>
<tr>
<th>Type of Gas</th>
<th>Uses</th>
<th>Delivery System</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Carbon Dioxide (CO₂)</strong></td>
<td>Used in clinical and physiological investigations</td>
<td>• Portable Cylinders</td>
</tr>
<tr>
<td><strong>Liquid Nitrogen (N₂)</strong></td>
<td>Liquid Nitrogen is used for freezing skin tissue in Out Patients Departments</td>
<td>• Small quantity contained in sealed storage vessel Local Specialist Application</td>
</tr>
<tr>
<td><strong>Helium Air Mixture</strong></td>
<td>Lung Function Testing in CID</td>
<td>• Cylinders Local Specialist Application</td>
</tr>
<tr>
<td><strong>0.28% Methane and Carbon Monoxide /Air</strong></td>
<td>Lung Function Testing in CID</td>
<td>• Cylinders Local Specialist Application</td>
</tr>
</tbody>
</table>
A.2.3 Fixed Pipeline Systems

The MGPS has dedicated sources of supply for each gas as well as MA4/SA7, Medical Vac and AGSS. These are distributed across the site via a fixed pipeline system supplying terminal units (to which the user connects and disconnects medical equipment) and is monitored continually by an alarm system.

A.2.4 Cylinder Supplies

Medical gases can be supplied in cylinders of various sizes for patient administration in departments. Cylinders may also be attached to equipment in wards and departments such as those linked to anaesthetic machines or connected directly into manifolds linked into the fixed pipeline systems for main supply and emergency reserve supply of medical gases. Cylinders containing special order or clinical gases are also used in departments for calibration and testing of equipment or as part of a procedure.

A.2.5 Central Cylinder Stores

Medical gas cylinders are kept in a purpose built cylinder store. This contains specified areas for each gas, racking to allow safe storage and an area for cylinders awaiting return because they are empty or defective.

A.2.5.1 Cylinders for Use on Wards or Departments

Storage of cylinders within the main building is generally kept to a minimum and where required these cylinders should be stored in a safe manner using appropriate storage solutions for the size and type of cylinders. In Ward areas these are generally found at the far end of the ward, in full view of nursing staff and secured via chains to a cylinder rack.

For detailed requirements of medical gas cylinder storage facilities refer to HTM 02-01 Part B Section 8.

Trust cylinder storage locations and access requirements can be found at Appendix 4.

A.2.5.2 Reduction of Stocks

Wards and departments are encouraged to reduce the number of spare cylinders kept on their ward or department to a minimum. Keeping a higher number is wasteful of Trust resources and may well increase the level of risk to the unit concerned. Empties are to be returned as soon as possible.

A.2.6 Cylinder Manifold Rooms.
Manifold rooms are located within locked rooms or enclosures and allow connection of cylinders for both main distribution (Main Supply Manifold - MSM) and emergency back-up (Emergency Reserve Manifold - ERM) supply to the site via the fixed pipe system.

**Locations and types of manifolds and gases can be found at Appendix 5.**

The ERM medical gas supplies will come on line automatically in the event of an emergency. The MGPS alarm system will also be activated.

There are two types of Emergency Reserve manifold; fully automatic or manual.

1. **Fully automatic manifolds** should have all vessel or cylinder valves open so that the manifold can automatically switch between Bank A and Bank B.

2. **Manually operated manifolds** MUST have the line valve (cylinder valve in some cases) on ONE bank closed; this is to facilitate a manual changeover when the bank connected online reaches a low level.

**A.2.7 Central Vacuum and Compressed Air Plant**

Central pipeline vacuum supplies are used across the trust for attachment of bodily fluid suction devices. Compressed air is also provided across the Trust in the form of Medical Air 4bar (MA4) and Surgical Air 7bar (SA7). All such plant should comply with current specifications for the supply of plant for use in MGPS (HTM 02-01).

**Essential information and locations of the central vacuum and compressed air plant can be found at Appendix 6.**

**A.2.7.1 Dental Compressed Air and Vacuum Systems**

The Dental Clinics maintained within YDH have access to the MGPS for the supply of oxygen and vacuum. They also have independent stand alone systems for the provision of air and suction. The stand alone systems are covered within HTM 02-01 Supplement Number 1 and must be used for dental procedures as described therein.

**A.2.8 Anaesthetic Gas Scavenging System (AGSS)**

The Trust has active gas scavenging systems fitted in all anaesthetic delivery equipment to remove exhaled anaesthetic gasses. These systems are located in areas such as Theatres and Gynae and are managed and monitored by Facilities staff.

**Essential information and locations of the anaesthetic gas scavenging system can be found at Appendix 7.**
A.2.9 Liquid Oxygen Installations

As the Trust has a high volume requirement for oxygen and the demand can only be met by bulk storage of liquid oxygen. This is maintained by two VIE (Vacuum Insulated Evaporator) vessels located in a dedicated compound in the West End Car Park. The compound is secure and gates are kept locked.

The liquid oxygen is pressurised within the VIE and passes through a large evaporator which allows the liquid to convert to a gas. From here distribution is via a standard MGPS manifold control with automatic changeover to a second smaller vessel, which forms the secondary source of supply should the pipeline pressure drop below a preset level.

Should this happen MGPS alarms would sound at switchboard who would follow the procedure given in Appendix 8.

Storage of cryogenic liquids and in particular Oxygen requires strict controls and only authorised personnel have access into the compound. Minimum safe distances for both personnel and vehicles is controlled by signage and fencing with a lockable steel chain preventing vehicles parking too close or blocking access.

- Access for delivery is controlled by coded lock
- Tank content is monitored remotely by supplier
- Filling requests are automatic via Supplier Monitoring System

IN THE EVENT OF AN EMERGENCY – Staff should report immediately by dialling 4444 from an internal phone or 01935 384444 from a mobile. Switchboard will invoke the emergency procedure (refer to Appendix 8).  

A.2.10 Medical Gas Alarm Systems.

All MGPS equipment and Manifolds are monitored continually by an alarm system for indication of failure/faults, low/high pressure and low levels supply. The alarm will be indicated locally and/or at the central switchboard depending on the nature and severity of the activation.

Alarms are indicated on the MGPS panels both audibly and visually. In the event of an MGPS alarm sounding staff should report immediately by dialling 4444 from an internal phone or 01935 384444 from a mobile. Switchboard will follow the procedure in Appendix 8.

- Medical and Surgical Air (MA4/SA7) and associated equipment
- Oxygen
- Entonox®
- Nitrous Oxide
- Medical Vacuum
Local MGPS Alarm Panels

Local MGPS Alarm panels are sited in each ward and department area where MGPS may be present, and locally to Manifold Rooms and other MGPS equipment such as the VIE

Central MGPS Alarm Panels

Central MGPS Alarm Panels are located at the 24hr manned switchboard located at the Hospital’s Main Reception. Plant and manifold systems have local panels linked to a central panel in the main switchboard to allow for 24hr monitoring giving warning of plant failure or pressure faults in piped systems

In the event of an MGPS alarm sounding Switchboard will follow the procedure in Appendix 8.

A.2.11 Area Valve Service Units (AVSU) Emergency Isolation

These are valves which permit isolation of certain parts of the system for servicing or repair and also in the event of an emergency requiring isolation i.e. fire or serious damage.
These valves are fitted in locked boxes at the entrance to wards and other areas, they have a removable or ‘Break Glass’ front to allow emergency access and minimise risk of accidental or unauthorised isolation of supply.
Careful consideration should be given before isolation as they may serve a large area and advice from the AP MGPS will always be necessary.

A.2.12 Line Valves (LV)

These can be located in ceilings, service ducts and other normally inaccessible locations. They are normally locked by means of a padlock or similar mechanism to prevent unauthorised isolation of supply. They serve to isolate sections of the MGPS to allow maintenance or other works to be completed.

A.2.13 Terminal Units (TU)

This term refers to the equipment at the point of delivery to allow connection of flow meters, controllers or other associated devices specific to the type of gas, AGSS or Vacuum

A.2.14 Flexible Hoses

This term refers to the medical gas specific flexible hoses used to connect items of equipment from Terminal Units or Theatre Pendants. These can also be found inside the moving sections of Theatre Pendants
Appendix 3 - Medical Gas Policy CONTROL OF MEDICAL GASES

Appendix 3 contains details of the management of equipment used to provide patients with medical gases.

A.3.1 Patient Applied Equipment

A.3.1.1 Oxygen Flowmeters connected to Medical Gas Pipeline System

Oxygen flowmeters must remain turned off at all times except when in use. *Masks must not be left on beds with flowmeters left open*

Nursing staff must be aware of the importance of this as there are two consequences arising from failure to turn off the flowmeters when not in use:

- *Fire or Explosion risk; severe burns or damage to equipment*
- *Wasteful and costly discharge of Oxygen*

Safety Note: It is important to understand that clothing and bedding etc. can become saturated with oxygen and may catch light easily. If saturation has occurred or is suspected extra care should be taken to minimise risk of combustion through static discharge or similar. Blankets and clothing need to be ventilated and turned over several times to release the oxygen contamination.

A.3.1.2 Oxygen Flowmeters connected to Cylinders

*Cylinder valves* in regular use should remain open but with the attached *flowmeters turned off*, except when in clinical use.

A.3.1.3 Pressure Regulators

Pressure regulators are attached to medical gas cylinders to reduce pressure to a manageable and safe level. The regulators are pin indexed to ensure that specific regulators for a specific gas can only be attached to a cylinder filled with that specific gas.

To prevent any failure of this safety system:

- Pressure regulators must not be tampered with
- The correct regulator must be selected for the gas used. The pin indexing system should prevent incorrect attachment but forcing or modifying an incorrect fitting *MUST NEVER BE ATTEMPTED.*
- Regulators are clearly marked with the gas for which they are suited. Do not use the wrong regulator for the gas required.

A.3.1.4 Entonox® Equipment

Entonox® is a powerful analgesic and is delivered to the patient via a demand valve system. It is a 50/50 blend of N₂O and O₂ and must be above 10°C before it may be used otherwise it may separate back into two gasses.
Entonox® is supplied to Yeovil Women’s Hospital via a Medical Gas Pipeline System and therefore the equipment is connected via a standard N₂O+O₂ terminal unit. In all other areas (i.e. Emergency Department) it is delivered via portable cylinders or an MGPS blending device connected to separate O₂ and N₂O Terminal Units.

It must only be used by nursing or midwifery staff trained and competent in its use. Clinical staff must be aware of how the regulator is connected to the cylinder, and the importance of ensuring the regulator is turned off when not in use.

**Safety Note:** To ensure that the gas is suitable for immediate use, Entonox® cylinders should be maintained at a temperature above 10°C for at least 24 hours before use. The dedicated Entonox® Manifold Room is heated and monitored to try to maintain this temperature. Cylinders delivered during cold weather or stored in other locations may need to undergo a warming process, either using a warm water bath or allowing them to stand and reach room temperature for 24 hours before use.

### A.3.1.5 Portable Oxygen

Portable oxygen for regular use is not available on GP prescription. Supplies for patient domiciliary use can only be obtained from secondary care respiratory departments following specific referral from either secondary care specialists or GPs.

There are CD cylinders with variable flow meters within the Trust. These may be borrowed for short term trips where no other source of oxygen is available at the *request of a suitable clinician or Doctor* as O₂ is a POM. *It is essential they are returned after use.*

All patients who may need portable oxygen should be referred to the Respiratory Nurse Specialists.

### A.3.1.6 Use of Patients’ Own Oxygen Concentrators

The use of patients’ own concentrators eliminates the need for oxygen cylinders and should be considered for use where appropriate by healthcare staff.

Guidelines on this matter are available from Medical Electronics Dept.
A.3.2 Handling and Using Cylinders

For detailed safety procedures on handling medical gas cylinders follow procedures detailed in Appendix 9.

A.3.3 Medical Gas Hazards & BOC Material Safety Data Sheets (MSDS)

A.3.3.1 Classification of Gas Cylinders

In this document, gas cylinders are classified into two main categories – medical (including clinical) or non-medical (industrial or commercial). Cylinders from these two categories must never be mixed either in storage or in use.

Gas cylinders are further subdivided into groups, depending on the major risk associated with the cylinder contents as follows:

- Group 1 – Flammable
- Group 2 – Oxidising
- Group 3 – Toxic or corrosive (the contents may also be Flammable or Oxidising)
- Group 4 – Others (including inert gases)

Medical gases can also be divided into two groups - those that support combustion and those that do not.

<table>
<thead>
<tr>
<th>Support Combustion</th>
<th>Do Not Support Combustion</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Oxygen</td>
<td>- Carbon Dioxide</td>
</tr>
<tr>
<td>- Nitrous Oxide</td>
<td>- Helium</td>
</tr>
<tr>
<td>- Oxygen/Carbon Dioxide</td>
<td>- Nitrogen</td>
</tr>
<tr>
<td>- Oxygen/Helium</td>
<td></td>
</tr>
<tr>
<td>- Compressed Air</td>
<td></td>
</tr>
</tbody>
</table>

A.3.3.2 Fire & Explosion Risk

Some materials, which do not normally burn in air, will burn in an atmosphere of oxygen, nitrous oxide or gas mixtures containing more than 21% oxygen. These gases do not burn themselves, but strongly support combustion. Special attention should be directed to the hazards associated with smoking and naked flames.

Management of Fire Safety in hospitals is detailed in HTM 05-01 which is further detailed in the Trusts Fire Policy.

Safety Note: When using medical gas cylinders it is essential that no part of the cylinder valve or equipment is lubricated or contaminated with oil or grease. This is due to the risk of spontaneous combustion that can occur with high-pressure gases in the presence of hydrocarbons. Special care is needed with the use of hand creams and alcohol gel as these could provide sufficient contamination to the medical cylinder valve surface to cause an ignition when the valve is turned on.
A.3.3.3 Other Hazards Associated with Medical Gases and Cylinders

Medical gases also have hazardous properties that may be narcotic or may result in asphyxiation if released in an uncontrolled way. Hazards may also come from cylinder handling due to their size and shape or from extremes of heat and cold. Cylinders of various sizes hold compressed gases. The cylinder itself presents a hazard if the valve is damaged. Sudden decompression of the cylinder contents through the valve seat could turn the cylinder into a dangerous projectile. Careful handling and storage of cylinders is therefore essential.

A.3.3.4 Material Safety Data Sheets (MSDS)

BOC supply Safety Data Sheets for all medical gases which can be found by going to the BOC website here:
COSHH assessments are to be completed for each application and use of medical gases in the Trust and departments are to have these available for reference.
For more information, refer to the Fire, Health and Safety Manager or follow the procedures outlined in the Hazardous Substances Safety Policy for advice on COSHH assessment.

A.3.4 Control of Gas Cylinders

All Manifold Rooms, Medical Gas Cylinder Storage Rooms and Plant Rooms containing MGPS equipment are to be kept locked and access is restricted to authorised personnel only
A key for the Medical Gas Cylinder Storage Room is held within the Switchboard key box
BOC have their own key to enable deliveries
Keys are also held by:

- Porters
- Workshop
- Estates
A.3.4.1 Safety of Medical Gas Cylinder Stores and Manifold Rooms

The Main Medical Gas Cylinder Store and Main Manifold Rooms are used to store cylinders. New cylinder delivery and collections of empty cylinders are from each area as follows; Main Medical Gas Cylinder Store, Main Supply Manifold Room N₂O located opposite the Main Medical Gas Cylinder Store and Main Supply Manifold Room N₂O+O₂ located externally at YWH.

All appropriate protective clothing and handling/transporting equipment must be made available and used by all persons entering the store. Only authorised persons are allowed to enter the store.

A.3.4.2 Safety Standards to be followed at All Times

- Cylinders stores must be secure from unauthorised access
- A copy of cylinder colour codes must be displayed within the store
- Cylinder types and contents must be displayed on the outside of the storage facility
- Hazard warning notices (Fire, Compressed Gas Cylinders, No smoking) must be clearly displayed
- Natural high and low level ventilation must be provided.
- Good lighting levels
- Medical Gas Cylinder Store has separate bays specific to different gas types and full and empty cylinders, these should not be mixed
- Non-Medical (or Non-Clinical) gas cylinders are not permitted in the Medical Gas Cylinder Store
- Smaller cylinders must be stored horizontally on racks provided

Note: Signage requirements can be found in HTM 02-01 Part B Section 8 (Cylinder Management).

A.3.4.3 Safety Procedures to be followed at All Times

- All Manifold Rooms, Medical Gas Cylinder Storage Rooms and Plant Rooms containing MGPS equipment are to be kept locked and access is restricted to authorised personnel only
- Medical Gas Cylinder stores and Manifold Rooms must not be used as general storage areas and must be kept clean, dry and free from flammable materials and other rubbish
- Full and empty cylinders must be separated and identified
- Cylinders should be used in rotation according to the date, oldest first
- Only suitably trained staff may handle cylinders or change Manifold Cylinders
- Suitable PPE and cylinder trolleys must be used when handling cylinders
- Only Medical or Clinical Gas Cylinders may be stored within the Medical Gas Cylinder Store. Other gases such as pub gas, welding gas and balloon gas etc. must not enter the medical Gas Cylinder Store
A.3.5 Storage of Cryogenic Gases (Liquid Oxygen and Liquid Nitrogen)

Liquid Oxygen is stored in two Vacuum Insulated Evaporators (VIE) housed in a dedicated external enclosure in the West End Car Park. They are used as the primary and secondary sources of supply for the Oxygen across the entire site.

They are the property of the company who supply the bulk liquid oxygen and as such are maintained by them and leased by the Trust. The AP MGPS inspects the vessels and the compound weekly and changes the main evaporator duty at the same time to prevent the unit form becoming ice covered.

Liquid Nitrogen is stored in a Dewar for decanting into applicators in OPD. Storage areas for large volumes of liquid gases stored in Dewar’s, must have ventilation and a low Oxygen monitor to warn staff of the hazards of low oxygen levels and potential leaks.

Liquid Nitrogen and other Cryogenic Gases are hazardous due to the storage of extremely cold substances (stored at -196 Deg C) and hazards from burns. Although Nitrogen is non toxic and inert, it acts as an asphyxiant and if accidentally released it will rapidly displace oxygen in air to levels below that required to support life.

Handling of liquid Nitrogen is only to be done by competent persons who understand the hazards and have the ability, knowledge, skills and equipment to handle the substance safely.

See the Hazardous Substances Safety Policy for more information on storage and handling of liquid nitrogen.

A.3.6 Responding to Medical Gas Incidents

Actions will be required to be followed in the event of medical gas incidents; such as:

- Severe cylinder leak, severe medical gas terminal leak, severe damage to medical gas supply line including AVSUs.
- Fire or severe damage to buildings housing medical gas cylinders or plant.

A.3.6.1 Severe Medical Gas Escape

- **In Ward/Department Area** – In the event of a major medical incident or leak the immediate area of the leak should be evacuated. A distance of at least one closed Fire Door should be maintained between staff or patients and the leak.

- Staff should dial 2222 and inform the switchboard of the nature of the incident. Switchboard who will invoke the emergency procedure (refer to Appendix 8). Where possible windows should be opened to improve ventilation and consideration given to isolation of MGPS supply via the AVSUs situated at ward entrances; this action requires careful consideration as life may be endangered by isolation of supplies and advice from the AP should be sought if at all possible. The operation of light switches and other electrical equipment should be avoided so as to minimise risk of fire.

Duty Porter/Pharmacist must be be contacted for extra cylinders if they are required.
• **In All Other Areas** – When such a severe leak is identified the person detecting the leak should report the location and situation immediately to Switchboard, Ext 2222, who will invoke the emergency procedure (refer to Appendix 8).

Persons detecting leaks should not remain in the vicinity due to the possibility of oxygen saturation/asphyxiation/explosion/fire etc.

In either case the Clinical Site Manager and Facilities ‘On Call’ Engineer are to assess the situation and deal with emergency priorities, with the saving of life being the highest priority.

**A.3.6.2 Fire or Damage to Buildings**

In the event of fire or serious damage to cylinders or buildings housing cylinders and MGPS e.g. Main Medical Gas Cylinder Store or manifold rooms, the emergency services must be called. This should be initiated by calling the hospital emergency number 2222 reporting the location and situation immediately to Switchboard, who will invoke the emergency procedure (refer to Appendix 8).

**A.3.7 Contract Delivery & Supply of Medical Gas Cylinders**

As medical gases are Prescription Only Medicines (POMs), the only department that can order medical gas supplies is the pharmacy department.

Supplies of medical gas cylinders are ordered on a weekly basis by the pharmacy department, based on the number of cylinders returned during the previous collection.

Pharmacy will manage gas supplies in line with clinical requirements but ensuring that prudent stocks are maintained to meet clinical need whilst keeping the lowest level of cylinders for sensible storage and health and safety reasons.

**A.3.7.1 Main Supply Manifold (MSM)**

Main Supply Manifolds are of an automatic changeover type and will automatically change to a new bank of cylinders when the current ones become empty.

The minimum number of spare cylinders held in the manifold room should be sufficient to replenish one complete bank of the Main Supply Manifold. Empty cylinders must be replaced as soon as possible. All cylinders must be secured correctly and replaced only by suitably trained staff (Porters or CP MGPS).

Details of cylinder changes should be recorded in the manifold’s Cylinder Change Log Book.
A.3.7.2 Emergency Reserve Manifold (ERM)

If the line pressure drops below a preset point the ERM will automatically take over supply from the MSM and warning alarms will sound to indicate that the ERM is online and line pressure is low. The N₂O, MA4/SA7, and O₂+N₂O ERM are manually operated and therefore must be manually changed to the second cylinder bank when the current one is empty. The O₂ ERM is a fully automatic changeover type.

In the event of an Emergency Reserve Manifold (ERM) being brought into service, additional or replacement cylinders will be ordered by Pharmacy on instruction from the facilities department AP/CP as required.

Operation and monitoring of back up manifolds and replacement of cylinders will be performed by the Facilities Maintenance Department Competent Person (MGPS).

Cylinder stocks/pressures will be checked by the AP or CP (MGPS) hourly or more frequently if required. Details of the emergency situation should be recorded in the plant history record by AP (MGPS) or in the Medical Gas Pipeline Systems Log Book as appropriate.

A.3.7.3 Audit of Medical Gas Cylinders

An annual audit of all cylinders will be carried out by the account manager from BOC. The results of the audit will be to identify quantity and types of cylinders against stock levels held. The findings of any audits are to be reviewed at the subsequent medical gases committee meeting for review and action as necessary.

A.3.8 Transporting Medical Gases

Medical gases must not be transported in vehicles without first carrying out a risk assessment of the process. Guidance for movement of medical gases by couriers contracted by the Trust can be found in the Couriers Guidelines; this is available through the intranet under Information for Staff/Occupational Health & Safety or; refer to the Health & Safety Manager for advice. ADR and Carriage of Dangerous Goods regulations may apply to the transport of gas cylinders by vehicle.

A.3.9 Identification and Reporting of Faulty/Damaged Cylinders and Valves

Faulty or Damaged cylinders are to be reported internally to Pharmacy and to the supplier through formal reporting systems. Refer to Appendix 9. Cylinders must be clearly labelled and placed in the Quarantine area of the Main Medical gas Cylinder Store.
### CYLINDER STORAGE LOCATION

<table>
<thead>
<tr>
<th>Plant Room No.</th>
<th>Location</th>
<th>Area Served</th>
<th>Gases</th>
<th>Capacity</th>
<th>Racking Type</th>
<th>Key held by</th>
</tr>
</thead>
</table>
| Main Medical Gas Cylinder Store | Loading Bay Level 2 | Site Wide | All types | Multiple Cylinder sizes and gases Dedicated bays and racking Segregated returns and Quarantine area | Metal         | • Porters  
• Workshop  
• Estates  
• Reception |
| Nitrous Oxide MSM | Loading Bay Level 2 | Site Wide | N₂O ONLY | Main Manifold  
• 2x6 G  
ERM  
• 2x2 G  
• 6xG Spare | Wall Brackets | • Porters  
• Workshop  
• Estates  
• Reception |
| Entonox© MSM | External Access YWH Service Road Side | YWH | N₂O+O₂ 50/50 ONLY | Main Manifold  
• 2x4 G  
ERM  
• 2x2 G  
• 16xG Spare  
• Multiple portable cylinders | Metal         | • Porters  
• Workshop  
• Estates  
• Reception |

All Manifold Rooms and Plant Rooms containing MGPS equipment are to be kept locked and access is restricted to authorised personnel only.
Appendix 5 – Medical Gas Policy

**MANIFOLD ROOM LOCATIONS**

<table>
<thead>
<tr>
<th>Gas</th>
<th>Location</th>
<th>Installation Manifold Detail</th>
<th>Key held by</th>
</tr>
</thead>
</table>
| Nitrous Oxide| ZPL44 External Loading Bay Level 2 YDH | Main Manifold  ●  2x6 G  
ERM  ●  2x2 G                                                                 |  ●  Porters  
●  Workshop  
●  Estates  
●  Reception |
| Medical Air  | ZPL18 Level 2 Lift Lobby YDH       | ERM Only  ●  2x4 J  
700kPa and 400kPa via pressure reduction                                                       |  ●  Workshop  
●  Estates |
| Entonox®     | ZPL36 External Ground Floor YWH Service Road | Main Manifold  ●  2x4 G  
ERM  ●  2x2 G                                                                 |  ●  Porters  
●  Workshop  
●  Estates  
●  Reception |
| Oxygen       | ZPL45 External Level 2 YDH Restaurant Patio Galvanised Steel Enclosure | ERM Only  ●  2x5 J                                                                 |  ●  Med Gas Key T161  
●  Porters |

All Manifold Rooms and Plant Rooms containing MGPS equipment are to be kept locked and access is restricted to authorised personnel only
Appendix 6 – Medical Gas Policy

LOCATIONS OF CENTRAL VACUUM AND COMPRESSED AIR PLANT MA4/SA7

<table>
<thead>
<tr>
<th>System</th>
<th>Configuration</th>
<th>Location</th>
<th>Make</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vacuum</td>
<td>Triplex pump MMV 1800 S</td>
<td>ZPL18 Level 2 Lift Lobby YDH</td>
<td>Millennium Medical Products</td>
</tr>
<tr>
<td>Compressed Air</td>
<td>Duplex compressor MMA 1570 S</td>
<td>ZPL18 Level 2 Lift Lobby YDH</td>
<td>Millennium Medical Products</td>
</tr>
</tbody>
</table>

All Manifold Rooms and Plant Rooms containing MGPS equipment are to be kept locked and access is restricted to authorised personnel only.
### Appendix 7 – Medical Gas Policy

**LOCATIONS OF ANAESTHETIC GAS SCAVENGING SYSTEMS**

<table>
<thead>
<tr>
<th>Department</th>
<th>Configuration</th>
<th>Location</th>
<th>Make</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main Theatre</td>
<td>Simplex</td>
<td>Cupboard in rear dirty corridor next to Theatre 4</td>
<td>SKG 275</td>
</tr>
<tr>
<td>Day Theatres/ A&amp;E</td>
<td>Duplex</td>
<td>ZPL 14 (level 2)</td>
<td>Becker SV8.400</td>
</tr>
<tr>
<td>Women’s Unit Delivery Theatre</td>
<td>Duplex</td>
<td>ZPL 40 (level 3 Women’s Unit)</td>
<td>Becker SV7.190/2</td>
</tr>
<tr>
<td>Gynae Theatre</td>
<td>Simplex</td>
<td>ZPL34 (Ground Floor front external plant room)</td>
<td>SKG 250</td>
</tr>
<tr>
<td>Radiology</td>
<td>Simplex</td>
<td>Plant located on roof level above, access through Med Electronics office</td>
<td>SKG 275</td>
</tr>
<tr>
<td>Medical Electronics</td>
<td>Simplex</td>
<td>Plant located on roof external to department</td>
<td>Becker SV 5190</td>
</tr>
</tbody>
</table>

All Manifold Rooms and Plant Rooms containing MGPS equipment are to be kept locked and access is restricted to authorised personnel only.
Appendix 8 – Medical Gas Policy

SWITCHBOARD PROCEDURE FOR MEDICAL GAS INCIDENTS

In the event of Switchboard being alerted to medical gas incidents the following procedures apply:

- **Emergency:**
  
  **Major Leak OR Equipment Failure** - Contact Site Manager and Facilities Duty Engineer – 4444 during normal hours and on call engineer out of hours

SWITCHBOARD PROCEDURE MEDICAL GAS ALARMS

<table>
<thead>
<tr>
<th>ALARM TYPE</th>
<th>WHO TO INFORM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change Cylinders</td>
<td>Duty Porter – Tel: 4321</td>
</tr>
<tr>
<td>Change Cylinders Immediately</td>
<td>Duty Porter – Tel: 4321 and Duty Engineer – 4444 during normal hours and on call engineer out of hours</td>
</tr>
<tr>
<td>Refill Liquid</td>
<td>Duty Porter – Tel: 4321 and Duty Engineer – 4444 during normal hours and on call engineer out of hours</td>
</tr>
<tr>
<td>Refill Liquid Immediately</td>
<td>Contact Site Manager and Duty Engineer – 4444 during normal hours and on call engineer out of hours</td>
</tr>
<tr>
<td>Plant Emergency</td>
<td></td>
</tr>
<tr>
<td>Plant Fault</td>
<td></td>
</tr>
<tr>
<td>Pressure Fault</td>
<td></td>
</tr>
</tbody>
</table>
PROCEDURES FOR HANDLING AND-changing Cylinders

In order to comply with current manual handling regulations, when handling medical gas cylinders, the following procedures taken from BOC approved training should followed:

1. Fire and Explosion Risk

Some materials which do not normally burn in air will burn in an atmosphere of oxygen, nitrous oxide or gas mixtures containing more than 21% oxygen. These gases do not burn themselves, but strongly support combustion, and therefore special attention should be directed to the hazards associated with smoking and naked flames. When using medical gas cylinders it is most important that no part of the cylinder valve or equipment is either lubricated or contaminated with oil or grease. This is due to the risk of spontaneous combustion that can occur with high pressure gases in the presence of hydrocarbons. Special care is needed with the use of hand creams and alcohol gel as these could provide sufficient contamination to the medical cylinder valve surface when handling the cylinder to cause an ignition when the valve is turned on.

2. Types of Cylinders and Sizes

Cylinders are available in many sizes including CD, HX, C, D, E, F, G, and J (See attachment or refer to BOC)

3. Cylinder Colouring

- Oxygen - Black Cylinder/White Top
- Nitrous Oxide - Blue Cylinder/Blue Top
- Entonox - Blue Cylinder/Blue and White Top
- Air - Green Cylinder/Black and White Top
- Carbon Dioxide - Green Cylinder/Green Top

4. Identifying BOC Cylinders

4.1 Labelling

BOC produce a range of cylinders fitted with an integral valve that combines the function of the normal valve fitted to the cylinder and a regulator in a single integrated unit. There are several different versions of integral valves fitted to cylinders. All valves have a simple handwheel to control the supply of gas and a 'live' contents gauge so that the contents of the cylinder can be determined without turning on the valve.

Dependant on their use, the integral valve is either fitted with a standard British Standard Schrader outlet (compatible with those used on medical pipeline systems) or a clickstop flowmeter with fir tree outlet to provide set flowrates. In some cases the valve will be
fitted with both options. These cylinders obviate the need for separate medical gas regulators and allow gas to be quickly administered direct to the patient.

In accordance with EC labelling regulations (Pharmaceutical Products) and the Chemicals (Hazard Information and Packaging) Regulations, 1993, the cylinder label includes the following details.

- Product name, chemical symbol and pharmaceutical form of the product
- Product specification
- Hazard warning diamonds and UNSI number
- Safety phrases
- Marketing Authorisation number
- Cylinder size code
- Nominal cylinder contents in litres
- Maximum cylinder pressure in bars
- Product shelf life and expiry date
- Directions for use
- Storage and handling precautions
- Product and cylinder size bar code
- Batch label

On the label, reference is made to the Medical Gas Safety Data Sheet, which details the recommended clinical indications, routes of administration, dosage schedules and contra-indications.

The cylinder filling date may be identified from the "Batch label" fitted to every medical cylinder. This label identifies:

- The batch number which includes the filling branch code
- The filling date
- The expiry date
- The cylinder code and product

5. **Fitting Valves and Manifolds**

There are five basic valve types: bull-nose, handwheel, star, pin-index and integral valves. The latter may be configured as either top/side spindle or knurledknob (top) operated.
5.1 Bullnose Valves

Bull-nose valves are used on larger cylinders: for example F, G and J. Gas connection is made between the spherical end (bull-nose) of the pipeline or regulator and the conical seat of the valve outlet. The seal is made by a special O-ring on the bull-nose (pictured).

**Note:** It should be noted that this valve outlet is not unique to the gas. Additional care must therefore be taken to ensure the correct cylinder is connected to the equipment.

5.2 Handwheel Valve

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

5.3 Star Valve

The star valve combines a regulator and valve as a single unit. They are operated by a single handwheel and are fitted with a variety of outlets and, in the latest cylinder types, a differently formed handwheel.

A range of output flow rates is also available. They are fitted to some sizes of medical air and oxygen cylinders. The latest, lightweight cylinders from gas suppliers are fitted with a combined valve (similar in construction to the star valve), regulator and flow control device.

**Note:** The cylinders will become available in a range of sizes during the life of the Health Technical Memorandum 02-01, Part B). These are C/D Type cylinders.
5.4 Pin Index

Pin-index valve  Side spindle Pin-index valve  Bodox Seal

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

5.4.1 Pin Index Types

Illustration of a Pin-index valve pin position

The pin-index valve system of non-interchangeable valves has been designed to ensure that the correct gas is filled into the cylinder and that the cylinder can only be connected to the correct equipment. The hole positions on the cylinder valve correspond with the pins fitted to the yoke attached to the equipment. The pin positions for each medical gas is unique and conforms to the ISO 407 specification (formerly BS 1319). If an attempt is made to fit the wrong gas cylinder to the yoke, the pins will not locate and a gas tight seal cannot be made.

5.4.2 Fitting Pin Indexes

When fitting a new cylinder to a yoke, inspect the Bodok sealing washer (BOC part No. 888823) to ensure that it is in good condition and free from contamination. Replace the seal if there is any doubt about its condition.

The pin index valves fitted to C, D and E size cylinders are fitted with a simple thumbwheel to turn the gas on and off. Do not remove the seal fitted to the valve until the cylinder is required for use and exercise care when handling used cylinders to ensure that the thumbwheel is not inadvertently turned on. BOC has developed a simple carrying grip for handling these pin index cylinders (BOC Part No. 888944). J size medical oxygen and medical air (normally used on manifolds) and to F and G size.
Entonox cylinders are fitted with side spindle pin index valves. These valves have the same pin locations as the smaller cylinders and are operated by a standard square section valve key (BOC Part No. 888829).

Should you require new Bodok sealing washers or carrying grips for pin index valves please contact the AP MGPS on 4444

5.5 Integral Valve

An integral valve combines the function of the normal valve fitted to the cylinder and a regulator in a single integrated unit. There are several different versions of integral valves fitted to cylinders. All valves have a simple handwheel to control the supply of gas and a 'live' contents gauge so that the contents of the cylinder can be determined without turning on the valve.

6. Medical Gas Flowmeters

Care should be taken to ensure the correct flowmeter is fitted to the gas regulator. Not all medical gas flowmeters have gas specific fittings. For example Medical Oxygen and Medical Air flowmeters normally have differently calibrated flow-tubes, but the same fitting onto the regulator. Entonox© flowmeters have a gas specific fitting for each of the regulators and can not be connected to the wrong cylinder.

7. Use of Cylinders

7.1 Before Use

The following guidelines should be followed:

- The correct cylinder is selected for the application and where a regulator is required, check that the cylinder product and filling pressure are compatible with the selected regulator

- Only correctly designed valve spindle keys are used to open the cylinder valve

- Cylinders containing liquefiable gases (i.e. nitrous oxide and carbon dioxide) are used upright with the valve uppermost (unless the attached equipment is specially designed to withdraw liquid from the cylinder)

- The cylinder contents are checked to ensure that sufficient gas is available for the required use
• For permanent gas cylinders (i.e. oxygen, air, Entonox, helium and gas mixtures) contents may be determined by reading the gas regulator pressure gauge

• For liquefiable gas cylinders, contents may only be determined by weighing the cylinder and deducting the cylinder tare weight (stamped on the cylinder shoulder)

• Medical Gas Cylinder are being used for a medical (or clinical) application. Medical oxygen cylinders must never be used for industrial applications or in place of compressed air, for example for driving air tools.

![No oil or grease][No smoking][No naked flames]

Select the cylinder with the oldest filling date, provided that is within the expiry date specified on the batch label. The cylinder should be prepared as follows:

• Remove the tamper evident seal by pulling the tear tag, removing plastic cover or seal, then discard

• Check that the cylinder valve outlet is clean. Do not use the cylinder where there is evidence of any contamination or if the tamper seals have already been removed or broken

• Check that the regulator or equipment to be attached to the cylinder is appropriate for the cylinder to be used

• Momentarily open the Cylinder valve to blow out any dust or foreign matter in the valve outlet. Ensure that the jet of gas is kept away from the operator's body

• Ensure that the connecting face of the yoke, manifold or regulator is clean and free from oil or grease. Oil or grease can spontaneously combust when exposed to high pressure gasses

• If any sealing faces are contaminated or dirty then seek advice from AP MGPS or refer to Pharmacy for heavy signs of contamination

• Check that the 'O' ring or sealing washer is in good condition. Replace if it shows any signs of wear or damage, but only with one of the correct type

• Attach the regulator, manifold tailpipe or yoke to the cylinder valve, using only reasonable force to tighten. Never use excessive force as this may damage the valve outlet threads
• Open the cylinder valve slowly with a standard valve key or with the handwheel. Fully open the valve and then close a quarter turn to enable subsequent users to distinguish between an open or closed valve

• Ensure a cylinder key is available at all times so that the cylinder may be isolated in an emergency

• Cylinders fitted to a manually operated ERM should be fitted so as to allow one bank of cylinders to remain isolated, and a suitable cylinder key MUST be available, preferably permanently attached to the manifold

• Ensure that the equipment operating instructions are available. Cylinders should be checked regularly whilst in use to ensure that they have sufficient contents and that leaks do not occur

• Detailed cylinder change instructions can be found in each MSM room and should be followed carefully. If in doubt please call 4444 for more information from AP MGPS

Safety Note: If a cylinder is leaking or damaged and cannot be turned off, warn staff in the vicinity and ventilate the area if possible. Patients and staff should ensure that they maintain at least one Fire Door separation from a serious leak. Contact Site Manager and Duty Engineer – 4444 during normal hours and on call engineer out of hours

7.2 After Use

After use ensure that:

• The cylinder valve is closed immediately, using a correctly designed cylinder valve key or handwheel with moderate force only

• The pressure in the tail pipe or regulating equipment is released before removal

• On cylinders fitted with bullnose valves, the valve outlet protection cap is replaced to protect the valve outlet from contamination

• Empty cylinders must not be vented and all cylinder valves should be closed after use

• All empty cylinders should be returned to the Medical gas Cylinder Store Empty Cylinder Section and will be collected by BOC
7.3 Leaks

Medical gas cylinders are filled to a high pressure and gas leaks may occur when equipment is connected to the cylinder. These leaks may be indicated by a hissing sound. Having connected equipment to the cylinder check for leaks by carefully opening the cylinder valve;

- Close the cylinder valve. A leak will be identified by any fall in the regulator pressure gauge reading if a leak has been identified
- Close the cylinder valve and release any gas trapped between the cylinder valve and regulator by venting the system
- Remove the connected equipment and check the 'O' ring or Bodok seal for signs of wear
- Replace any worn O rings or Bodok seals ONLY with the correct items, never use rubber or PTFE tape/sealing compound
- Re-connect the equipment, using only moderate force and re-check for leaks

If any leak persists and cannot be rectified, under no circumstances attempt to use sealing or jointing compounds to cure the leak contact 4444 and report as a defect

8. Directions for Changing Manifold Cylinders

Ensure that there are sufficient replacement cylinders available before removing any empty cylinder from the manifold and NEVER leave a manifold without cylinders attached. Detailed instructions are available in each Manifold Room Log Book:

- Only suitably trained staff should attempt to change cylinders, if in doubt seek advice form the AP MGPS by calling 4444
- Ensure that only the correct gas and cylinder type are fitted to a manifold, if in doubt seek advice form the AP MGPS by calling 4444
- Remove the plastic seal and with the cylinder in the upright position, partially open the valve momentarily to blow away any grit or foreign matter that may have accumulated in the valve gas outlet. Ensure that no part of the body is in line with the valve outlet, the valve must not be held during this operation
- Check the condition of the bodok seal in the cylinder yoke and change if necessary taking care not to expose the surfaces to grease or oil
• Connect the cylinder to the manifold and tighten firmly by hand only taking care not to put undue strain on the manifold tail pipe
• Ensure that there are no leaks using the leak detector spray
• Press the reset button on the manifold (if fitted)
• Complete the cylinder change log book
• Failure to follow these guidelines could endanger a patient’s life

Note: If a problem or fault is suspected advise the Pharmacy Department or AP MGPS immediately

• Wear safety shoes and gloves when moving cylinders
• Large cylinders should only be moved with a trolley designed appropriately for the size of cylinder
• Never leave cylinders free standing
• Never roll cylinders along the ground
• Never churn large nitrous oxide or carbon dioxide cylinders fitted with hand wheel valves as the valve may open accidentally
• Do not remove tamper seals, caps or covers from cylinders until they are put into use
• Cylinders should be handled with care, never knocked violently or allowed to fall over
• Never paint or obscure any markings or labels on cylinders
• Never apply any unauthorised labels or markings to cylinders
9. **Handling Medical Gas Cylinders**

The following guidelines apply:

- Ensure that no part of the cylinder valve or equipment is contaminated with oil, jointing compound or thread tape. If there is any sign of contamination or damage the cylinder must be isolated and returned to BOC as soon as possible (See cylinder fault reporting).

- Do not change cylinders with hands contaminated with alcohol gel, grease or other lubricant.

- Ensure that there is no smoking or naked lights.

- Use only new and sealed cylinders, any cylinder that has already been used should be placed in the empty cylinder area.

- Check the expiry date on the cylinder collar or label and ensure that the oldest cylinders are used first.

- Ensure that the cylinder has a full, complete product label identifying the product and gas pressure inside the cylinder.

- Select the correct cylinder for the application.

- Ensure that cylinders are located in a safe position and secured so they can’t fall over.

10. **Handling Safety**

In order to comply with current manual handling regulations the following precautions should be followed:

- Wear safety shoes and gloves when moving cylinders.

- Large cylinders should only be moved with a trolley designed for the purpose.

- Handle cylinders with care, they are heavy and contain compressed or liquefied gas.

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

- Do not remove seals or covers from new cylinders until they are ready to be used.

- Do not place cylinders in an area where they will become damaged or which may block exits or walkways.

- Never paint or obscure any markings or labels on cylinders.
• Never apply any unauthorised labels or markings to cylinders, unless advised by BOC to identify faulty or incident cylinders

11. **Faulty Cylinders**

Faulty Cylinders should be clearly labelled and a bag or envelope placed over the top to prevent further use and identify as faulty:

• Complete a label with the following details; Nature of Fault i.e. leaking cylinder or wrong gas etc. Please also sign and print your name with the date and attach securely with tape or string to the defective cylinder

• Record the details of the defective cylinder for Pharmacy; Type, Size, details of fault, details of cylinder serial number, batch number and date etc.

• Attach label to cylinder and place in MGPS Main Cylinder Store in the Quarantine area

• Faulty cylinders are also referred to as *Incident Cylinders*

• Inform Pharmacy who will arrange collection as a defective cylinder
12. Incident Cylinders

A Cylinder described as an Incident Cylinder where there is a fault with the cylinder such as:

**Examples:**  
- Wrong gas in Cylinder compared to label or identification  
- Abnormal patient reaction to gas  
- Cylinder empty, but labelled or indicated full  
- Incorrect labelling  
- Shell damage  
- Serious valve leak

The Cylinder should be immediately removed from use, and labelled as an Incident Cylinder.

Follow the labelling procedure as described under Faulty Cylinders Appendix 11.

**Note:** In the case of a patient or safety incident the Chief Pharmacist will give consideration as to whether it should be reported to the Department of Health, and instigate a drug recall procedure.

In these situations the cylinder may need to be retained in the Quarantine area of the Medical gas Cylinder Store whilst the incident is investigated.

Please inform the AP MGPS if this should be the case.

**IF IN DOUBT, TAKE IT OUT OF USE**
# MEDICAL CYLINDER DATA

## Cylinder types

<table>
<thead>
<tr>
<th>Cylinder Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>Air</td>
</tr>
<tr>
<td>A2</td>
<td>Oxygen</td>
</tr>
<tr>
<td>A3</td>
<td>Nitrous Oxide</td>
</tr>
<tr>
<td>A4</td>
<td>Entonox (60% N2O/40% O2)</td>
</tr>
<tr>
<td>A5</td>
<td>Helium</td>
</tr>
<tr>
<td>A6</td>
<td>Carbon Dioxide</td>
</tr>
<tr>
<td>A7</td>
<td>Oxygen+C02</td>
</tr>
<tr>
<td>A8</td>
<td>Helium+Oxygen Mixture (99% He/1% O2)</td>
</tr>
<tr>
<td>A9</td>
<td>Lunge Function Mixtures Type 1-4</td>
</tr>
<tr>
<td>A10</td>
<td>Carbon Dioxide+Oxygen</td>
</tr>
<tr>
<td>A11</td>
<td>Medical Gas Mixture (5% CO2, 95% Air)</td>
</tr>
<tr>
<td>A12</td>
<td>Medical Gas Mixture (5% CO2, 95% N2)</td>
</tr>
</tbody>
</table>

## Pin Index Valves

<table>
<thead>
<tr>
<th>Pin Index</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pin 1</td>
<td>Single</td>
</tr>
<tr>
<td>Pin 2</td>
<td>Double</td>
</tr>
<tr>
<td>Pin 3</td>
<td>Triple</td>
</tr>
</tbody>
</table>

## Valve Types

<table>
<thead>
<tr>
<th>Valve Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valve 1</td>
<td>Simple</td>
</tr>
<tr>
<td>Valve 2</td>
<td>Complex</td>
</tr>
</tbody>
</table>

## Water Capacity (mL)

<table>
<thead>
<tr>
<th>Cylinder Code</th>
<th>Water Capacity (mL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>1.0</td>
</tr>
<tr>
<td>A2</td>
<td>2.0</td>
</tr>
<tr>
<td>A3</td>
<td>3.0</td>
</tr>
<tr>
<td>A4</td>
<td>4.0</td>
</tr>
<tr>
<td>A5</td>
<td>5.0</td>
</tr>
<tr>
<td>A6</td>
<td>6.0</td>
</tr>
<tr>
<td>A7</td>
<td>7.0</td>
</tr>
<tr>
<td>A8</td>
<td>8.0</td>
</tr>
<tr>
<td>A9</td>
<td>9.0</td>
</tr>
<tr>
<td>A10</td>
<td>10.0</td>
</tr>
<tr>
<td>A11</td>
<td>11.0</td>
</tr>
<tr>
<td>A12</td>
<td>12.0</td>
</tr>
</tbody>
</table>

## Notes

- The table above is a general guideline for medical gas cylinder types.
- Specific gas mixtures may vary depending on the manufacturer.
- Always consult the manufacturer's specifications for detailed information.
- The water capacity values are approximate and may vary by manufacturer.
Appendix 10 – Medical Gas Policy

PROCEDURES FOR ISSUING PERMIT TO WORK ON TRUST PREMISES AND LIST OF AUTHORISED PERSONS

All procedures will be in accordance with HTM 02-01 using pre-printed permits, available from HMSO, held by AP MGPS.

The roles of AP, CP, DNO, QC etc. as defined by HTM 02-01 may only be fulfilled by those persons suitably qualified and appointed by the Trust and may be subject to change.

A current list of these personnel and which sites their authority is valid on is available from the AP MGPS.
Appendix 11 – Medical Gas Policy

PROCEDURE FOR FILTER CHANGING ON VACUUM PLANT

Medical vacuum systems: bacteria filters
Standard operational procedure for filter changing
(HTM 02-01 Bio filter procedure)

Follow the procedures listed below
If you observe any suspicious contaminant, such as mucus or blood, stop work immediately and report the situation to the Authorised Person (MGPS). Biological contamination may appear crystalline or organic. Do not be deceived by appearance; treat all foreign material as a possible hazard.

- Do not commence any work on a vacuum system without a PTW issued by and guidance from the AP MGPS
- Do not eat or smoke when working on vacuum systems or components
- Inspect your hands carefully for cuts or abrasions before putting on waterproof gloves; do not attempt task with open wounds on hands
- Apply a waterproof dressing as necessary to effectively cover all lesions
- Wear the waterproof gloves provided and ensure that they remain intact throughout all work stages
- Wear standard-issue overalls and ensure that they remain fully buttoned
- Wear eye protection, the face mask and disposable plastic apron provided.
- Wear all protective clothing throughout all work stages
- Take care not to cut yourself
- If you do happen to cut yourself, carry out the following procedures:
  1. Remove glove
  2. Allow wound to bleed freely
  3. The contaminated area should be washed gently under running water and not scrubbed
  4. Seek medical advice on appropriate action immediately
  5. Inform the Authorised Person (MGPS) of the incident
  6. Complete an incident log

- Dispose of all removed infected material and oil in accordance with hospital procedures, for example sealed within a bag marked "contaminated" and entrusted to the hospital authorities for safe disposal
- Request guidance from the Authorised Person (MGPS) if in doubt
- Do not remove contaminated materials from site
- Do not dispose of potentially contaminated material in ordinary rubbish bins.
- Do not place contaminated tools or equipment into your toolbox
- Upon completion of work, remove any contaminated outer clothing and always wash your hands and any contaminated tools in an approved disinfectant; then rinse under running water
## Appendix 12 – Medical Gas Policy

### LIST OF CONTRACTORS FOR MAINTENANCE OF MPGS

<table>
<thead>
<tr>
<th>Company Name</th>
<th>Address</th>
<th>Telephone Numbers</th>
<th>Contact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Penlon</td>
<td>Abingdon Science park Barton Lane Abingdon Oxford, OX14 3PH</td>
<td>01235 547060</td>
<td>01235 547060</td>
</tr>
<tr>
<td>Medicare</td>
<td>19 Crane Way Woolsbridge Business Centre Three Legged Cross Dorset BH12 6FA</td>
<td>01202 828239</td>
<td>01202 828238</td>
</tr>
<tr>
<td>Memo</td>
<td>UBHT Bristol</td>
<td>0117 3422455</td>
<td>0117 3422455</td>
</tr>
</tbody>
</table>
Appendix 13 – Medical Gas Policy

MEDICAL ELECTRONICS PROCESS SHEET 44
REPAIRING MEDICAL GAS FLEXIBLE HOSES

<table>
<thead>
<tr>
<th>Medical Electronics Process Sheet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Process Ref: MEPS44</td>
</tr>
<tr>
<td>Type: Policy</td>
</tr>
<tr>
<td>Author: R Perkins</td>
</tr>
<tr>
<td>Date: 18/8/2009</td>
</tr>
<tr>
<td>Revision No:</td>
</tr>
<tr>
<td>Revision date:</td>
</tr>
</tbody>
</table>

Description: Repairing Medical Gas Flexible Hoses.

Note: Previously Medical Electronics “Policy for repairing Medical Gas Flexible Hoses” (1/1/1999, updated 10/12/2007)

References:
YDH NHS FT Medical Gases Policy
BS EN 739:1998 Low-pressure hose assemblies for use with medical gasses.
- EBME01H - O₂ (Oxygen) pipeline 4 yearly
- EBME02H - MA4 pipeline 4 yearly
- EBME03H - N₂O (Nitrous Oxide) pipeline 4 yearly
- EBME04H - Vacuum pipeline 4 yearly
- EBME06H - Vacuum extension box 4 yearly
- EBME07H - SA7 extension box 4 yearly
- EBME08H - MA4 extension box 4 yearly
- EBME09H - SA4 pipeline 4 yearly
- EBME10H - CO₂ (Carbon Dioxide) pipeline 4 yearly

It is the policy of Yeovil District Hospital NHS Trust that flexible hoses used to connect Electro-medical and mechanical-medical equipment to terminal units will be repaired in the Trust.

Only the Medical Electronics Department are authorised to repair flexible hoses.

All flexible hose assemblies shall be repaired to their existing length to comply with the flow and pressure drop requirements of BS EN 739:1998 1998 - Low-pressure hose assemblies for use with medical gases.

All necessary test equipment shall be used and maintained in good condition and no personnel will be allowed to repair a flexible hose with out relevant training.

A register of personnel competent to repair flexible hoses will be maintained by the Medical Services Officer.

All flexible hoses will be repaired with reference to the work sheets above.

Flexible hoses will only be repaired in the Medical Electronics laboratory.
Each flexible hose will have an individual asset number to enable it to be identified.

A record of repair shall be kept maintained by means of the Trust’s Equipment Management System.

Flexible hoses will be kept in the department where their use is intended.

All hoses constructed for use as multipurpose test hoses must be made of RED coloured material and kept secured by an authorised person.

All materials used to repair flexible hoses will comply with the requirements of BS EN 739:1998 - Low-pressure hose assemblies for use with medical gases.

Only materials detailed in the Approved Component List may be used to repair flexible hoses. Any materials not on the approved component list will be subject to a separate risk assessment.

All wide bore ferrules (part number 8570 -30) will be stamped with a 3/16 letter “X”, to indicate that the flexible hose has been repaired by Medical Electronics. They will be stamped before entering the stock system.

In order to avoid contamination all materials used to repair flexible hoses will be stored in a clean area.

The crimping tool will be kept secure in the Medical Electronics laboratory to prevent unauthorised use.

A Tug Test Hose will be manufactured and tested six monthly referring to the following work sheet (copy attached). The results of the tests will be recorded on the Trust’s Equipment Management System EBME12D -Six Monthly Tug Test Hose.

All tests leakage and flow tests will be carried out using Medical Air only.

Vacuum hoses will be subject to the same test as 400 kPa medical gas flexible hoses.

<table>
<thead>
<tr>
<th>Date</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>13/5/99 -</td>
<td>Mr. A Read</td>
</tr>
<tr>
<td>Refresher</td>
<td></td>
</tr>
<tr>
<td>training.</td>
<td></td>
</tr>
<tr>
<td>13/5/99</td>
<td>Mr. J Cross</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>13/5/99</td>
<td>Mr. R Perkins</td>
</tr>
<tr>
<td></td>
<td>Mr. S Shaik</td>
</tr>
<tr>
<td></td>
<td>Mr. W Whittlessay</td>
</tr>
<tr>
<td></td>
<td>Mr J Bull</td>
</tr>
<tr>
<td></td>
<td>Mr A Lim</td>
</tr>
</tbody>
</table>
Medical Gas flexible hose Component List

All components for Medical Gas Flexible Hoses will be supplied by:

Therapy Equipment Ltd,
Unit 1,
Cranbourne Avenue,
Cranbourne Industrial Estate,
Potters Bar,
Herts,
EN6 3JN

Telephone: 01707 652270
Fax: 01707 563622

Component Details

<table>
<thead>
<tr>
<th>Component ID</th>
<th>Description</th>
<th>Gas/Chemical</th>
</tr>
</thead>
<tbody>
<tr>
<td>8600</td>
<td>NIST Nut and Nipple (Pipeline) - O₂ - Oxygen</td>
<td></td>
</tr>
<tr>
<td>8601</td>
<td>NIST Nut and Nipple (Pipeline) - MA4 - 4 Bar Air</td>
<td></td>
</tr>
<tr>
<td>8602</td>
<td>NIST Nut and Nipple (Pipeline) - SA7 - 7 Bar Air</td>
<td></td>
</tr>
<tr>
<td>8603</td>
<td>NIST Nut and Nipple (Pipeline) - Vacuum</td>
<td></td>
</tr>
<tr>
<td>8604</td>
<td>NIST Nut and Nipple (Pipeline) - N₂O – Nitrous Oxide</td>
<td></td>
</tr>
<tr>
<td>8510</td>
<td>Probe Indirect - O₂ - Oxygen</td>
<td></td>
</tr>
<tr>
<td>8511</td>
<td>Indirect Probe - MA4 - 4 Bar Air</td>
<td></td>
</tr>
<tr>
<td>8512</td>
<td>Indirect Probe - SA7 - 7 Bar Air</td>
<td></td>
</tr>
<tr>
<td>8513</td>
<td>Indirect Probe - Vacuum</td>
<td></td>
</tr>
<tr>
<td>8514</td>
<td>Indirect Probe - N₂O – Nitrous Oxide</td>
<td></td>
</tr>
<tr>
<td>8515</td>
<td>Indirect Probe - N₂O + O₂ - Entonox© 50/50</td>
<td></td>
</tr>
<tr>
<td>8700</td>
<td>High Pressure Anti static Pipeline Hose - O₂ - Oxygen (White)</td>
<td></td>
</tr>
<tr>
<td>8701</td>
<td>High Pressure Anti static Pipeline Hose - Vacuum (Yellow)</td>
<td></td>
</tr>
<tr>
<td>8702</td>
<td>High Pressure Anti static Pipeline Hose - Air (Blue)</td>
<td></td>
</tr>
<tr>
<td>8703</td>
<td>High Pressure Anti static Pipeline Hose - N₂O - Nitrous Oxide (Blue)</td>
<td></td>
</tr>
<tr>
<td>8706</td>
<td>High Pressure Anti static Pipeline Hose - N₂O + O₂ - Entonox© (Blue/white)</td>
<td></td>
</tr>
<tr>
<td>8750-20</td>
<td>Heat Shrink Hose Sleeving Printed - O₂</td>
<td></td>
</tr>
<tr>
<td>8750-21</td>
<td>Heat Shrink Hose Sleeving Printed - MA4</td>
<td></td>
</tr>
<tr>
<td>8750-22</td>
<td>Heat Shrink Hose Sleeving Printed - VAC</td>
<td></td>
</tr>
<tr>
<td>8750-23</td>
<td>Heat Shrink Hose Sleeving Printed - N₂O</td>
<td></td>
</tr>
<tr>
<td>8750-24</td>
<td>Heat Shrink Hose Sleeving Printed - MA7</td>
<td></td>
</tr>
<tr>
<td>8750-25</td>
<td>Heat Shrink Hose Sleeving Printed - N₂O + O₂ - Entonox© 50/50</td>
<td></td>
</tr>
<tr>
<td>8750-30</td>
<td>Wide Bore Ferrule (Marked in house with the letter “X” with a 3/16 Stamp)</td>
<td></td>
</tr>
</tbody>
</table>

Leakage Test Details.

BS EN 739:1988 Low-pressure hose assemblies for use with medical gasses:

5.4.11 Leakage

5.4.11.1 The leakage from the hose assembly shall not exceed 0.592 ml/min (0.06 kPa l/min) at the following test pressures

a) For hoses for compressed medical gasses: 1400 kPa
b) For hoses for vacuum: 500 kPa

5.4.11.2
If the outlet connector includes a check valve, the check valve shall not leak more than 0.296 ml/min (0.03 kPa l/min) The test for leakage is given in 6.3.

6.3 Test Method for leakage.
If the outlet connector is not provided with a check valve, apply a blank connector to the outlet connector. Connect the inlet end of the hose assembly to the gas supply and apply the test pressures specified in 5.4.11 for a period of 60 s. Shut off the gas supply. Measure the leakage or the rate of pressure loss.

NOTE:
In order to simplify the testing procedures, vacuum hoses will be tested to the same specification as for hoses for compressed medical gasses. This will be considered acceptable as it exceeds the requirements of BS EN 739:1988. Because of the difficulty in measuring the small amounts detailed as acceptable leaks in 5.4.11, all hoses will be tested for zero leakage. This will be considered acceptable as it exceeds the requirements of BS EN 739:1988.

Flow and pressure drop Test Details

BS EN 739:1988 Low-pressure hose assemblies for use with medical gasses:
5.4.12 Flow and pressure drop.

The pressure drop across the hose assembly at the test pressure and test flow shall not exceed the following values:

a) For compressed medical gasses: 25 kPa at a test pressure at 320 kPa and a test flow of 60 l/min, and 80 kPa at a test pressure of 320 kPa and a test flow of 200 l/min;

b) For air and nitrogen for driving surgical tools: 80 kPa at a test pressure of 640 kPa and a test flow of 300 l/min;

c) For vacuum: 20 kPa at a test pressure of 40 kPa absolute pressure and a test flow of 40 l/min

The test pressure drop is given in 6.6

6.2 Test method for pressure drop
Maintain the hose assembly in a straight configuration, not coiled or kinked. Apply the test gas and the test pressure at the inlet connector. Increase the flow until the test flow is attained and measure the pressure drop across the assembly. Test pressures and test flows are specified in 5.4.12. In one end of the hose assembly is provided with a check valve; maintain this in the open position by the appropriate gas-specific connector.

NOTE:
In order to simplify the testing procedures, vacuum hoses will be tested to the same specification as for hoses for compressed medical gasses. This will be considered acceptable as it exceeds the requirements of BS EN 739:1988.
**Annex A – Equality Impact Assessment Tool**

To be completed and attached to any procedural document when submitted to the appropriate committee for consideration and approval.

Name of Document: **Medical Gas Policy**

<table>
<thead>
<tr>
<th></th>
<th>Does the policy/guidance affect one group less or more favourably than another on the basis of:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Race</td>
</tr>
<tr>
<td></td>
<td>Ethnic origins (including gypsies and travellers)</td>
</tr>
<tr>
<td></td>
<td>Nationality</td>
</tr>
<tr>
<td></td>
<td>Gender</td>
</tr>
<tr>
<td></td>
<td>Culture</td>
</tr>
<tr>
<td></td>
<td>Religion or belief</td>
</tr>
<tr>
<td></td>
<td>Sexual orientation including lesbian, gay and bisexual people</td>
</tr>
<tr>
<td></td>
<td>Age</td>
</tr>
</tbody>
</table>

2. Is there any evidence that some groups are affected differently?

   None

3. If you have identified potential discrimination, are any exceptions valid, legal and/or justifiable?

   None Identified

4. Is the impact of the policy/guidance likely to be negative?

   No

5. If so can the impact be avoided?

   Not Applicable

6. What alternatives are there to achieving the policy/guidance without the impact?

   Not Applicable

7. Can we reduce the impact by taking different action?

   Not Applicable

For advice or if you have identified a potential discriminatory impact of this procedural document, please refer it to The Equality & Diversity Lead, together with any suggestions as to the action required to avoid/reduce this impact.