Salisbury NHS
NHS Foundation Trust

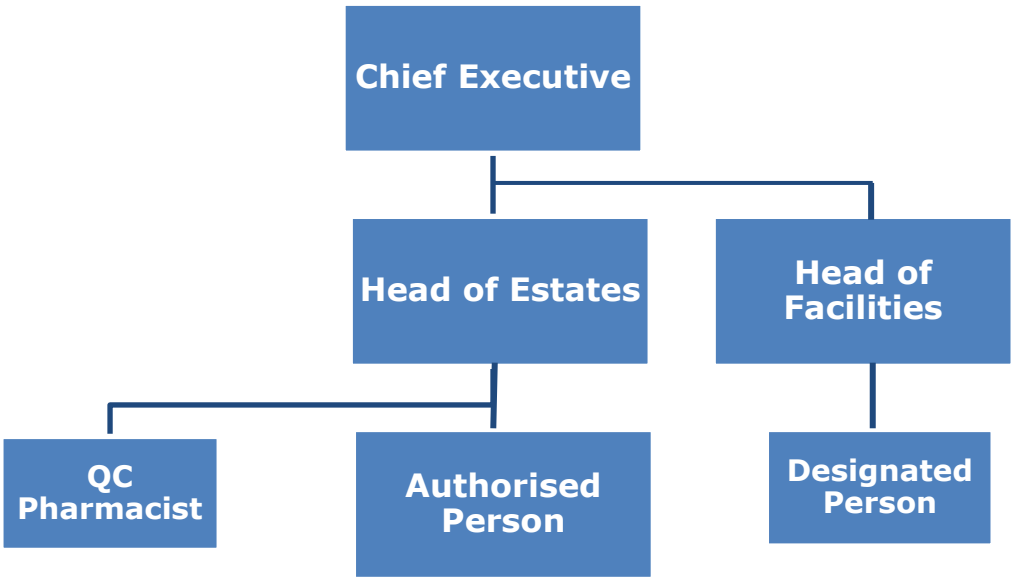
EMERGENCY PROCEDURES AND TELEPHONE NUMBERS FOR LIQUID OXYGEN AND MEDICAL GAS CYLINDER SUPPLIES AND OTHER EMERGENCY CONTACT TELEPHONE NUMBERS

Estates Department (Daytime)	If **URGENT** call: ext. 2651 (Bleep 2003), ext. 4444 or 5603
Estates Department (Out of hours)	Contact Estates On Call Engineer via Switchboard
Authorised Person (MGPS)	Ext. 2651 Bleep 2003 or Ext. 4444 or via On Call Engineer via ETS / switchboard
Portering (daytime)	Ext. 2132 OR 5615
Portering (out of hours)	Bleep 1313
Pharmacy (Quality Controller) (daytime)	Ext. 4262
Pharmacy (Stores) (daytime)	Ext. 4277
Pharmacy (On call Pharmacist) (out of hours)	Via Switchboard
Purity testing. Wessex Laboratory Services	Via Estates ONLY
Risk Management (daytime)	Ext. 2496 or 4829
Medical gas cylinder orders (British Oxygen Company (BOC))	Via Pharmacy ONLY
Liquid Oxygen orders	Via Pharmacy ONLY
Liquid Oxygen (VIE) Plant emergencies	Via Estates Duty Engineer ONLY
Medical Devices Management Centre	Ext. 2575, 2266, 4429
Medical Gas Contractor	Via Estates Duty Engineer ONLY

NB: **FES (FM) have responsibility for the maintenance and repair of the medical gas installations in SDH Phase 2** (including all pipe work, area valve service units (AVSUs), alarms, terminal units etc). Their responsibility extends from where Phase 2 (sectors 10 & 11) connects to SDH main medical gas installation in SDH North main streets.

DESIGNATED HOSPITAL PERSONNEL

Title	Medical gas role	Tel. No.
Chief Executive	**Chief Executive**	**4249**
Head of Estates	**Head of Estates**	**5603**
Contractor/ Consultant	**Authorising Engineer**	**Via Estates**
Estates Operations Manager	**Authorised Person**	**2651**
Project Officer	**Authorised Person**	**4826**
Chief Pharmacist	**Quality Controller (QC)**	**4262**
QC Pharmacist	**Carries out purity and quality testing under the control of the QC**	**Via Estates**
Head of Facilities	**Facilities Manager**	**5611**
Portering Services Manager	**Designated Person**	**5615**



KEY HOLDERS

Estates Department hold keys for valves, plant and manifold rooms.

Contact an Authorised Person for details.

EMERGENCY PROCEDURES

A.1 EMERGENCY SUPPLIES FOR MEDICAL GAS SYSTEMS (GENERAL)

SEE PARAGRAPH A.6 FOR EMERGENCY ORDERING PROCEDURES AND APPENDIX A FOR EMERGENCY TELEPHONE NUMBERS

Ensuring supply continuity

All medical gas supply sources employ duplication of plant items to reduce the risk of failure. Supply continuity is also aided by connection of all medical gas plant and monitoring systems to SFT "Essential" electricity supply. Additionally, medical gas plant is provided with an emergency supply system, which, although of limited capacity compared with the main plant, will ensure continuity of supply while repairs to a failed plant are effected.

Vacuum plant is duplicated but has no emergency reserve supply if its mains and "Essential" electricity supplies fail. This service would be lost in these circumstances.

Emergency supplies are designed to operate automatically on failure of the main supply source. Associated alarm systems indicate that emergency supplies are in use.

A.2 OXYGEN SUPPLIES

In the event of failure of the primary liquid oxygen storage tank, the secondary liquid oxygen storage tank will automatically provide SFT with oxygen.

In addition, two pipelines via separate routes supply oxygen from the primary and secondary storage tanks into SFT. These two pipelines interconnect via locked valves in the medical gas plant room SDH North, sector 14, level 2. These two pipelines and valves facilitate the isolation of the pipelines in case of damage or rupture. These valves can only be operated by an AP (Medical Gases).

Similarly, two pipelines carry oxygen from the medical gas plant room SDH North, sector 14, level 2, and to SDH Central. These two pipelines interconnect via valves at the top of the North Corridor SDH Central. These pipelines and valves facilitate the isolation of the pipelines in case of damage or rupture. These valves can only be operated by an AP (Medical Gases).

A.3 MEDICAL COMPRESSED AIR PLANT

In the event of total electricity supply failure (i.e. mains and back-up sources): the medical air compressor will not function. Supplies of air will therefore be provided from the limited capacity of the automatic emergency supply cylinder manifold unit (ESM).

The ESM will come on line automatically and will change banks automatically. Cylinder replacement will be the responsibility of Portering. Extra cylinders may need to be ordered (see below).

Estates Technical Services will inform Site Team and Duty Manager of plant failure. Duty Manager will inform Persons in clinical charge of Wards/Depts. to

conserve air wherever possible, in order that essential supplies to patient ventilators are maintained.

ETS will inform On Call pharmacist to order 40 extra J size air cylinders from BOC. Estates Technical Services will monitor usage of air and liaise with On Call pharmacist regarding further ordering of extra air cylinders.

Estates Technical Services staff must ensure that all plant has reset to full operating conditions on restoration of power.

Portering will need to ensure manpower and cylinder supplies as above.

A.4 NITROUS OXIDE AND ENTONOX MANIFOLDS

The nitrous oxide and Entonox automatic manifold systems are fitted with manually operated emergency supply manifolds. These are available to supply gas in the event of failure of, or loss of gas from, the main manifold

The alarm conditions related to this situation are illustrated at App. H

The Emergency Standby Manifolds will come on line automatically; it will not be necessary to open the Emergency Standby Manifold main isolating valve to ensure that gas supply is maintained. When in use Emergency Standby Manifolds will **NOT** change from left to right cylinder banks automatically. Detailed instructions identifying which valves to turn and in which order shall be posted adjacent to each Emergency Standby Manifold but staff responsible for operation must receive suitable training.

Due to the limited capacity of the Emergency Standby Manifold, it is essential that the pressure in the cylinders be monitored continuously while it is in use. Manual changeover from an empty to a full cylinder will be required. The empty cylinder must then be replaced by a full one.

It is the responsibility of Portering and Pharmacy to ensure that sufficient cylinders are available to maintain the gas supply.

A.5 MEDICAL VACUUM

In the event of failure of medical vacuum system: All nursing/clinical staff **MUST** be made aware that **FAILURE OF GENERATOR AND MAINS SUPPLIES SIMULTANEOUSLY WILL RESULT IN FAILURE OF THE MEDICAL VACUUM SYSTEM.**

IF VACUUM PROVISION IS CONSIDERED CLINICALLY CRITICAL, LOCALLY GENERATED VACUUM WILL HAVE TO BE PROVIDED.

Alternative options for providing medical vacuum:

- **Ejector-driven** suction units. powered from the main oxygen supply, or from a separate compressed gas cylinder (oxygen or medical air).

- **Battery-driven** suction units. (Note that the battery MUST be maintained in a fully charged condition).

- **Mechanically-driven** (Manual) suction units.

ALL staff MUST be aware that "normal" electrically driven bedside suction pumps will NOT work if all electricity supplies fail.

TRAINING IN THE USE OF EMERGENCY VACUUM EQUIPMENT MUST BE UNDERTAKEN BY ALL APPROPRIATE STAFF.

A.6 EMERGENCY ORDERING PROCEDURE FOR LIQUID OXYGEN AND MEDICAL GAS CYLINDERS

Liquid oxygen and medical gas cylinders are routinely ordered by Pharmacy, based on historic stock levels and weekly use (full for empty basis).

Portering staff check stocks weekly and report any deficiencies to Pharmacy.

For emergency ordering, the following procedure should be followed:

- Pharmacy (the on-call Pharmacist if out of hours) to telephone the emergency number of the medical gas supplier at the start of this section.
- Pharmacy to tell the medical gas supplier that "New issues" are needed, if no empties are to be returned;
- Medical gas supplier delivers order.

A.7 FAILURE OF MAINS / GENERATOR ELECTRICITY SUPPLIES

In the event of an electricity supply failure, the surgical compressed air plant, vacuum plant, oxygen system, all manifolds and medical gas alarm systems will continue to provide and monitor gas supplies as normal, **PROVIDED THAT SFT EMERGENCY GENERATOR IS WORKING.**

In the event of failure of both mains **and** generator supplies, gases will be supplied from their emergency supply systems (see above).

THE VACUUM PLANT WILL NOT OPERATE AND CENTRAL VACUUM SERVICE WILL BE LOST.

Relevant medical gas alarm panels (in switchboard, Radnor, Theatres, Pembroke Suite, Spinal Unit) will display a "System Failure" red warning light and give an audible alarm.

In these circumstances:

The person identifying the alarm condition informs Switchboard who will inform:

- the Authorised Person (MGPS)
- Site Team
- Porters

- Portering and Estates Technical Services will arrange for staff to monitor gas consumption, replacing empty cylinders as necessary, until the electricity supply is restored.

- Head Porter, Pharmacy and Authorised Person (MGPS) will arrange emergency cylinder/regulator supplies as necessary.

- Following restoration of supply the Authorised Person (MGPS) performs system checks to ensure full plant and alarm operation.

A.8 A SERIOUS LEAK OF MEDICAL GAS(ES)

The person discovering the leak must inform the Person in Clinical Charge of the affected area and the Switchboard immediately, giving the following details:

- floor level
- ward or department
- room number
- gas or gases involved
- if patient ventilators are in use

Switchboard will inform:

- the Authorised Person (MGPS)
- Site Team
- Porters

The Person in Clinical Charge carries out isolation of medical gases to the area **AFTER ASCERTAINING THAT NO PATIENTS WILL BE PUT AT RISK BY THE ISOLATION,** and issues appropriate instructions to make the situation safe, in accordance with SFT Fire Policy (Fire Action Plan)

The Duty Porter remains on standby to provide extra gas cylinders as required.

Authorised Person (MGPS) liaises with switchboard and informs them what areas are affected and arranges for repairs to the system(s) affected to be carried out under the Permit to Work system;

Incident Form completed by Person in Clinical Charge or person who discovered leak.

A.9 TOTAL OR PARTIAL FAILURE OF MEDICAL GAS SUPPLY

The person discovering the failure must inform the Person in Clinical Charge of the affected area and the Switchboard immediately, giving the following details:

- floor level
- ward or department
- room number
- gas or gases involved
- if patient ventilators are in use

Switchboard will inform:

- the Authorised Person (MGPS)
- Site Team
- Porters

The Person in Clinical Charge of the affected area checks which patients may have been put at risk by the failure and, if necessary, arranges immediate emergency medical action.

The Authorised Person (MGPS) decides the most appropriate method of long-term emergency gas provision, depending on the reason for the failure and its possible duration.

Locally regulated cylinder supplies established at ward/department entrances/bedsides if required.

Nursing/midwifery and medical staff should attempt to reduce gas consumption to a minimum during the emergency.

Portering staff monitor/replenish cylinders at any emergency stations and at plant/manifold emergency supply manifolds as required.

The Duty Porter will arrange emergency cylinder deliveries via Pharmacy as necessary.

The Authorised Person (MGPS) liaises with the Approved Competent Person (MGPS) to re-instate the gas supply, under control of the Permit to Work system.

Within 24 hours of supply restoration and the Authorised Person (MGPS) completes an Adverse Event Incident Form and gives a written report to the Chief Executive.

If long term loss of oxygen or medical air services are envisaged, department closure may be warranted in extreme circumstances. In these circumstances the Duty Manager will liaise with clinical colleagues, including the DSN/Site Team, the Executive Director on-call and the Authorised Person (MGPS) on the possible need to transfer critically ill patients to other hospitals.

In general, failure of gases to anaesthetic trolleys in Theatres will be managed in the first instance by use of emergency supply cylinders attached to the equipment. If the failure is to be long-term, additional cylinders should be arranged via Portering, if clinicians decide that a list cannot be interrupted.

A.10 CONTAMINATION OF A MEDICAL GAS SUPPLY (EVIDENCED BY PARTICULATE DEBRIS, UNUSUAL SMELLS OR FUMES COMING FROM EQUIPMENT CONNECTED TO A TERMINAL UNIT*)*

Smells noticed when using "plastic" equipment hoses to deliver gas to a patient are not unusual. Resulting from leeching of small quantities of volatile organic compounds from the hose material, this smell usually disappears rapidly after first use of the hose and is considered harmless.

However, much more serious is the situation where operatives or patients complain of an unusual or very strong smell from equipment. In rare cases this may be accompanied by breathing difficulties.

This situation **MUST** be treated **VERY** seriously and **IMMEDIATE** action taken to ascertain the cause.

Where it is obvious that the smell is coming from the pipeline rather than a piece of connected equipment, the gas supply should be considered contaminated and **MUST NOT BE USED**.

Any evidence of particulate matter arising contaminating a connected device must be investigated, the gas supply should be considered contaminated and **MUST NOT BE USED**.

The patient MUST be disconnected from the supply and alternative provision arranged, as in the case of a complete gas failure.

Other patients in the same area must be considered at risk and appropriate action taken.

It is essential that if such an incident occurs the person identifying the problem must inform the Person in Clinical Charge and Switchboard immediately.

Switchboard will inform:

- the Authorised Person (MGPS)
- Site Team
- **ALL** departments which could be affected, especially those involved with critical care.

The Authorised Person (MGPS) and QC (MGPS) investigate source of pollution.

Remedial action may involve intervention of Approved Competent Person (MGPS).

QC (MGPS) performs final testing of gas quality and identity before system is allowed on line.

An Incident Form must be completed by the person in clinical charge of the area in liaison with Authorised Person (MGPS).

SEE APPENDIX E FOR FULL DETAILS OF ACTION TO TAKE TO INVESTIGATE AND RESOLVE CONTAMINATION

A.11 CONTAMINATION OF MEDICAL VACUUM SYSTEM

If contaminant liquid is detected in the on-line bacteria filter drain flask Infection Control staff must be notified immediately and advise on any precautions to effect filter change safely.

Decontamination of pipe work (if necessary) should be carried out in accordance with the procedure described in HTM 02-01 2006 **BEFORE** filters are changed. (Note that the prescribed method does NOT require shut down of the vacuum system during decontamination of the affected area);

Approved Competent Person (MGPS) will change the filter in accordance with standard practice requirements and advice from Infection Control staff.

If the contamination is due to system misuse, Authorised Person (MGPS) completes an Adverse Event Report Form which must be sent to the Risk Management Department.

The Designated Nursing/Midwifery Officer must be notified and take appropriate remedial action.

An Incident Form must be completed by the person in clinical charge of the area in liaison with Authorised Person (MGPS).

A.12 OXYGEN INSTALLATION (VACUUM INSULATED EVAPORATOR (VIE) STORAGE VESSEL) EMERGENCY ACTIONS

Emergency action signage is displayed at the Vacuum Insulated Evaporator (VIE) storage vessel compounds.

This signage is maintained in a legible condition.

Actions to reduce system pressure in the event of safety valve release and bursting disc rupture are described in these instructions.

The Authorised Person (MGPS) must be fully familiar with the oxygen installation and in the event of an emergency, able to carry out the required safety actions quickly and effectively.

The Authorised Person (MGPS) is familiar with the location of the specified valves and able to find them, even under conditions of poor visibility that may occur during gas or liquid discharge.

Appropriate safety precautions must be observed and personal protective clothing and equipment must be used if warranted.

Safety valve discharge and bursting disc failure will be rectified by appropriate Estates Technical Services actions and liaison with the gas supplier if necessary.

Safety notes

Operating safety valves and ruptured bursting discs discharge large quantities of cold oxygen gas in the immediate vicinity of the plant.

Vehicles parked in this area should NOT be started while surrounded by the gas cloud. If necessary move vehicles from the area manually.

Ensure that no smoking takes place near the plant during gas/liquid discharge.

Vacuum Insulated Evaporator (VIE) storage vessel valve operations in emergency situations

PROBLEM	ACTION
MAIN SUPPLY PIPE FRACTURE	**Close Valves A & B on both vessels Isolate main pipeline valve (Valve C)**
SAFETY VALVE DISCHARGING	**Close Valve B**
BURSTING DISC DISCHARGING	**Close Valve B**
FIRE IN HOSPITAL	**Consult Fire Brigade and Medical Director/Chief Executive**

A.13 FAILURE OF AN ANAESTHETIC GAS SCAVENGING SYSTEM (AGSS)

A local alarm "System fail" warning and lack of movement of the air receiver flow indicator will evidence failure of the system.

Failure results in spillage of gaseous/vaporised anaesthetic agents into the immediate environment.

Mechanical ventilation rates are generally quite high (about 20 air changes per hour) and the effects of this spillage are, therefore, minimised.

Staff, if working in the area for extended periods, may exceed the COSHH recommendations for exposure.

Anaesthetic Practitioner (or Manager) notifies the Authorised Person (MGPS) and Departmental Manager of the problem.

Attempts should be made to reduce staff exposure, if operations continue with a failed system.

Authorised Person (MGPS) organises repairs under control of Permit to Work System signed by the Theatre Nurse Manager, or their nominated deputy

Repairs and re-commissioning testing completed by Approved Competent Person (MGPS)

On completion of work staff are made aware (by the person signing off the Permit to Work) that the system is back in use.

An Incident Form must be completed by Anaesthetic Practitioner in liaison with Authorised Person (MGPS).

A.14 FIRE

SFT Fire Policy (Fire Action Plan) should be followed in the event of a fire involving, or likely to involve the MGPS.

The Senior Brigade Officer assumes full control of the area(s) affected.

MEDICAL GAS SUPPLIES MUST NOT BE ISOLATED UNTIL THE DESIGNATED NURSING/MIDWIFERY OFFICER IN CLINICAL CHARGE HAS CONFIRMED THAT ALL PATIENTS LIKELY TO BE AFFECTED HAVE BEEN EVACUATED AND/OR HAVE ALTERNATIVE GAS PROVISION.