



The Institute of Healthcare Engineering and Estate Management

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Briefing Note: Medical Gas Cylinder Storage Room Ventilation and Fire Safety Requirements at Ward/Department Level

VENTILATION TECHNICAL PLATFORM (VTP)- LIBRARY OF TECHNICAL GUIDANCE

Introduction

This briefing note outlines the ventilation and fire safety requirements for medical gas cylinder storage at the local ward or department level, drawing from Health Technical Memoranda (HTMs) and other applicable documents, particularly HTM 02-01 (Medical Gas Pipeline Systems) and HTM 05-03 (Firecode). Ensuring proper ventilation and adherence to fire safety measures in these areas is critical for patient and staff safety, preventing the accumulation of hazardous gases, and maintaining compliance with health and safety regulations.

Scope

The purpose of this document is to provide an overview on the ventilation requirements for the provision of local ward or departmental level medical gas cylinder storage facilities with specific reference to fire safety requirements.

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Acknowledgments

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Key Principles and Requirements for Ward/Department Level Storage

Adequate Ventilation Area:

For medical gas manifold rooms, a ventilation area equivalent to 1.5% of the total area of the walls and floor is recommended to ensure adequate ventilation. (HTM 02-01 B, p.66) A typical manifold room may consist of a 2 x 6 bank of G size cylinders containing 4,760 litres of gas each (57,120 litres total). In contrast a local cylinder store may typically contain 12 CD sized cylinders containing 460 litres each (5,520 litres total). A typical local cylinder store is therefore likely to contain 10% of the gas of a manifold room. In addition, a leak from a G sized cylinder has the potential to release 4,760 litres of gas where a leak from a CD cylinder can only release 460 litres of gas. Based on this the risk of gas build up and enrichment is considered low.

Recommendation - Based on the risk the recommendation for new builds would be to apply half of the 1.5% required for manifold rooms to both main stores and smaller, local storage areas within wards or departments (0.75%). The typical size of a clean utility where medical gas cylinders may be stored (or similar utility room) is 16m² (HBN 04-01 p.25). The recommended opening is therefore 0.4m² (based on a 2.4m ceiling height). This is the equivalent of a 640mm x 640mm opening. This opening may be via a louvre in the door (noting fire requirements below), via an openable window, or a combination of both.

If an area of 0.75% is not feasible, mechanical ventilation equal to or exceeding 10 litres per second is recommended. With an area of 16m² and a ceiling height of 2.4m the volume of a typical utility room is 38m³. A leak on a typical CD cylinder will release 0.46m³ of gas into a 38m³ room which equates to 1.2% of the room's volume. A ventilation flow rate of 10 litres per second will result in almost 1 air change per hour which will be sufficient to remove this gas and prevent a build up and enrichment.

Minimum Requirement - If the 0.75% area cannot be met and there is no mechanical ventilation available, then documented management procedures will need to be implemented. This may consist of regular checks of cylinder contents, and that cylinders are turned off. Consideration should be given to placing a portable oxygen detection device in the room to alert if any enrichment is detected (although other gases can be stored oxygen is the most prevalent in local stores). Other, more suitable locations should be investigated for cylinder storage that either have mechanical ventilation or some ventilation openings in the building fabric.

Evidence base for recommendations

While larger manifold rooms are typically located on external walls to facilitate natural high and low-level ventilation, smaller, internally sited cylinder stores within wards or departments may require mechanical ventilation to achieve the necessary air changes. (HTM 02-01 A, p.127)

Medical gas cylinders should not be used or stored in basements or cellars that lack natural floor-level ventilation. (HTM 05-03 Part K, p.43) This is particularly important at the ward/department level where space may be limited and proper ventilation can be overlooked

Oxygen Enrichment and General Ventilation:

In areas where oxygen is used for patient therapies (e.g., oxygen tents, CPAP ventilation), oxygen enrichment can occur. It is essential that adequate general ventilation is provided in these ward/department areas to avoid this hazard. (HTM 02-01 B, p.80)

A risk assessment should be conducted to determine if local oxygen enrichment monitoring is necessary in specific clinical areas. (HTM 02-01 B, p.80)

Fire Hazards of Gas Cylinders:

The main hazards associated with gas cylinders include leakage, where contents may be flammable, oxidising, asphyxiant, or toxic. Leakage can contribute to fire, explosion, or health hazards. (HTM 02-01 B, p.63)

Oxygen is an oxidising agent and can significantly increase the intensity of a fire.

Flammable materials should not be stored in cylinder stores or manifold rooms. (HTM 05-03 Part A, p.37)

Compartmentation and Fire Separation:

Main medical gas stores should always be located in separate buildings. (HTM 05-02, p.31)

Local medical gas stores within wards/departments should only contain a sufficient quantity for daily use. (HTM 05-02, p.31)

Where gas cylinders are stored indoors they should be housed in a dedicated, well-ventilated, secure storeroom or cabinet/cupboard of adequate fire-resisting construction. (L138 (Second edition), p.46)

If the number of cylinders is small, a dedicated cabinet/cupboard of adequate fire-resisting construction should be used instead of a full storeroom. (L138 (Second edition), p.46)

The same storeroom or cabinet should not be used for both stored cylinders and those in use, nor for incompatible substances. (L138 (Second edition), p.46)

Fire Detection Systems:

Smoke or heat detector heads should be installed in medical gas manifold rooms and internal medical gas cylinder stores in any hospital with an automatic fire detection system, in accordance with HTM 05-03, Part B - 'Firecode: alarm and detection systems'. (HTM 02-01 A, p.22)

Signage and Emergency Procedures:

Safety signage, including Hazchem notices, should be posted in and outside any area where cylinders are stored. (HTM 02-01 B, p.66)

A store identification notice (e.g., "Medical gas storage area - smoking, welding and naked lights prohibited") and a store contents notice should be clearly displayed. (HTM 02-01 B, p.66)

An "emergency actions" notice, detailing procedures, key locations, and contact numbers, should be clearly posted on the front of the cylinder store. (HTM 02-01 B, p.66)

Information on the location of gas cylinders should be given to attending emergency services at the earliest appropriate opportunity. (L138 (Second edition), p.46)

Operational Aspects and Safety Measures:

Minimising Storage: Attempts should be made to reduce excessive levels of cylinder storage at the ward/department level. (HTM 02-01 B, p.64)

Local Storage (Wards): Cylinders mounted on trolleys for emergency gas supplies in ward areas should have designated "parking" areas, and these areas should be signed to indicate their purpose. All staff should be aware of their location and function. (HTM 02-01 B, p.64)

Training: All staff responsible for medical gases should receive training in general safety considerations, including fire safety. This includes understanding hazard warning signs, safe movement and storage of cylinders, and managing potential ignition sources. (HTM 05-03 Part A, p.37),(HTM 05-03 Part A, p.37)

Maintenance: All ventilation systems and fire safety equipment must be maintained in an efficient state, in efficient working order, and in good repair. Regular maintenance and routine testing are essential to ensure continued compliance and safety.

Conclusion

Effective ventilation and stringent fire safety measures in medical gas cylinder storage areas at the ward/department level are paramount for ensuring the safety of patients and staff. Adherence to the guidelines set out in HTM 02-01 and HTM 05-03, coupled with robust risk assessments, appropriate compartmentation, clear signage, and ongoing maintenance and staff training, is crucial for mitigating the inherent risks associated with medical gases and maintaining a safe healthcare environment. Estates and facilities teams, in collaboration with clinical staff and fire safety officers, must ensure these requirements are met and regularly reviewed.



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