

Hinckley CDC and Endoscopy Unit. Design Note. Ventilation Strategy.

Ventilation Strategy

Introduction

This Design Note was prepared to support Planning Application for Hinckley CDC and Endoscopy Unit Project to outline Ventilation Strategy principles that will be adopted within the design of the building.

The provision of appropriate ventilation is an essential part of the design within a healthcare facility, to help create a safe and comfortable environment for patients and staff. It is crucial that appropriate strategies are put in place to meet the specific needs of the occupants, provide a clean environment, support quality assurance, and protect from harmful substances.

The purpose of ventilation systems and strategies can include one or more of the following:

- Provision of outdoor air supply for all building occupants.
- Contribute to thermal comfort, by providing heating and/or the provision of cooling, to offset occupancy, fabric, solar and equipment heat gains.
- Control of room pressures and air flows, to provide air flow regimes and room containment strategies to satisfy the control of infection.
- Removal of odours, gas vapours, fumes, and dust, for the purpose of health and safety.
- Reduction of excessive moisture levels, to prevent condensation.
- Dilution and control of airborne pathogenic material.

Given the variety of different functions found within healthcare settings, a range of ventilation strategies are employed to achieve these objectives.

Air handling units, Distribution Ductwork and Air intake and Exhausts

All mechanical ventilation systems that incorporate supply air provision will utilise 100% outside air, with the air handling plant arranged in a blow-through configuration, incorporating inlet and outlet noise attenuation and a plate heat exchanger heat recovery device. Associated with each supply air system will be a combined clean and dirty extract system, to maximise heat recovery.

All AHUs, unless serving non-clinical areas, will be compliant with the construction and component requirements of HTM03-01.

The heat recovery units will be plate heat exchangers, to avoid the potential for cross-contamination possible with thermal wheels. The heat recovery sections will be selected to maximise heat recovery, with a minimum recovery of 80% targeted.

The AHUs will be located on the roof Level of the building, with distribution of air to the areas served via a series of vertical accessible risers.

All ventilation ductwork will be designed in accordance with BESA DW/144.

All AHUs will be provided with atmosphere side and room side attenuators. Where possible, acoustic attenuation will be applied to all ventilation systems prior to exit from the plant room, in accordance with HTM requirements and the requirements of the local environmental health officer.

Air intake and exhausts will have as a minimum 10m separation to meet BREEAM requirements. Air intakes will be through duct mounted louvres nearing east façade facing existing hospital buildings. Vitiated air exhaust discharge will be vertical to above via duct mounted discharge cowl/ louvre.

Ventilation strategies

To achieve the objectives above, there are a variety of ventilation strategies that will be used to meet the needs of the individual spaces, these include:

Natural	Using openings, windows, louvres and/or doors that are manually operated by the users or semi-automated. No air is delivered into the room from the central AHUs.
Mixed-mode	Mixed-mode ventilation utilises mechanical systems, to provide a base level of fresh air, and natural ventilation, typically for the purposes of limiting summertime temperatures.
Mechanical	Mechanical ventilation utilises an air handling unit to treat the incoming supply air before distributing it within the building, via a network of ventilation ducts.
Specialist	Subject to the nature of the space some areas require specialist forms of ventilation specific to their function. This could be specialist requirements linked to fire strategy and life safety, or emergency exhaust systems for Scanner rooms and Endoscopy Dirty decontamination rooms.

Natural ventilation will be incorporated where possible, except when:

- The level of internal noise from external sources is unacceptable when windows are open.
- At ground floor spaces where due privacy requirements is unacceptable when windows are open
- Where variability of air change rates is not acceptable.
- Unpleasant smells are generated either inside or outside the building.
- Where inflows of air are undesirable.
- Clinical requirements do not allow it.
- Maximum specified internal temperatures would be exceeded.
- Rooms are deep plan.

Where mechanical ventilation systems are provided, they will be designed to suit the planned departmental configuration. The volumes calculated will be based on the departmental schedule of area and air change rates, as prescribed in HTM 03-01 Specialist Ventilation for Healthcare premises, or other applicable guidance documents.

All plant/systems associated with mechanical ventilation will be zoned to take into account the operational hours of each department, and to ensure that unoccupied areas can be switched off. In the case of ventilation plant that serves continuously operating areas and intermittently occupied areas, motorised dampers and variable speed fans on both supply and extract systems will be provided, with suitable control logic within the iBMS so that the air flows remain in balance.

Typical spaces

This section covers some of key spaces within Project and outlines the proposed ventilation strategies that will be applied.

Multi-bed bays

Multi-bed bays within the hospital will be mechanically ventilated.

The same guiding principles apply as the in-patient single bedrooms.

Supply air will be provided via ceiling mounted diffusers within the centre of the space, with extract grilles located above each individual bed position.

Where en suites are provided, these will have mechanical extract, with make-up air drawn from the main multi-bed space via door transfer grilles.

An LTHW heater battery located in the supply air duct within the room will provide heating to the space.

Endoscopy Rooms

The ventilation strategy for Endoscopy Treatment Rooms will be provided in accordance with the requirements of HTM03-01.

Air will be supplied to achieve a minimum ventilation rate of 12 to 15 air changes per hour within the room, and as specified within HTM03-01 for the ancillary areas.

Comfort cooling will be provided via the supply and extract systems, with heating via the AHU and duct-mounted heater batteries located within the ceiling void, as applicable. No humidification will be provided.

The air-change rate in the recovery room will be 15 air changes per hour, with a balanced air flow to control the level of anaesthetic gas pollution. The supply air terminals will be ceiling mounted above the recovery bed positions. Extract will be positioned at low level (bed height or below), behind the bed head positions or in the corners, with supplementary ceiling mounted extract grilles.

Emergency exhaust may need to be provided to Endoscopy dirty decontamination rooms Requirements to be verified at next design stage.

Imaging rooms

Ventilation to MRI, CT and other imaging rooms will be designed to ensure the internal environment is achieved and controlled to the requirements set out by the equipment manufacturers.

Air handling plant will be provided on a zoned basis for the specific areas.

Comfort cooling will be provided via the supply and extract systems, with heating via the AHU heating coil and duct-mounted heater batteries. No humidification will be provided. Control rooms may additionally require fan coil units to deal with their high heat gains, which will be determined by dialogue with the equipment manufacturers.

Non-ferrous materials will be used within the MRI suite, particularly for all ductwork, pipework, service supports and associated controls/fittings.

From the MRI suite, a fully-welded quench pipe may be required, to allow for exhausting of helium gas in an emergency quench situation. This pipe will route directly to atmosphere. An exclusion zone will be provided around the exhaust where there is a risk of it coming into contact with anyone.

An oxygen monitoring and alarm system will be provided within each MRI room.

An additional dedicated extract vent fan will be provided to serve the MRI scanner room's extract system, where recommended by the MRI scanner equipment supplier. It will be located at the highest point within the room, to extract any unwanted gases from the MRI suite. Provision will be made for make-up air to be supplied via a pressure stabiliser during extract. The extract fan will operate in conjunction with the recommendations of the MRI scanner equipment supplier.

The control room will include alarm systems for the oxygen monitoring, exhaust and quench systems.

Toilets

For the removal of "vitiated" air from toilets and bathrooms within clinical departments, extract ductwork will be provided within the department and connected to the general extract ductwork, in order to maximise heat recovery in the air handling units.

The control of the ventilation will be based on a combination of timeclock and occupancy sensors, with the system operating continuously during the day and put in a set-back condition at night, when usage is reduced.

The supply air will be heated, to provide background heating to the spaces.

Non-clinical spaces

Non-clinical areas within the scheme will be assessed on an individual basis, with ventilation provided based on the guidance provided by CIBSE.

Large open plan office areas will be mechanically ventilated, based on 14 l/s per person.

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