University Hospitals of Leicester NHS
NHS Trust

Ventilation Systems Management Policy

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CONTENTS

REVIEW DATES AND DETAILS OF CHANGES MADE DURING THE REVIEW

Policy will be reviewed annually from the initial date of approval.

This is the first version.

KEY WORDS

Air Changes
Air Conditioning Unit
Authorising Engineer
Authorised Person
Cooling
Competent Person
Contamination
Critical Ventilation
Theatres
Ventilation
Verification

1 INTRODUCTION AND OVERVIEW

This policy should be read in conjunction with the Procedure Document for the Management of Ventilation Systems and Equipment

1. Introduction

1.1. The University Hospitals of Leicester NHS Trust, hereafter known as the Trust, has an objective of providing safe, high quality Healthcare Environments for its patients, staff, visitors and equipment. This is achieved by ensuring that Trust premises are designed and maintained to high standards and comply with all the statutory and mandatory requirements as well as being aligned with NHS technical standards.

1.2 Ventilation is used extensively in healthcare premises for both the comfort of the occupants in buildings and to closely control the environment and air movement within the space. It adopts controls to manage and reduce hazards to patients, staff and equipment form airborne contaminants, dust, harmful microorganisms, heat and cold environments.

1.3 This document sets out the Policy for managing air handling, cooling and ventilation systems at sites owned and managed by the Trust.

1.4 The Trust aspires to provide a safe, high quality Healthcare Environment for its patients, staff, and visitors. This is partially achieved by ensuring that Trust premises are maintained to a high standard; comply with statutory and mandatory requirements and best practice as set out in Health Technical Memorandums (HTM), Health Building Notes (HBN) and other Department of Health (DH) guidance.

1.5 This policy describes the systems and processes required to ensure that air handling/ventilation systems are designed, installed, commissioned, validation, maintained, inspected verification and tested to provide a safe and suitable environment. The policy is based on HTM 03-01 Parts A & B (2021) previously HTM 03 (2007), local building regulations and relevant health and safety requirements. It is to be noted that most of the Air Handling Plant on our sites were installed to regulations before that which is current. Some plant is 20 years old and some is more than 40 years. It is recognised that in this case verification may only conform to that which the original equipment was installed to.

2 POLICY SCOPE –WHO THE POLICY APPLIES TO AND ANY SPECIFIC EXCLUSIONS

2.1 This policy identifies the roles and responsibilities of those involved in the design, management, operation, maintenance and testing of systems and the key associated activities. It applies to all properties owned and maintained by our Trust including properties leased, rented, or occupied under lease or other occupancy agreement. It covers maintenance on all ventilation/air conditioning plant and associated installations (such as duct work and fire dampers) undertaken by the Estates department.

2.2 Non-critical systems: General ventilation and extract systems used extensively throughout the buildings.

3 DEFINITIONS AND ABBREVIATIONS

Critical Systems:

A Ventilation system which out of service would seriously degrade the ability of the premises to deliver optimal healthcare would be considered critical. This includes:

- Operating theatres of any type, including rooms used for interventional investigations (for example catheter laboratories)
- Patient isolation facility of any type.
- Critical care, intensive treatment, or high-dependency unit
- Neonatal unit.
- Pharmacy aseptic suite
- Inspection and packing room in a sterile service department
- MRI, CT, CAT, and other types of imaging technologies that require particularly stable environmental conditions to remain with calibration.
- Pathology department category 3 laboratory and other cabinets

Non-critical systems:

General ventilation and extract systems used extensively throughout the buildings.

Critical Ventilation Verification Report:

Detailed inspection and testing report which indicated the performance, condition and compliance of a critical ventilation system to the relevant operational standards.

4 ROLES – WHO DOES WHAT

4.1 **Chief Executive -** Has overall responsibility for all activity, and must ensure that inspection, service, and maintenance activities are carried out safely without hazard to staff, patients, or members of the public.

4.2 **Director of Estates and Facilities (Responsible Persons) -** Is the appointed by the Chief Executive with devolved powers of responsibility to ensure that sufficient and suitable resources are in place to manage and maintain the Trust's ventilation equipment, including that suitably qualified personnel are employed to implement, manage and review this activity.

4.3 Deputy Director of Estates and Facilities
are responsible for regularly reviewing Trust Ventilation infrastructure and identifying systems for replacement/upgrade through the Backlog Capital Programme; Implementation and review of this policy; Ensure that sufficient and competent staff and resources are available for all areas covered by this policy.

4.4 **Regional Estates Managers -** The Regional Estates Managers are responsible for day to day operational maintenance and repair (inclusive of validations and verifications) of the Trust's Ventilation infrastructure and when appropriate identifying / reporting systems for replacement/upgrade through the Backlog Capital Programme; To comply with this policy; Manage the competent staff and resources available for all areas covered by this policy.

4.5 **Authorised Persons (AP) -** The Authorised Person is responsible for:

- Ensuring that all ventilation/air conditioning equipment is inspected, serviced, maintained, and tested (inclusive of validations and verifications) in a safe manner without hazard to staff, patients, or members of the public.
- Critical systems are identified and tested by a Competent Person.
- Ensure reactive and Planned Preventative Maintenance (PPM) arrangements are in place.
- Escalate any issues outside own area of authority.
- Maintain records of maintenance, testing and validation work.
- Prepare and submit an annual performance report for the Infection Prevention & Decontamination Group.

4.6 **Competent Persons (CP) -** The Competent Person is responsible for:

- Undertaking work on systems as designated by engineering managers including:
- Carry out repairs and planned preventative routines as instructed by the AP
- providing feedback on performance and maintenance issues.
- ensuring all health and safety, COSHH, Trust policies and procedures and risk assessments are always adhered to.
- reporting any maintenance defects or required changes to PPM routines or asset data.
- Record work done in system logbooks on individual ventilation systems

4.7 Project Managers (PM)

- All new installations meet the latest statutory requirements and technical standards including the provision of satisfactory validation reports.
- A suitably qualified person is involved in the design of all new installations and that commissioning and performance checks are undertaken and documented.
- That all new installations are accessible and maintainable without resorting to specialist access equipment or the need for removal of finishes/infrastructure.
- That maintenance teams are provided with comprehensive Operation and Maintenance manuals (O & Ms) on the handover of completed installations.
- Ensure that appropriate training and familiarisation is provided to in house and contract maintenance teams.

4.8 Infection Control Officer

- Is the officer nominated by management to advise on monitoring the infection control policy and microbiological performance of system.
- Interpret and advise on testing which is out of parameters or failure which may impact on usage of a ventilated area.
- Provide professional support to Estates' staff.

4.9 Local Managers/Users

- Reporting ventilation and system defects to the Estates helpdesk.
- Ensuring that they are familiar with the systems in their areas.
- Ensuring reasonable access for maintenance purposes.
- Reporting all incidents (including near misses) via Datix web.

4.10 Authorising Engineer (AE)

The Authorising Engineer is an Independent Professional Advisor, appointed by the Trust to undertaking independent auditing and providing advice on ventilation systems. To review and witness validation documentation, making informed suggestions and observing to assist the Estates department in improving and maintaining the Facility.

4.11 Ventilation Safety Group (VSG)

The Group will monitor the ventilation safety testing within the Trust and report monthly on issues arising from non-compliance.

Submit quarterly reports and make recommendations to the Trust's Infection Control Committee in relation to ventilation verification, testing and any other related issues.

Identify and agree the strategic direction each year for review and implementation of the Ventilation Safety Action Plan

Monitor compliance against the Health and Social Care Act & Department of Health guidance

Review any new methods to ventilation and make recommendations relating to their use.

Receive and review incoming guidance from outside areas and ensure an appropriate response is initiated by the Trust.

5. POLICY IMPLEMENTATION AND ASSOCIATED DOCUMENTS –WHAT TO DO AND HOW TO DO IT

5.1 The Trust is committed to ensuring that all ventilation/air conditioning equipment is designed, installed, commissioned, validated, inspected - verified, serviced, and maintained in accordance with all the relevant legislation and guidance to ensure that such equipment does not pose a health or operational risk to either, staff, patients, visitors and equipment.

5.2 This policy sets out the Trusts framework for achieving compliance with the following legislation and guidance:

- Health and Safety at Work Act 1974
- Control of Substances Hazardous to Health (COSHH) Regulations 2002
- Health Technical Memorandum 03-01 'Specialised Ventilation for Healthcare Premises' Parts A & B (2021).

5.3 Application of the arrangements set out in this policy will ensure that the Trust meets its statutory obligations and operates within approved safety standards and codes of practice.

5.4 Implementation of this policy will:

- Ensure that ventilation equipment is suitable for its intended use and is maintained to satisfactory performance levels.
- Contribute to the overall control of infection agenda within the Trust.
- Comply with health and safety legislation requirements.
- Ensure the standards set out initially Standards for Better Health and modified over time by the Care Quality Commission are met.
- Maintain the health, comfort and environment for all patients, staff and visitors to the Trust by ensuring adequate heating and ventilation exists and it is fully functional.

Processes and Procedures

5.5 Technical and performance guidance is set out in Health Technical Memorandum 03-01 Specialised Ventilation for Healthcare Premises' parts A & B (2021).

5.6 In many existing systems, original design and commissioning information may not be available. It will therefore be necessary to determine a suitable level of system performance based on the function, purpose, and age of the installation. Where performance does not meet current guidance there will be a gap analysis and risk assessment. These will be considered by the Trust's Ventilation Safety Group for any further actions.

5.7 Design and Installation

The design and installation of new equipment is fundamental to the long-term provision of suitable systems which will perform well over a 15-20-year life span, but is recommended to be replaced after 10 years.

- All ventilation/air conditioning equipment shall be appropriate for the area it is being designed for.
- All ventilation/air conditioning equipment is to be designed and installed by suitably qualified personnel and complies with the requirements of HTM 03-01 and other statutory legislation.
- Systems shall be designed to the highest standards in terms of energy usage to ensure that the Trust's carbon and sustainability agenda are not compromised as in compliance with the current NHS Net Carbon Zero Building Standard at the time of design.
- Cooling and/or air conditioning inclusive of humidification / dehumidification will only be installed in Trust buildings where there is a specific patient imperative or where critical plant needs to be maintained within prescribed temperature parameters. Cooling in office areas is unlikely to meet this criterion.
- All installations should be easily accessible for maintenance and testing of all maintainable parts and components without the need for specialist access equipment and/or removal of building fabric and finishes.
- When new equipment is accepted for use, full information as to its designed mode of operation together with maintenance procedures is provided as part of the handover procedures and prior to system use.
- All new ventilation/air conditioning systems shall be commissioned and signed off by a suitably qualified person to ensure that the minimum standards are achieved.

- The detailed procedure for the Validation is within HTM 03-01 Part A (2021)
- The users and those who maintain the system need to be instructed in its safe operation and how to provide the correct environmental conditions as part of the handover procedure at the end of the commissioning period.

5.8 Maintenance

All critical ventilation/air conditioning systems shall be inspected quarterly and verified annually to ensure that the minimum standards are achieved including:

- Ensuring safe access when carrying out routine service and maintenance activities.
- Preventing or controlling risks associated with Legionella and other potential hazards.
- Checking that the system remains fit for purpose.
- Maintenance procedures should be reviewed periodically to ensure that they remain appropriate.
- The degree and frequency of maintenance should relate to the function of the system, its location, its general condition, and the consequence of failure.
- All ventilation systems should be worked upon with the relevant authorisations to ensure a competant person only carries out the works and is authorised under the issue of a “Permit to Work”.

5.9 Testing

All critical ventilation systems should be inspected quarterly and verified at least annually. In some circumstances the verification may need to be carried out more frequently.

The quarterly inspection should be a simple visual check; the annual verification will be a more detailed inspection of the system together with the measurement of its actual performance.

Annual Verification Systems

- The annual verification is intended to establish that:
- The system is still required,
- The AHU conforms to at least the minimum standards to which it was installed.
- The fire containment has not been breached.
- The verification should also assess whether the general condition of the ventilation system is adequate, the fabric of the area served is satisfactory and the system performance is adequate with respect to the functional requirement.

Annual verification will require:

- A full measure of the supply and extract airflow rates.
- The calculation of room air-change rates if applicable.
- The measurement of room differential pressures if applicable
- The measurement of room noise levels.
- Air-quality checks if appropriate.
- A check on the control functions.
- The detailed procedure for the Verification is within HTM 03-01 Part B (2021)

5.10 Information

The following information shall be provided adjacent to the plant to which it refers:

- General information regarding the intended operation of the plant together with a schematic diagram of the equipment and its distribution system.
- Specific information as to the purpose of the plant and details of those departments and/or personnel that should be informed prior to switching off or
- Carrying out maintenance activities.
- Specific information required for the safety of the personnel carrying out the service and maintenance activities.
- Ventilation system records and logbooks should be kept of the commissioning information, operational management routine, monitoring and maintenance;
- A sign should be fitted indicating that 'No plant can be isolated without permission of the user' and the associated "Permit to Work" duly completed.

5.11 Inspection and Maintenance Records

Records of maintenance activities/instructions, operating manuals, commissioning information, and inspections should be kept for at least five years. Logbooks should be available for each Ventilation System consisting of Maintenance records, Test, Validation and Verification data.

5.12 Associated Documents

This policy should be read in conjunction with the Procedure Document for the Management of Ventilation Systems and Equipment

6 EDUCATION AND TRAINING REQUIREMENTS

All staff, and contractors carrying out maintenance, annual inspections, and verifications, on Ventilation Systems must have received suitable training before being allowed to work on these systems. Training records shall be kept up to date for all staff and contractors and show the level of competency associated with the work being undertaken. These details will be formally registered on the Trusts Control of Contractors System and all contractors shall have completed a site induction.

7 PROCESS FOR MONITORING COMPLIANCE

7.1 The VSG shall, collectively, be responsible for ensuring that auditing processes are in place across the Trust's arrangements for the Management & Control of the ventilation systems. The Trust's Authorising Engineer (Ventilation) shall undertake an annual review audit and a six monthly review of the practical implementation of ventilation management arrangements and prepare a report for the VSG.

Element to be monitored	Lead	Tool	Frequency	Reporting arrangements
Authorised Competent Person Ventilation	Senior Specialist Engineer	Authorising Engineer report	Annual	UHL Ventilation Safety Group
Critical Ventilation Verification Reports Review	Senior Specialist Engineer	Critical Ventilation Verification Reports	Quarterly	UHL Ventilation Safety Group
Authorising Engineer's report	Senior Specialist Engineer	Authorising Engineer report	Annual	UHL Ventilation Safety Group
Audit ventilation Master plan database	Senior Specialist Engineer	Audit report	Six Monthly	UHL Ventilation Safety Group
Monitor Ventilation Systems Planned Preventative Maintenance (PPM) performance	Regional Estates managers	Planet system report	Monthly	Monthly Performance Reports

8 EQUALITY IMPACT ASSESSMENT

8.1 The Trust recognises the diversity of the local community it serves. Our aim therefore is to provide a safe environment free from discrimination and treat all individuals fairly with dignity and appropriately according to their needs.

8.2 As part of its development, this policy and its impact on equality have been reviewed and no detriment was identified.

9 SUPPORTING REFERENCES, EVIDENCE BASE AND RELATED POLICIES

NHS England & NHS Improvement - Health Technical Memorandum 03-01: Specialised ventilation for healthcare premises Part A-The concept, design, specification, installation

and acceptance testing of healthcare ventilation systems, & Part B – The management, operation, maintenance and routine testing of existing healthcare ventilation systems.

https://www.england.nhs.uk/publication/specialised-ventilation-for-healthcare-buildings/

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The Health and Safety Executive, The Control of Substances Hazardous to Health Regulations 2002 (as amended), L5 (Sixth Edition) 2013 (COSHH), Norwich, TSO

https://www.hse.gov.uk/pubns/priced/l5.pdf

The Health and Safety Executive, HSE Guidance 'Controlling Airborne Contaminants at Work – A Guide to Local Exhaust Ventilation, HSG 258 (Third edition), 2017, Norwich, TSO

https://www.hse.gov.uk/pubns/priced/hsg258.pdf

The Health and Safety Executive, Provision and Use of Work Equipment Regulations 1998 (PUWER), L22 (Forth edition), 2018, Norwich, TSO

https://www.hse.gov.uk/pubns/priced/l22.pdf

The Health and Safety Executive, HSE Guidance 'Clearing the Air- A simple guide to buying and using local exhaust ventilation (LEV), INDG408 (rev1), 2016, Norwich, TSO

https://www.hse.gov.uk/pubns/indg408.pdf

10 PROCESS FOR VERSION CONTROL, DOCUMENT ARCHIVING AND REVIEW

This document will be uploaded onto SharePoint and available for access by Staff through INsite. It will be reviewed by the VSG every three years, or when conditions change. The updated version of the Policy will then be uploaded and available through INsite Documents and the Trust's externally-accessible Freedom of Information publication scheme. It will be archived through the Trusts PAGL system.

University Hospitals of Leicester NHS
NHS Trust

Procedure Document for the Management of Ventilation Systems and Equipment

Contents

Introduction

Ventilation is used extensively in all types of healthcare premises, to provide a safe and comfortable environment for patients, staff, and visitors. More specialised ventilation is provided in primary patient treatment areas.

It is also installed to ensure compliance with quality assurance of processed items in pharmacy and sterile services departments, and to protect staff from harmful organisms and toxic substances.

The sophistication of ventilation in healthcare premises is increasing. Patients and staff have a right to expect that it will be designed, installed, operated and maintained to standards that will enable it to fulfil its desired functions reliably and safely.

The Health and Safety at Work Act 1974 is the core legislation that applies to ventilation installations. As these installations are intended to prevent contamination, closely control the environment, dilute contaminants or contain hazards, their very presence indicates that potential risks to health have been identified.

The Control of Substances Hazardous to Health (COSHH) Regulations 2002 place upon management an obligation to ensure that suitable measures are in place to protect their staff and others affected by the work activity. These methods may include both safe systems of work and the provision of a specialised ventilation system. In laboratories the requirements are often met by the provision of fume cupboards and microbiological safety cabinets.

Objectives of these procedures

This Document is intended to be complementary to Health Technical Memorandum (HTM 03-01 2021) and attempts to gather all relevant information required to operate and maintain in a unified manner the various types of mechanical ventilation systems in use throughout the University Hospitals of Leicester NHS Trust (UHL)

There are three principal objectives:

- To define activities associated with ventilation systems.
- To define the roles and responsibilities of operatives responsible for working on ventilation systems.
- To control hazards associated with work on ventilation systems

1) Management roles and responsibilities

It is essential that clear lines of managerial responsibility are in place for the avoidance of any doubt as to who is responsible for the safe operation and maintenance of ventilation plant and equipment. A periodic review of management systems should take place to ensure that agreed standards are being satisfactorily maintained. Those required inspecting, verifying, or maintaining ventilation equipment will be required to demonstrate their competence to do so. As a minimum they should have sufficient knowledge of its correct operation and be able to recognise and diagnose faults.

Designated staff functions

Any persons intending to fulfil any of the staff functions specified below should be able to prove that they possess sufficient skills, knowledge, and experience to perform safely, the designated tasks.

Management - General

Management is defined as the owner, occupier, employer, general manager, chief executive officer or other person within or on behalf of The Trust ultimately accountable for the safe operation of premises.

Designated Person (*where applicable*)

This person is responsible for providing the essential senior management link between The Trust's organisation and its professional support. The Designated Person will also be able to provide an informed position at Board level.

Authorising Engineer (Ventilation) [AE (V)]

The AE (V) is defined as the person appointed by Management to provide independent auditing and advice on ventilation systems, to oversee the appointment and training of Authorised Persons (Ventilation) and review and witness documentation on validation of systems.

Authorised Person (Ventilation) [AP (V)]

The AP (V) will be a person possessing adequate technical knowledge of ventilation systems, plant and equipment who has received appropriate training, having been appointed in writing by the Designated Person on the recommendation of the AE (V). The AP (V) will be responsible for the practical implementation and operation of The Trust's safety policy and procedures relating to the engineering aspects of ventilation systems.

Competent Person (Ventilation) [CP (V)]

The CP (V) will be the person defined as a person designated by The Trust's management to carry out maintenance, validation and periodic testing of ventilation systems.

Infection Prevention and Control Officer

The Infection Prevention and Control Officer (or consultant microbiologist, if not the same person) will be the person nominated by The Trust's management to advise on monitoring the infection prevention and control policy and microbiological performance of the ventilation systems.

Note: Major policy decisions should be made through an infection prevention and control committee. This committee should include representatives for the user department, estates and facilities or their nominated representative (the Authorised Person).

Plant Operator

The plant operator is any person who operates a ventilation system.

User

The User will be the person responsible for the management of the department or unit in which the ventilation system serves. This could typically be the head of department, operating theatre manager, head of laboratory, production pharmacist, and head of research or other responsible person).

Records

A record should be retained of those appointed to carry out the above functions, clearly stating the extent of the post-holder's duties and responsibilities and to whom they report.

Note: Substitute or replacement staff should be designated to cover for sickness, holidays, and staff transfers.

2) Management Team and Contacts

Position	Name	Contact Details
Executive Manager	RM	Chief Executive, Please see the contacts within Outlook or on InSite
Designated Person	DK	Director of Estates & Facilities, Please see the contacts within Outlook or on InSite
Trust Senior Operational Manager	MM	Deputy Director of Estates, Please see the contacts within Outlook or on InSite
Deputy Trust Senior Operational Manager	AM	Regional Estates Manager, University Hospitals Leicester Please see the contacts within Outlook or on InSite
Co-ordinating Authorised Person (ventilation)	MO	Senior Specialist Engineer University Hospitals Leicester Please see the contacts within Outlook or on InSite
Authorised Person (Ventilation)	PP, SF, RP, LH, RC, MO	University Hospitals Leicester Please see the contacts within Outlook or on InSite
Competent Person (Ventilation)	TBA from The AP's	University Hospitals Leicester Please see the contacts within Outlook or on InSite
Authorising Engineer (Ventilation)	Mr Graham Taylor	GPT Consult LLP. 4 The Warehouse, Union Wharf, Market Harborough Leicestershire LE16 7UW
Nurse Consultant for Infection Prevention and Control	IJ	University Hospitals Leicester Please see the contacts within Outlook or on InSite

Training

Routine inspection and maintenance procedures can cause risks to the health of staff undertaking the work and those receiving air from the plant. All those involved should be made aware of the risks and safe systems of work should be agreed. Suitable safety equipment should be provided as necessary, and training should be given on its use.

Any training provided should be recorded together with the dates of delivery and the topics covered.

Training in the use of safety equipment and safe systems of work will need to be repeated from time to time to cater for changes in staff.

Specific Health and Safety aspects

Staff engaged in the service and maintenance of extract ventilation systems may be particularly at risk from the likes of pathology departments, mortuaries, laboratories, endoscopy suites, source-protective isolation facilities and other areas containing a chemical, biological or radiation hazard. In such cases the risk should be identified and assessed.

The means by which a system can be rendered safe to work on should be determined and a permit-to-work on the system implemented.

Training in the exact procedures should be provided for all staff involved.

Some healthcare facilities such as pharmacy aseptic suites may contain specialised units that are subject to additional access restrictions. Estates or contract staff requiring access may need additional training or have to be accompanied when entering the unit.

Note: Reference should be made to the following guidance

Health & Safety Commission's Health Service Advisory Committee:

1. 'Safe working and prevention of infection in clinical laboratories and similar facilities.

2. 'The management, design and operation of microbiological containment laboratories.

3. 'Safe working and prevention of infection in the mortuary and post-mortem room'.

3) Operational Procedures

Planned work or emergency work on ventilation plant

A Permit to Work should always be employed if working on any Critical Ventilation System.

No ventilation system should be switched off without first considering what the plant is supplying and the consequences. A "Permission to isolate services" should be completed to ensure the user has prepared for the interruption of the air supply and the required operational protocols have been applied. This should be checked with the user; Supply and extract systems may be electrically interlocked. The plant information records should also be checked. This should also be used as to returning document to confirm all works are complete and the system has been returned to safe operational use and the area can resume routine clinical practices.

If the plant operating parameters are to be changed, check with the AP (V); AE (V) and User Department **A Permit-to-Work will be needed.**

When working on Local Exhaust Ventilation (LEV) systems, always check with the user before commencing work. Decontamination of a cabinet may be required before starting work. **A Permit-to-Work will be needed.**

Log Sheets

Log sheets for each ventilation system should be located and retained in the Estates Department and be completed on completion of any work carried out. The following information should be provided adjacent to the plant:

- Schematic diagram and department served.
- Safety information for department and maintenance personnel.
- Filter information.

4) Ventilation Systems

General requirements - AHUs

All ventilation plant should have been designed and installed to ensure compliance with Health Technical Memorandum (HTM 03-01 2021) any relevant Health Building Note and the 'Environmental Protection Act 1990, Part III: Statutory Nuisance' and the 'Noise and Statutory Nuisance Act 1993 have not been contravened.

All ventilation systems should be inspected annually to ensure conformity with minimum requirements which are designed to.

- ensure safe access when carrying out routine service and maintenance tasks.
- prevent or control risks associated with Legionella and other potential hazardous organisms.
- check that the system remains fit for purpose.
- Maintain records of outcome.

Every effort should be made to ensure that all air handling units (AHUs) achieve the minimum requirements set out below.

AHU Location and Access

All AHUs should be secured from unauthorised access.

Units located on roofs must have a safe and permanent means of access.

Suitable precautions must be in place to prevent personnel, equipment or tools from falling during maintenance activities.

Units located outside at ground level should be secured within a lockable compound to prevent unauthorised access. Vehicles should be excluded from the vicinity to ensure that exhaust fumes are not drawn into intakes.

All parts of AHUs should be easily and safely accessible for routine inspection and service.

The area around an AHU within a building should be tanked to prevent water penetration to adjacent areas and should be adequately drained.

Fire precautions should be in accordance with Firecode (HTM 05)

Combustion equipment must not be in a fire compartment that houses air handling equipment.

Plantrooms that house AHUs must NOT be used for general storage. Care should be taken to ensure that combustible material is not kept in the plantroom.

The plant must not contain any material or substance that could support the growth of microorganisms.

The plant must not contain any material or substance that could cause or support combustion.

Access to items that require routine service such as filters, coils and chiller batteries, should be via hinged doors. Where ventilation plant is located externally stays should be incorporated to hold doors in the open position requiring manual intervention to close the door.

Items requiring infrequent access such as attenuators may be via clipped or bolted-on lift-off panels. To prevent injury due to the mass of bolted-on or lift-off panels, the design of the AHU equipment should ensure that access to these items is from either the side or top, never from underneath. This is especially important where AHUs are located within ceiling spaces.

All doors and panels should be close-fitting and without leaks.

Every effort should be made to ensure that access can be achieved via fixed ladders and platforms or by pulpit-style movable steps.

Electrical and mechanical services should not restrict or impede access to those parts of the AHUs that require inspection.

Viewing ports and internal illumination should be installed in order to inspect filters and drainage trays.

Internal illumination should be provided by fittings to at least IP55 rating and should be positioned so that they provide both illumination for inspection and task lighting.

All the lights within a unit should be operated by a single switch.

AHU Intakes and Discharges

Air intake and discharge points should not be located where they will cause vitiated air to be drawn into a system. In existing systems, it may be necessary to extend the intake or discharge point to a suitable position. (HTM 03-01 Part A; paragraphs 9.35).

Each air intake and discharge point should be fitted with corrosion-resistant weatherproof louvers or cowls to protect the system from driving rain. The inside of the louvers should be fitted with a mesh of not less than 6mm and not more than 12mm to prevent infestation by vermin and prevent leaves being drawn in.

The duct behind a louvre should be self-draining. If this is not practicable it should be tanked and provided with a drainage system. Cleaning access must be provided either from the outside via hinged louvers or by access doors within the plenum on the inside. Where a common plenum is provided for more than one system, cleaning access should be via a walk-in door.

Where intakes are fitted with a frost battery these should be of the "open coil" pattern not requiring pre-filters. Removable filters must be fitted before incoming air passes through heater batteries.

AHU Drainage System

All items of plant that could produce moisture must be provided with a drainage system. The system will consist of a drip-tray, glass trap, air break and associated drainage pipework.

Some existing AHUs may not have been mounted far enough above the finished floor level to permit the correct installation of a drainage system. If an AHU cannot be raised to an adequate height an alternative arrangement (such as a pump-out system) must be provided. Where pump-out systems are incorporated they should be fitted with equipment fail indicators.

The drip-tray should be constructed from a corrosion-resistant material such as stainless steel and arranged so that it will drain completely. To prevent 'pooling' it is essential that the drain connection should not have an upstand and that a slop of approximately 1 in 20 in all directions should be provided to the drain outlet position. The tray must be completely accessible or, for smaller units, easily removable for inspection and cleaning.

Each drip-tray should be provided with its own drain trap of the clear (borosilicate) glass type to allow the colour of the water to be observed, giving an early indication of corrosion, biological activity or contamination within the duct. (Reference should be made to SHTM 03-01 Part A, paragraphs 4.20-4.25 and Part B, paragraph 3.29 for further information).

The trap should incorporate a means of filling and should have couplings to facilitate removal for cleaning. It should be in an easily visible position where it will not be vulnerable to casual knocks. Pipework connecting it to the drainage tray should have a continuous fall of not less than 1 in 20.

Traps fitted to plant located outside or in unheated plantrooms may need to be trace-heated in winter. The trace-heating should be checked for operation and must not raise the temperature of the water contained above 5°C.

Water from each trap must discharge via a clear air gap of at least 15mm above the unrestricted spill-over level of either an open tundish connected to a drainage stack via a second trap, or a floor gully (or channel). A support should be provided to ensure that the air gap cannot be reduced. More than one drain trap may discharge into a tundish provided each has its own air break.

Drainage pipework may be thermoplastic, copper or stainless steel. Glass should not be used except where previously described. Pipework should be of minimum diameter 22mm and have a fall of at least 1 in 60 in the direction of flow. Pipework should be well supported and located so as not to inhibit access to the AHU.

Dampers

AHUs serving critical areas and those that are shut down out of hours should be fitted with motorized low-leak shut-off dampers located immediately behind the intake and discharge of each supply and extract system.

Fan Drives

Fan-drive trains, both supply and extract, should be easily visible without the need to remove access covers. Protecting the drive train with a mesh guard is the preferred option. For weatherproof units in outside locations the fan drive should be enclosed but easily visible through a viewing port with internal illumination and accessible via a lockable hinged door.

The motor windings of induction-drive "plug" motor arrangements and in-line axial flow fans having a pod motor within the air stream must be protected from over-temperature by a thermistor and lockout relay.

Note: Where a fan is operated through a computer control system, it is necessary to ensure that it can be switched to a direct start with fixed speed and manual operation should the software develop a fault. This is particularly important for critical care systems serving operating theatre suites, high dependency care units of any type, isolation facilities, laboratories and pharmaceutical production suites.

Heater and Frost Batteries

Access for cleaning must be provided on both sides of heater and frost batteries.

Where auxiliary or 'trimmer' wet heater batteries are in false ceiling spaces they should be fitted with a catch tray and leak detection alarm. The catch tray should be installed under both the battery and the control valve assembly to protect the ceiling from leaks. A moisture sensor should be fitted in the tray. However, placing wet heater batteries in ceiling voids should be a last resort and avoided if possible.

Frost batteries should be of the 'open coil' (i.e. no fins) type as described in HTM 03-01.

Cooling Coils

Each cooling coil (whether forming part of an AHU or within a branch duct) must be fitted with its own independent drainage system as previously described. A baffle or similar device must be provided in the drip-tray to prevent air bypassing the coil and the tray should be of sufficient size to capture the moisture from the eliminator, bends and headers.

The cooling coil control valve should close upon selection of low speed, system shutdown, low airflow, or fan failure.

Where auxiliary wet cooling coils are in false ceiling spaces, they should be fitted with a catch tray and leak detection alarm. The catch tray should be installed under both the battery and the control valve assembly to protect the ceiling from leaks. A moisture sensor should be fitted in the tray.

Humidifiers

Humidifiers are no longer routinely required. Where they are fitted but have been out of use for a significant period they should be removed. All associated pipework should also be removed back to its junction with the running main.

Where humidifiers are fitted and their use is still required or can be justified, they should fully conform to the installation standards as set out in HTM 03-01 Part A, Section 4.

All humidifiers must be fitted with their own independent drainage system as previously described.

Only steam-injection humidifiers, whether mains fed or locally generated, are suitable for use in air conditioning systems within healthcare facilities. Water humidifiers (such as spinning disc type) if still fitted, should be removed.

Self- and locally generated steam humidifiers must be supplied with potable water and the installation should be capable of being isolated, drained and cleaned. HTM 03-01 Part A, Section 4 also refers.

Some steam generators are of a type that requires regular cleaning and descaling. The installation should enable them to be physically isolated from the air duct to prevent contamination of the air by cleaning agents.

The humidifier control system should fully conform to the standard set out in HTM 03-01 Part A, Sections 4 and 6.

Note: The section of ductwork containing the humidifier may require to be periodically decontaminated for which hinged access doors with viewing ports and internal illumination should be provided.

Filtration

All filters should be of the dry type. Panel filters are generally used as pre-filters and should be positioned on the inlet side of the supply fan, downstream of the frost coil. Secondary filters (usually of the bag-type or pleated paper) where required, should be on the positive pressure side of the fan.

The filter installation should provide easy access to filer media for cleaning, removal or replacement. A hinged access door should be provided for this. The upstream side of the filter should be visible for inspection by means of a viewing port with internal illumination.

All filters should be complete with a means of checking the differential pressure across them. Direct-reading dial-type gauges marked with clean and dirty sectors are preferred. During commissioning of ventilation plant the "design dirty pressure" value should be clearly marked on the respective gauges for future reference.

Note: Filters must be securely housed and sealed in well-fitting frames that minimise air bypass as this significantly reduces filter efficiency; the higher the filter grade, the greater the effect. Mounting frames should be designed to ensure that the airflow pushes the filter into its housing to help minimise air bypass.

High-efficiency filters – HEPA and ULPA

Where fitted, HEPA filters should be of the replaceable-panel type with leak- proof seals. Their installation should permit the validation of the filter and its housing.

HEPA filters are sometimes used in extract systems for the containment of hazardous substances or organisms. They may be fitted with pre-filters to extend their service life.

When used in this way the installation should incorporate designed provision for the subsequent safe removal and handling of contaminated filters by maintenance staff.

Energy Recovery and Control

Energy recovery, where fitted, will require cleaning access to both sides of the device.

Whichever type of energy recovery device is installed the extract side should be protected by a G3 filter and provided with a drainage system to remove condensate.

The heat recovery device should be controlled in sequence before utilisation of the main heater battery and may need to incorporate a control to prevent the transfer of unwanted heat when the air-on condition rises above the plant's required set point.

Note: To ensure continuing energy conservation the control system utilized in providing AHU time and temperature control will be regularly tested to ensure that all components are operational, are in calibration and that the system is performing correctly without any instability in control loops detected. Where faults are detected either in hardware, software or control loop stability these will require to be corrected as soon as possible.

Attenuation

Cleaning access should be provided at both ends of any attenuator unit.

Identification and labelling

All supply and extract ventilation systems should be clearly labelled. Labels should identify both the AHU and the area that it serves. The lettering should be at least 50mm high and be mounted in an easily visible place near the fan of the unit. Any sub-systems and the principal branch ducts should be similarly labelled.

The direction of airflow should be clearly marked on all main and branch ducts.

All air-flow test points should be clearly identified, and the size of the duct given.

All air-flow test points should be fitted with tight fitting removable rubber (flanged) grommets to prevent air loss / ingress.

5) Staff Training

Training will be appropriate to the staff member and reflect his/her involvement in ventilation management and maintenance.

Training can be provided by manufacturers, installers, external approved training bodies and in-house estates staff

The following topics will typically be covered:

- Electrical Safety
    - All staff to be authorised, competent or skilled under The Trust's Electrical Safety Policy.
- Personal Protection
    - Staff to be aware of and possess a copy of The Trust's Personal Protection Policy. Any specialised protection will be provided and recorded separately.
- Ventilation Measurements
    - Training in the use of the instrumentation, interpretation of the readings and the effect on plant due to changes in parameters.
- Control of Legionella
    - Awareness of the implications of Legionella and the possible causes in a ventilation system. The method of reporting a potential hazard and the appropriate treatment.
- Working on Steam Systems
    - Awareness of the guidance given in The Trust's Steam Generating Plant Policy. (HTM 08-08: Pressure Systems also refers.).

6) Typical Types of Mechanical Ventilation Systems

Depending on the complexity, size and extent of facilities, the following would be expected:

- wall fans (supply or extract).
- roof fans (supply or extract).
- air handling and distribution plant.
- general extract plant.
- dirty extract.
- local split system air cooling systems.
- laminar flow installations.
- air conditioning systems.
- supply and extract with heat recovery.
- supply and extract with percentage fresh air.
- local exhaust ventilation systems.

Local Exhaust Ventilation Systems

Local exhaust ventilation (LEV) systems are used to protect personnel from chemical, gaseous, biological, and general dust hazards. They are designed to capture the pollutant at source and safely discharge it. The following are typical examples of LEV applications:

- laboratory fume cupboards.
- pharmacy safety cabinets including cytotoxic cabinets.
- pathology microbiological safety cabinets, formaldehyde mixing and specimen preparation bays.
- glutaraldehyde mobile cabinets and workstations.
- dental grinders, buffers, casting machines, sand blasters and plating baths.
- X-ray and photographic film processing units.
- mortuary bone saws, dissection table and specimen bench extracts.
- fixed and mobile welding and soldering bay fume extract equipment.
- battery charging bay extract.
- wood working machinery dust control systems.
- general dust extract systems.

Note: HSE Document 'Controlling airborne contaminants at work' (appendix 1 refers) offers sound advice on all aspects of LEV systems and is available as a free download from their website.

All LEV systems must be subjected to an initial thorough examination and test. HS (G) 54 'The Maintenance Examination and Testing of Local Exhaust'.

7) Plant Performance and Records

All plant information will be filed in the estate's office in plant and performance records.

Any alteration to plant, measurements taken, or testing must be recorded on the correct documentation.

The following information should be retained:

- Original Commissioning Information.
- Plant Data Sheet.
- Plant Performance Sheet.

- Ventilation Grille Layout.
- Log-Sheet (Ventilation plant).
- Amendment Sheet.
- Fire Damper Tests.
- Microbiological Performance Tests.
- Plant Disinfection Records.
- Cleaning Programme.
- Ventilation Register.
- Log Sheet (LEV).
- Permit-to-Work (LEV).

8) Statutory Legislation and Guidance

Statutory Requirements

It is the responsibilities of the owners, operators and occupiers of premises, general managers, and chief executives to ensure that their premises and the activities carried out within the premises comply with all statutes.

The following comprise the most important statutory requirements affecting ventilation systems:

- Health and Safety at Work etc. Act 1974.
- Management of Health and Safety at Work Regulations 1992.
- Workplace (Health, Safety and Welfare) Regulations 1992.
- Provision and Use of Work Equipment Regulations 1998.
- Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 1985.
- Control of Substances Hazardous to Health (COSHH) Regulations 2002.
- Manual Handling Operation Regulations 1992.
- Personal Protective Equipment at Work Regulations 1992.
- Electromagnetic Compatibility Regulations 1992.
- Control of Legionellosis.
- HVCA Cleanliness of Ventilation Systems PR/17.

HSE Controlling airborne contaminants at work.