The Institute of Healthcare Engineering and Estate Management

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Design Output and Performance Specification Guidance for the Ventilation Strategy / Systems for Dental Care Facilities

Ventilation Technical Platform (VTP)- LIBRARY OF TECHNICAL GUIDANCE

Introduction

This guidance note has been produced to provide a baseline minimum operational standard for dental practices with regards to the ventilation performance. The guidance includes both a principle section for the ventilation strategies to be considered for the standard operation of a dental care facility with a specific section for issues relating to the safe management of facilities during the current COVID-19 situation. These additional specific standards may also be potentially beneficial for any other future infection risk which could be impacted or transmitted via an airborne route.

The guidance is intended to provide both non-technical information and areas to be considered for dentists, practice managers and other healthcare professionals. In addition it provides detailed performance information to ventilation specialists, engineering designers and installers to ensure systems can be appropriately designed, installed, commissioned, and validated to provide a safe and appropriate dental care environment.

For the avoidance of doubt the design standard is intended for use in both primary and secondary care settings. It is not intended as a retrospective standard for existing systems, but provides advice and guidance on new installations or refurbishment / improvement design schemes.

In any healthcare facility that are outside of the hospital curtilage, for example private dental practices, a risk assessment of the nature of the treatment being delivered, condition of the patients and intensity of use needs to be undertaken by those responsible for the facility in order to determine the extent to which this guidance will be applicable.

The use of ventilation as an environmental mitigation is based on the process of dilution of the aerosol by introducing 'outside air'. Ventilation can be provided by either natural or mechanical means and there are a variety of methods which can be considered to achieve dilution. It should be noted that ventilation is not effective on its own and must be considered as part of a range of mitigation measures.

Background

The legal requirement to provide ventilation is contained within the Workplace (Health, Safety and Welfare) Regulations 1992 and in Northern Ireland, the Workplace (Health, Safety and Welfare) Regulations (Northern Ireland) 1993. In addition, the Scottish Building Technical Handbook (non-domestic) in Scotland and Approved Document F in England, Wales and Northern Ireland, the Building Regulations (Northern Ireland) 2012, Part K provide the regulations for the ventilation requirements to maintain indoor air quality in all workplaces.

The ventilation is important in any facility as it provides a means of bringing outside air into a space to remove contaminants and permit a healthy working environment.

There is a minimum requirement for outside air this is recommended by the Chartered Institute of Building Services Engineers (CIBSE) and the current Building Regulations (Part F) to be typically 10 l/s/person for most spaces. Healthcare ventilation guidance provides a further recommendation for the number of air changes per hour (ACH) in certain spaces within a healthcare environment (i.e. 10 ACH for a treatment room; guidance is provided in HTM 03-01 and SHPN 36 Part 2 Appendix 2).

Ventilation Strategies

Ventilation can be provided by either natural or mechanical means or a combination of the two.

- natural ventilation
- mixed mode ventilation
- mechanical ventilation

Natural ventilation

Natural ventilation is usually created by the effects of wind pressure. It will also occur if there is a temperature difference between the inside and the outside of a building. The “thermo-convective” effect frequently predominates when the wind speed is low, and will be enhanced if there is a difference in height between inlet and outlet openings.

Ventilation induced by wind pressures can induce high air-change rates through a building, provided air is allowed to move freely within the space from the windward to the leeward side. Opening windows at opposite sides/elevations of the building may provide an improved through draft, however, in most healthcare applications, internal subdivisions will restrict or prevent this effect.

In many situations the restriction in window opening, (typically in Healthcare, windows restrictors are required fixed at 100mm opening for patient safety), will mean that purpose made ventilation openings are needed to achieve the necessary airflow rates. The air entering the openings may need to be controlled by motorised dampers linked to temperature, occupancy, and / or carbon dioxide sensors in the ventilated space. This approach is likely to be most suitable for new designs / installations, provided room conditions and ventilation performance strategies can be achieved and demonstrated, as the majority of existing premises use openable windows for natural ventilation.

With natural ventilation, it is almost impossible to maintain consistent flow rates and ensure that minimum ventilation rates will be achieved at all times. However, this variability is normally acceptable in such areas as office accommodation, staff areas, waiting and consulting rooms. Natural ventilation may be provided by opening windows, damper-controlled openings, trickle vents in widows or air bricks through walls, which can be either permanently open or closable.

Further information can be found in Health Building Note (HBN) 00-10 Part D – 'Windows', BS 5925 and CIBSE's Applications Manual AM10 – 'Natural ventilation in non-domestic buildings'.

The most common form of natural ventilation is achieved through openable windows or windows with 'trickle' vents fitted. Where natural ventilation is used in clinically sensitive areas (where instruments may be open to the air or in treatment spaces then insect screens should be incorporated to reduce the risk of contamination from outside during periods of insect activity.

Mixed mode ventilation

Mixed mode ventilation is an assisted form of natural ventilation. Fans are fitted in purpose-made damper-controlled ventilation openings. Alternatively, a separate draw- or blow-through ventilation unit may be installed. In both cases the dampers and fans are controlled by temperature and occupancy sensors to ensure a minimum airflow rate while taking advantage of natural ventilation effects when present.

Where natural or mixed mode ventilation is adopted with complex air paths, the designer should produce an airflow diagram in order to ensure correct provision of air-transfer devices. CIBSE's

Applications Manual AM13 – 'Mixed mode ventilation' gives guidance. Modelling of the airflows under a range of conditions should be undertaken to establish the airflow paths.

Openable windows are the base form of natural ventilation. Mechanical ventilation is normally via ductwork and ceiling grilles; however, some surgeries may only have wall/window mounted fans. This combination of ventilation provision would be considered as mixed mode.

Mechanical tempered-air-supply systems

Where mechanical supply systems are required, the outside air should be tempered and filtered before being delivered to the space in order to avoid discomfort.

The majority of space air temperature heating load will be provided by the energy-recovery device with the balance from a constant or variable temperature battery. In most instances, the low pressure hot water (LPHW) heating system should offset any fabric loss so that set-back room temperatures can be maintained during unoccupied periods without the need for the ventilation system to operate.

Mechanical or forced ventilation systems will typically involve an air handling unit (AHU) or air source heat pump (with a outside air supply feature), which will bring in outside air, heat/cool it to an appropriate temperature and supply it to the room(s), with either an integral combined or separate extract system removing air from the space.

It has been established to a relatively high degree of certainty that outside air should be maximised and recirculation isolated or minimised as far as reasonably practical to reduce the current risk from COVID-19.

Extract ventilation systems

Extract ventilation is required in sanitary facilities, dirty utilities and rooms where odorous but non-toxic fumes are likely; this is to ensure air movement into the space. A single fan/motor unit should be provided to meet this need. There is no healthcare requirement to provide a separate foul/ dirty extract system. Care should be taken to ensure the location of the air discharge does not create an issue to others or any potential 'short circuiting' of exhausted air back into the facility.

Clean Air Paths

When considering the type of ventilation to be used it may be important to consider the need to create clean air paths. The ventilation should provide a clean airflow path to control staff or patient exposure to potential contamination. Ideally any source of potential contamination should have an airflow which takes the contamination safely outside without the air passing through another person's breathing zone. Typically this can be achieved with introducing filtered outside air at high level through ceiling mounted ductwork and grilles and extracting it at low level or immediately from an area at the foot of the treatment chair/couch. Airflow should be away from the heads of the dentist, patient and nurse and ideally towards the foot of the patients' chair.

Excessive air movements or air velocities (draughts) may create unwanted turbulence of aerosols, increasing the time with which they will remain airborne and increasing the risk of airborne transmission.

Pressure Cascades

In addition to the dilution effect that ventilation can provide to a clinical space to reduce the airborne concentration of any contamination created within the room from the occupants of clinical activities, it can also be used to provide an airflow from clean to less clean or a degree of isolation/separation of rooms. This is known as a pressure regime or cascade.

Positive Pressure

In simple terms a positive pressure cascade is achieved by ensuring the ventilation supplied to a room is of a greater flow rate than that of the surrounding areas, and provides a clean air path from the room out to surrounding areas minimising the risk of contamination entering the room from other areas.

A well-designed ventilation scheme that provides a suitable quality of air and efficiently scours the space will further reduce any potential airborne contamination. If the ventilation maintains the space at a positive pressure to adjoining areas, the risk of contaminants originating outside of the space entering will be reduced.

Negative Pressure

A negative pressure cascade is the opposite of the positive pressure cascade which ensure more air is extracted from a room than is supplied ensuring any make up air is drawn in from surrounding areas. Care needs to be taken that the supply air is sufficient to supply heating, cooling, outdoor air to provide compliant environmental conditions, when the extract air change rates are greater than supply.

Balanced Pressure cascade

A balanced ventilation system is a combination of both a supply and an extract systems of equal volume which provides a neutral environment with limited air movement between rooms/spaces.

A balanced system is necessary in instances where it is essential to maintain consistent air movement within an area (for example, recovery rooms).

Airborne risks to staff

Some dental healthcare workers may be at no more risk from airborne hazards when at their workplace than they are when not in a healthcare environment; however, certain groups as detailed below may be exposed to a variety of airborne contaminants;

- Staff who administer anaesthetic agents or who work in areas where they are routinely used will be at risk of casual exposure to these agents. Specific workplace exposure limits exist for these agents and further information and guidance is available from the HSE website in the EH40 and HSG 258 publications.
- Staff who routinely work in areas where they may come into close or extended contact with patients who have respiratory symptoms will be at risk of exposure to the microorganisms including COVID-19.
- Staff who come into contact with patients who are asymptomatic
- Staff working within the aerosol generation area during a patient's treatment
- Staff who clean the dental chairs and treatments rooms after treatment
- Staff who pre-clean used dental instruments and equipment prior to decontamination.

A well-designed ventilation system can mitigate or reduce the airborne risks to staff. It should:

- supply sufficient unvitiated air to dilute the possible contaminants;
- have air terminals located to efficiently scour the ventilated space;
- move the air from the clean to the less clean space and/or out of the building;
- supply the air at high level and remove it at low level so that the breathing zone of staff is in a clean airflow path.

Adoption of these principles will be sufficient to control the general risk to the staff identified above in their particular working environment. More specific airborne hazards should be captured at source and removed by local exhaust ventilation (LEV) systems provided under the COSHH Regulations.

Individual Room Ventilation Standards (for Primary and Secondary care settings)

All systems are to be designed to provide the following room conditions;

Treatment Rooms (with gaseous sedation)

Ideally each treatment room should achieve a minimum of 15 air changes per hour, be maintained at a positive pressure to surrounding areas, be filtered to a standard equivalent to the superseded BS EN 779:2012 (withdrawn in 2018) F7 grade. Typically this will be ISO ePM2.5 to 50-60% standard subject to outside air quality and desired indoor air quality. The room should also be capable of an environmental condition maintaining a set point of between 18 to 25°C. Specific care should be taken to calculate and control latent heat gains from medical equipment and personnel to manage room temperatures (potentially require air conditioning / cooling and this can be provided by in room circulation cassette style units, although not considered ideal). These types of air conditioning/cooling unit only recirculate air and cannot be used to calculate air change rates and should be avoided in the current COVID-19 pandemic, and only considered after completion of a suitable risk assessment.

Treatment Rooms (without gaseous sedation)

Ideally each treatment room should achieve a minimum of 6 - 12 air changes per hour, be maintained at a positive pressure to surrounding areas, be filtered to a standard equivalent to the superseded BS EN 779:2012 (withdrawn in 2018) F7 grade. Typically this will be ISO ePM2.5 to 50-60% standard subject to outside air quality and desired indoor air quality. The room should also be capable of an environmental condition maintaining a set point of between 18 to 25°C. Specific care should be taken to calculate and control latent heat gains from medical equipment and personnel to manage room temperatures (potentially require air conditioning / cooling and this can be provided by in room circulation cassette style units, although not considered ideal). These types of air conditioning/cooling unit only recirculate air and cannot be used to calculate air change rates and should be avoided in the current COVID-19 pandemic, and only considered after completion of a suitable risk assessment.

Recovery rooms (for use of gaseous sedation)

Ideally each recovery room should achieve a minimum of between 10 to 15 air changes per hour, be maintained at a neutral pressure to surrounding areas, be filtered to a standard equivalent to the superseded BS EN 779:2012 (withdrawn in 2018) F7 grade. Typically this will be ISO ePM2.5 to 50-60% standard subject to outside air quality and desired indoor air quality, and maintain an environmental condition which must be capable of maintaining a set point of between 18 to 25°C.

Recovery rooms (general)

Ideally each recovery room where no gaseous sedation has been used should achieve a minimum of 6 air changes per hour, be maintained at a neutral pressure to surrounding areas, be filtered to a standard equivalent to the superseded BS EN 779:2012 (withdrawn in 2018) F7 grade. Typically this will be ISO ePM2.5 to 50-60% standard subject to outside air quality and desired indoor air quality, and maintain an environmental condition which must be capable of maintaining a set point of between 18 to 25°C.

Equipment cleaning / Areas

All instrument cleaning rooms, should achieve a minimum of 10 air changes per hour, and be maintained at a negative pressure (-10Pa) to surrounding areas.

Dirty Utility rooms

All dirty utility/disposal rooms, should achieve a minimum of 6 air changes per hour (extract only), and be maintained at a negative pressure (-5Pa) to surrounding areas.

Clean utility / instrument storage areas

All clean utility rooms/areas to have a minimum of 6 air changes per hour, be maintained at a positive pressure (+5Pa) to surrounding areas, be filtered to a standard equivalent to the superseded BS EN 779:2012 (withdrawn in 2018) F7 grade. Typically this will be ISO ePM2.5 to 50-60% standard subject to outside air quality and desired indoor air quality, and maintain an environmental condition which must be capable of maintaining a set point of between 18 to 25°C (subject to assessment of any specific drug or material storage limits).

Kitchens / Beverage Bays

All kitchens and beverage bays, should achieve a minimum of 6 air changes per hour extract only (for odour control), and be ideally maintained at a negative pressure (-5Pa) to surrounding areas.

Welfare Facilities (Toilets, showers, staff changing)

All toilets, shower and changing rooms, should achieve a minimum of 6 air changes per hour (extract only), and be maintained at a negative pressure (-5Pa) to surrounding areas.

Reception areas

Reception areas must be ventilated to achieve compliance to building regulation standards (currently 10 litres per second per person, subject to a calculated maximum occupancy level) and maintain a locally agreed environmental temperature/condition. This may be achieved through natural ventilation (openable windows/door) where practical.

Offices

Office / general areas must be ventilated to achieve compliance to building regulation standards (currently 10 litres per second per person, subject to a calculated maximum occupancy level). This may be achieved through natural ventilation (openable windows/door) where practical.

Waiting Areas

Patient waiting areas must be ventilated to achieve compliance to building regulation standards (currently 10 litres per second per person, subject to a calculated maximum occupancy level) and maintain a locally agreed environmental temperature/condition. This may be achieved through natural ventilation (openable windows/door) where practical.

Multiple Dental Treatment areas (Open plan teaching units / Dental Hospitals)

Ideally each treatment chair should have local low level extract at each chair head, and the room as a whole should achieve a minimum of 15 air changes per hour, be maintained at a neutral pressure to surrounding areas, be filtered to a standard equivalent to the superseded BS EN 779:2012 (withdrawn in 2018) F7 grade. Typically this will be ISO ePM2.5 to 50-60% standard subject to outside air quality and desired indoor air quality. The room should also be capable of an environmental condition maintaining a set point of between 18 to 28°C. Specific care should be taken to calculate and control latent heat gains from medical equipment and personnel to manage room temperatures (potentially require air conditioning / cooling and this can be provided by in room circulation cassette style units, although not considered ideal). These types of air conditioning/cooling unit only recirculate air and cannot be used to calculate air change rates and should be avoided in the current COVID-19 pandemic, and only considered after completion of a suitable risk assessment.

Oral Surgical Units / Theatres

These type of oral surgical theatres should be designed to comply with the standards for conventional theatres as specified within HTM 03-01. These procedures could include maxillofacial oral surgery or dental implants involving an incision to expose the underlying bone of either upper or lower jaw.

System Installation Standards

All ventilation systems and associated plant should be in full compliance with the NHS Model Engineering Specifications C04 (archived but remains a good standard to use as a base minimum standard), BESA DW142 & 144, and HTM 03-01 Guidance.

All ductwork is to be manufactured from rigid galvanised metal ductwork (either spiral wound of rectangular) with all bends formed and not utilise flexible ducting unless limited to less than ½ metre in length and not used in place of formed bends for changes in direction.

All supply grilles should avoid draughts to patient areas, all extract grilles to be fixed bar grilles with removable core for low level extract grilles. All grilles to be installed with opposed blade dampers for final balancing, however these should not be used in place of duct mounted volume control dampers for system proportional balancing.

Ductwork distribution systems to have installed sufficient volume control dampers and access doors to facilitate balancing and internal inspection. All areas where ductwork passes through fire compartmentation to have fire/smoke dampers complying with EN 15650 (2010), BS 1366-2 (1999), and EN 13501-3 (2005) with suitable access doors fitted to both sides of the damper to facilitate access and maintenance.

All air conditioning units, primary or secondary cooling units must have a legionella risk assessment completed prior to final validation and handover.

The design of the ventilation system is to be co-ordinated to support the fire strategy for the unit and be subject to review and comment by the client or his representative prior to final sign off.

Fans of all types are used for ventilation and air conditioning applications, including those used in AHUs. The Ecodesign Directive 2009/125/EC lays out the framework defining the rules for setting product specific efficiency requirements and legislation on energy efficiency. All air handling units supplied and installed from the 1st January 2016 must conform to the legislative requirements of the EcoDesign Directive and the Energy-Related Products Directive (ErP). All designers must ensure that AHU's include for ErP compliant air handling units.

Applicable Ventilation Standards & References:

- HTM 03-01 Parts A & B – Specialist Ventilation for Healthcare Premises
- BS EN 13053: Ventilation for buildings. AHUs. Rating and performance for units, components and sections.
- BS EN 1886: Ventilation for buildings. AHUs. Mechanical performance (Stipulates the casing air tightness).
- BS EN 779: Particulate air filters for general ventilation. Determination of the filtration performance. (G1 to G4, M5 to M6 & F7 to F9).
- ISO 16890:2016 Air Filters for General Ventilation Parts 1 - 3
- BS EN 13779: Ventilation for non-residential buildings.
- EN 308: Heat exchangers. Test procedures for establishing performance of air to air and flue gas heat recovery devices. (At reference conditions of +5˚C outside, +25˚C inside and dry conditions).
- HBN 00-03 - Clinical and clinical support spaces
- SHPN 36 Part 2 (2006)
- HTM 04-01 Parts A, B, & C – The control of legionella, hygiene, "safe" hot water, cold water and drinking water systems.
- HSE L8 Legionnaires' disease - The control of legionella bacteria in water systems Approved Code of Practice and guidance on regulations
- HSG 274 Legionnaires' disease: Technical guidance, Parts 1, 2 & 3.
- HSG 258:2017 Controlling airborne contaminants at work - A guide to local exhaust ventilation (LEV)
- NHS COVID-19 ventilation guidance for single rooms Novel coronavirus (COVID-19) standard operating procedure Room Ventilation Guidance for Single Rooms (not operating theatres)
- NHS OCDO Standard operating procedure Transition to recovery A phased transition for dental practices towards the resumption of the full range of dental provision - Published 28 August 2020: Version 3
- Decontamination Health Technical Memorandum 01-05: Decontamination in primary care dental practices
- Role of Ventilation in Controlling SARS-CoV-2 Transmission SAGE-EMG
- Potential application of Air Cleaning devices and personal decontamination to manage transmission of COVID-19 SAGE-EMG 4th November 2020.
- PHE NHS Covid-19 Infection Prevention and control Dental Appendix, published 20 October 2020 , Updated 18 January 2021

COVID-19 Specific Issues and Considerations

Ventilation is an important factor in providing a safe and comfortable workplace, and this is widely recognised within healthcare guidance and building control regulations. Appropriate ventilation is considered important in terms of general health and wellbeing and current guidance recommends 10 air changes per hour for new buildings which include health treatment rooms.

In addition to the benefits of an adequately ventilated work place, ventilation has been identified as an important factor in eliminating aerosols within a dental surgery following an aerosol generating procedure (AGP), and is considered a key mitigation in reducing the risk of contamination.

PHE, NSS SBAR and SDCEP have all highlighted the importance of increasing air changes per hour (ACH) in a dental surgery as a means of reducing fallow-time, and this is now being considered as a critical element in reducing risk.

Particulate aerosols of <5µm, can potentially contain viable SarsCo-V2 virus. Particles of <5 µm can suspend in the air for a significant period of time and can theoretically be inhaled by patients or dental staff, settle in the lower respiratory system and cause infection. It should be noted that as yet, there is little evidence to indicate the risk of transmission from a dental aerosol although the minimum infective dose of SARS-COV2 (COVID-19) is currently unknown. Maximising the ventilation rates in all areas is important but especially those where AGP's are undertaken to increase patient throughput and minimise fallow time between patients whilst minimising risks to staff and patients.
Ventilation improvements can be very time consuming, complex and expensive, so it is critical to identify the current ventilation arrangements and options to improve airflow rates in a quick and cost effective manner. Options for a ventilation strategic review could include a range of options including but not limited to;

- Allocate a small number of rooms where AGP's are to be undertaken and ensuring ventilation is maximised within those areas,
- Ensure openable windows are opened as much as possible without causing excessive cooling or draughts in patient areas. This option may require improvements to a buildings heating system,
- Provision of simple extract units, such as window or wall mounted extract fans to provide a good air change rate within a treatment area, utilising natural air infiltration to replace extracted air. This option may require improvements to a buildings heating system to offset the heat losses caused by increasing extract airflows,
- Provision of ceiling mounted outside air source heat pumps or 'lozenge' type air handling plant to provide both tempered supply air and extract air within a designated treatment area. These types of unit will not be fully compliant to HTM 03-01 standards, but will provide a tempered air supply system in an energy efficient manner.
- Provision of a fully compliant HTM 03-01 air handling unit with full supply and extract functionality with appropriate filtration and room pressure cascades. This option will be expensive, but would provide a fully compliant system for a likely working lifespan of around 20 years, although will require dedicated plantroom provision and maintenance support.
- If there are no other available options then use of in room air scrubbers / UVC decontamination units may offer a very short term temporary improvement, whilst more appropriate engineering solutions are developed (see additional notes below).

Dental staff are recommended to give consideration to all of the above and where considered necessary review the PHE guidance and consult with their appropriate Authorising Engineer (Ventilation) or other suitably qualified and experienced healthcare building services engineering consultant for the associated engineering specialty.

Airborne contamination dilution rate and timescales

Due to the current Coronavirus (COVID-19) situation there is a great deal of interest and advice on if the virus is an airborne infection risk and if so how long does it take to clear any contamination from a room after an infectious patient has been present.

In simplified terms 6 air changes removes 99.8% of any airborne contamination provided no additional contamination is released (I.e. in an empty room after an AGP), provided that good air movement/mixing and total room dilution is achieved. The formula is 63% removal per air change, with every subsequent change removing a further 63% of the remaining level.

The rate of clearance of aerosols in an enclosed space is dependent on the extent of any mechanical or natural ventilation and the size of the droplets created – the greater the number of air changes per hour (ventilation rate), the sooner any aerosol will be cleared.

The time required for clearance of aerosols, and thus the time after which the room can be entered without a filtering face piece (class 3) (FFP3) respirator, can be determined by the number of air changes per hour (ACH) as outlined in WHO guidance.

Where feasible, environmental decontamination should be performed when it is considered appropriate to enter the room or area following an AGP without an FFP3 respirator. A single air change is estimated to remove 63% of airborne contaminants, after 5 air changes less than 1% of airborne contamination is thought to remain. Clearance of infectious particles after an AGP is dependent on the ventilation and air change within the room.

Within dental treatments rooms where natural ventilation is the only source of ventilation, the main concern is the amount of time required to remove any residual airborne contamination. It is difficult to calculate the air change rates and these will change frequently dependent on wind speed and internal/external temperatures. This time will increase further if there are no openable windows or other means of ventilation within the treatment room itself.

Portable / Temporary Re-circulation Filtration Units (Inc. HEPA)

If an air scrubber/filtration unit is considered it will not provide any dilution or outside air supply into the room, but may remove some contamination and particles from the air.

Mobile or temporary air scrubber/filtration units are being proposed for numerous applications especially where COVID-19 risks have been identified. The following issues need to be considered;

The units generally do not provide any form of outside air supply or dilution into the space.

The units generally do not filter odours or gases and as such only remove particles. Some portable filtration units are available with combination filtration solutions filtering particulate and odours and gasses. The filter should be provided with a test certificate to verify its performance to EN1822:2019.

The units may have some positive effect on overall airborne contamination levels but will act as a concentration of particles within the unit / filter.

The primary consideration for these units should include;

The total volume of air circulated over a given time period (litres/hour) when compared to the overall room volume.

The efficiency of the filter and estimated lifespan and maintenance requirements of the filters.

The independent test data and evidence based research which has been undertaken and peer reviewed to demonstrate the efficacy of the units in use.

The cost benefit analysis of the units as a solution as opposed to mechanical ventilation (supply and extract) provision.

Clinical Risk Assessment

As advised within the HTM 03-01 guidance prior to the deployment of these types of unit the Infection Prevention Control Team or Clinical leads for the area should undertake and record an assessment of risk from both the use and potential impact of not utilising a portable filtration unit. If no other practical solution is available then a portable filtration unit could potentially be considered as a temporary solution.

As part of this assessment it is essential that the appropriate unit settings and unit position within the specific clinical space are recorded. This information along with suitable and sufficient training must be provided to any staff who are expected to work in an area where these units are deployed to ensure their continued safe operation and operational effectiveness.

Infrastructure Assessment

In addition to the clinical assessment there will be a need to undertake an assessment of where and how any portable unit can be located. Areas to assess will include electrical load and capacity, location of the unit to ensure that air discharge does not interfere with any other ventilation systems or equipment, and any increased latent heat gains generated by the unit.

Location / Access to the unit

Both the clinical and infrastructure risk assessment should consider the physical location of the unit to minimise anyone being directly within the outflow air path to avoid both draughts and to maintain a clear zone at the point of discharge. The unit should be clearly labelled to discourage touching or moving the unit unless during cleaning/maintenance works and then it must be put back into the agreed / specified location within the risk assessment. If an adjustable fan speed is available on the unit the risk assessment should specify a maximum setting to minimise air currents within the breathing zones of staff.

Maintenance Standards

These types of unit require frequent inspection and checking to both ensure appropriate performance and minimise infection risks and maintain good hygiene standards.

User Daily checks and cleaning

The clinical area users should inspect and check the unit of correct operation daily including a wipe down of external surfaces with a damp, clean cloth and ensure that no signs of damage are present. Any issues or concerns should be reported immediately to the designated responsible person or maintenance provider.

Weekly Inspection and Servicing EXTENT OF WORK TO BE INCLUDED

- Check operation of the unit
- Check operation of all functions of the controller
- Examine and clean external surfaces of all motors, filters, fans, grilles and louvres.
- Check and clean or renew air filters as necessary
- Check electrical connections
- Check all covers are secure.

Temporary UV Light units (fixed and Mobile)

UV light units are generally only suitable for room decontamination when not in use or following occupation by an infectious or suspected patient. These units can be considered as an alternative to the use of a peroxide fogging systems, but have a number of potential issues to consider;

Exposure or 'kill' time to effectively clear surface contamination.

Typically the disinfection efficiency is directly related to the time-length of exposure to the UV source,

What is the distance of the target from the UV source, and

Ensuring all surfaces are accessible and no shadowing issues exist.

The efficiency of the UV bulbs / light source and estimated lifespan and maintenance requirements of them.

The independent test data and evidence based research which has been undertaken and peer reviewed to demonstrate the efficacy of the units in use.

The cost benefit analysis of the units as a solution as opposed to mechanical ventilation (supply and extract) provision.

Review and Reassessment

Any deployment of portable filtration or UV systems should only be considered as a last resort and MUST be kept under constant review. When a technology such as UVC is indicated as being suitable for use the current international

technical standards that apply to that technology should be referenced so that performance and suitability can be repeatedly proven. eg. For UVC ISO 15714:2019

As a minimum a 4 weekly formal review should be undertaken and recorded for each area where the units are used and progress on permanent repairs or solutions should be recorded to ensure that these types of units do not become long term. In practical terms the use of these units should never need to exceed 3 months (unless specific identified issues exist).