NHS National Services Scotland

Notes for Boards

Summary of Guidance

Infection Prevention and control (IPC) Considerations for Isolation Room Design and Patient Placement

November 2025

Antimicrobial Resistance & Healthcare Associated Infection (ARHAI) Scotland
An NHS Scotland Assure Service

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Approvals

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Contents

Introduction

Across the NHS Scotland healthcare estate there is a variety of single patient room types which are used to “isolate” patients. The demands for a single patient room can be for many reasons but is not limited to source isolation, protective isolation, source and protective or their suspected risks, patient safety, patient confidentiality, equality duty and mental health challenges. Due to the variation in single room and suite design, over time, there is limited guidance to aid clarity for operational decision-making regarding patient placement for infection prevention and control purposes within healthcare settings’ existing estate.

In 2018 HPS surveyed all health boards to establish the number and type of isolation rooms within the existing facilities.[1] Boards identified a number of single room designs across the NHS Scotland estate at that time; however, none were Positive Pressure Ventilation Lobby (PPVL) room designs which were included in the 2008 Scottish design guidance.[2]

This document aims to support NHS boards by providing a summary of guidance regarding the design, commissioning, validation, verification, and maintenance of isolation rooms and when they should or can be used. This document will signpost staff to relevant guidance documents and assist with understanding patient isolation requirements. It will recognise existing facilities that are suitable for isolation purposes and identify optimal requirements for proposed new isolation facilities.

For new construction projects where isolation facilities are required, a multi-disciplinary approach should be taken, with the infection prevention and control team and an independent authorising engineer involved in all aspects of planning to determine the suitability, quantity and location of isolation facilities for the proposed patient population.[3]

This document does **not** cover isolation facilities for patients confirmed to have contact high consequence infectious diseases (transmissible viral haemorrhagic fevers), who tend to be managed in high-level isolation units.

This document **does** cover isolation rooms for patients with suspected or confirmed airborne high consequence infectious diseases (HCID)**.**

Airborne HCID treatment centres will have their own local risk assessments in place to care for patients within these facilities. (see High consequence infectious diseases (HCID) for the current list of diseases).[4]

For the purpose of this document patient isolation refers to isolation of patients for infection prevention and control purposes only. There are many other reasons for patient placement in single rooms, such as observation, segregation or privacy, which are outwith the scope of this document.

Questions and answers

Question 1: Why do healthcare establishments require patient isolation facilities?

Answer:

Healthcare establishments require patient isolation facilities to prevent transmission of infection or protect vulnerable patients from infection. They are used to help prevent pathogens from spreading to service users and staff.[5]

These facilities can be used to:

- Isolate vulnerable (high-risk) individuals who are known to be highly susceptible to infection to protect them and **prevent** them from exposure to pathogens and reduce the risk of them developing an infection. Designed to prioritise individual safety, above that of the public or staff outside room. (Protective isolation, internationally called Protective Environment or PE room).[2]

or

- Isolate individuals with known airborne or suspected infection to protect others to **control** infection. Designed to prioritise public or staff safety, above that of the individual inside room. (Source isolation, internationally called Airborne Infection Isolation or AII room).[2]

For more information about patient placement refer to the National Infection Prevention and Control Manual for Scotland.

Relevant technical standards and guidance:

- National Infection Prevention and Control Manual: Home
- Chapter 1.1 Patient placement/Assessment for infection risk
- Chapter 2.1 Patient placement/Assessment for infection risks
- A-Z Pathogens
- Appendix 11

Question 2: How many isolation facilities (rooms) does each healthcare facility require?

Answer:

The Scottish Government CEL(2008)48[7] and its replacement CEL(2010)27[8] both recommend that all new builds should have 100% single room patient accommodation and that refurbishments should have a minimum of 50% single room patient accommodation. [7.8] Single patient rooms are used for isolating patients suspected or confirmed with many potentially transmissible infections, but these single rooms are not defined as isolation facilities. The CELs do not consider the proportion of single room requirements which that should be designed as special ventilated isolation facilities.

The number of special ventilated isolation facilities required within a healthcare facility will be informed by the number of source isolation and protective isolation facilities that will be required within the new facility and will be recorded on the clinical brief of the design. NHS boards should calculate how many of each special ventilated isolation facilities are required based on current and projected activity.[9] Boards should also reference relevant HBNs and SHPNs for specific departments such as Critical Care[10], Emergency Care[11] and Child and Young People care [12], plus ensure consideration is given to future proofing establishments.

Special ventilated isolation facilities may be included within the complement of single rooms for the overall design, but it should not be assumed that if a facility is 100%

single rooms, there is no need for isolation rooms (see question 3 for more information on the different types of isolation rooms).

In relation to critical care units, HBN 04-02 6.4 - 6.9 states that Isolation suites with lobbies are required and should be designed to provide simultaneous source and protective isolation. The precise number of special ventilated isolation facilities will depend on the case mix of the critical care unit. For example, critical care units that routinely admit neutropenic haematology patients may require up to 50% of their beds to be provided as special ventilated isolation facilities to protect high risk patient groups. No critical care unit should, however, have less than 20% of their beds as special ventilated isolation facilities.[10]

Health boards should as part of the clinical model identify areas where patients with severe immunosuppression may be cared for outwith “high-risk” patient care areas, such as rheumatoid patients and chronic pulmonary patients who may have been treated long term with steroid therapies. The health board as part of the clinical brief should determine if the single room provision is sufficient for the patient population or if special ventilated isolation facilities are required. Additionally, some patients suspected or diagnosed with respiratory infections such as pulmonary tuberculosis (TB), or influenza will often be cared for within respiratory wards and not within an Infectious Diseases (ID) unit. Therefore, health boards should determine the requirement for special ventilated isolation facilities outwith ID or critical care areas based on the proposed clinical model.

Relevant technical standards and guidance relating to patient placement:

- The Scottish Government, (2008), Provision of single room accommodation and bed spacing CEL 48(2008), 11 November 2008 -superseded by CEL 27(2010).
- The Scottish Government, (2010), Provision of Single room accommodation and bed spacing, CEL 27(2010), 20 July 2010
- Scottish Health Planning Note (SHPN) 04 In-patient Accommodation: Options for Choice Supplement 1: Isolation Facilities in Acute Settings (2008)

- In-patient care Scottish Health Planning Note (SHPN) 04-01 Adult in-patient facilities (2010)
- HBN 04-02 Critical Care Units (2013)
- SHPN 22 A&E facilities for adults and children, 2007
- Best practice Guidance HBN 23 Hospital Accommodation for children and young people

Question 3: What are the different types of patient isolation facilities and when should they be used?

Answer:

The terminology around patient isolation facilities can be confusing with some terms being incorrectly interchanged such as isolation room, suite, facility, enhanced single room, side room and special ventilated isolation facility without full understanding of the actual room requirements or function

A survey carried out by Health Protection Scotland (HPS) in Scotland in 2018[1], to establish the availability of single room provision across Scotland acknowledged 16 different types of single rooms identified as isolation areas although some of these designs currently would not now be considered appropriate for isolation of patients and would not currently adhere to the NIPCM[6] isolation requirements.

SHPN 04-01 (2010)[9] and SHPN 4 Supp1 (2008)[2], SHTM 03-01 (2022)[14] and NHS ADB database[15] all provide detailed isolation facility recommendations for single rooms with en-suites, plus their ventilation requirements.

All single rooms in new builds or refurbishments should include en-suite sanitary facilities for patients, with the exception of ITUs and some HDUs where the requirement for an en-suite should be considered by the Health Board at the design stage to reduce the risk of little used outlets becoming waterborne risk of infection to the high-risk patient population. For a greater degree of flexibility, it is recommended that a proportion of in-patient single room and isolation room facilities should be

accessible and manageable by individuals with sensory or physical disabilities with or without assistance.[2]

A literature review carried out by ARHAI Scotland formerly known as Health Protection Scotland (HPS)[6], recommended that patients are not isolated in single rooms without en-suite facilities[5], with the exception of neonatal patients as an en-suite is not required and areas such as critical care where they have been assessed as not being required for the expected patient care level.

Single room with en-suite facilities

The recommended hybrid ventilation for all standard single rooms is that they achieve 6 ACH dilution, with supply, extract, natural vent via opening windows [8], and be neutral or negatively pressured to corridor. The en-suite will be extract only for negative pressure rooms ≥10 ACH.[14].

The decision to design single room facilities with mechanical ventilation or mixed mode should be undertaken following a multidisciplinary approach with clinical stakeholders including IPC and based on the clinical model for the proposed facility.[9]

An en-suite single room can be a way to provide simple source or protective isolation requirements within a general ward; however, this type of room cannot provide the isolation requirements for all types of transmissible pathogens particularly airborne pathogens.[2]

When can an en-suite single room be used for isolation?

This type of room can be used to isolate patients infected or colonised with some pathogens.

Where possible, an en-suite single room should not be used to accommodate individuals suspected or confirmed with pathogens spread through air transmission (airborne) or those suspected or confirmed as having a high consequence infectious disease (HCID). However, in clinical situations where no other isolation facilities are available a single room with en-suite can be used until transportation to a HCID facility can be arranged following a board risk assessment for the situation.

A single room with en-suite should not be routinely used for immunosuppressed patients unless there are no special ventilated positive pressure ventilated lobby rooms or HEPA filtered PPVL suites available, and the patient should be moved to a more appropriate room as soon as practicably possible. When the room is being used for this purpose, the windows and doors should be kept closed to provide a physical barrier to adjacent spacing until a suitable room becomes available and a risk assessment undertaken.

The NIPCM A-Z of pathogens alongside Appendix 11 of the NIPCM provides further guidance on the type of isolation room required for different pathogens.

Special ventilated isolation facilities

Some en-suite single rooms have specialised ventilation providing positive, or negative pressure to adjacent spaced but do not have a lobby.

Lobbied en-suite single rooms (isolation suite) are generally preferred where lobbies are typically positively pressured but can be negatively pressured depending on the function of the room.

An “enhanced isolation suite” usually refers to an en-suite single room with a lobby. The lobby provides an area for staff to safely don and doff PPE, perform hand hygiene, and space for PPE and waste storage.[2] An additional benefit of an isolation room having a lobby is that it adds an extra layer of protection from either the ingress of contaminated corridor air when positively pressured or the egress into the corridor from airborne pathogens when it is negatively pressurised.

HBN 04-01, supplement 1 (2024) [13] recommends all types of specialised ventilation isolation rooms include lobbies as part of the design, and this should be considered in any new builds or refurbishments.[13] The guidance advises against having specialised ventilation isolation rooms where ventilation can be switched by clinical staff within the ward to alternate between negative and positive pressure due to recorded learning of being left on the wrong setting through human and technical errors.[13] HBN 04-01, supplement 1 (2024) has not been fully adopted for NHS Scotland and is subject to further review by NHSSA and the SHPN 4 Sup 1 has been archived within Scotland whilst the HBN document is reviewed by NHSSA.

Health boards are asked to contact NHSSA in the interim period for advice regarding specialised ventilation isolation room design.

Boards, infection control teams and bed managers should consider keeping a log or register of all room types which may be used for isolating patients within each healthcare facility. This should include the type of ventilation and location to assist with appropriate patient placement especially out of hours. Locally, clinical staff should be familiar with the types of isolation facilities within their setting and the circumstances under which the room can be used.

HBN 04-01 (2024)[13] 4.30 states: “a 100 mm border should be painted on the corridor wall to outline the lobby entry door: This colour coding system would assist all staff with patient placement isolation suites and the type of isolation it provides.

- blue for a source (negative pressure) isolation suite
- green for a protective (positive pressure) isolation suite
- orange for simultaneous source and protective (PPVL) isolation suites”[13]

Ventilation

SHTM 03-01 Part A: Section 8 (2022)[14], advises that air should always move from clean to less clean areas and air flows should be considered when designing isolation rooms. Differential pressures will reduce the risk of contamination between areas when doors are closed as part of a series of control measures included as part of the suite design and clinical practices. The transfer of particles from adjacent spaces can be controlled by a differential air pressure between spaces when doors are shut and air flow paths flowing from clean to less clean spaces when doors are open. Air change rates help dilute airborne contamination.[14]

The movement of air within specialist ventilated isolation rooms will help to assist control of the ingress and/or egress of potentially harmful pathogens, spread by air transmission. The volume of air delivered and/or removed will dilute the contaminated air and maintain a desired pressure difference between the facility/room/lobby and surrounding areas.

The design of the ventilation and correct operation of the facility will safeguard the isolation room against air transmitted (airborne) pathogens or contaminants is maintained even when the door is opened:

(a) between the lobby and corridor or

(b) between the lobby and bedroom.

Note: If the doors between the bedroom and lobby and corridor are opened simultaneously, or if there is a door between the bedroom and corridor and it is opened, then protection against airborne pathogens or contaminants will not be maintained.[13]

In general, for new builds, ventilation requirements will form part of the wider clinical brief for the whole facility. Isolation room requirements must be considered as part of this initial design and be fully compliant with guidance requirements at the time of board approval of the design. Any changes to design after contract agreement could result in delays, financial penalties or sub-optimal design risking patient safety or limitations to room function. Room requirements should also comply with SHTM 03-01 Part A (2022)[14] unless the ventilation safety group (VSG) have agreed on a derogation from technical guidance. For isolation rooms developed as part of a refurbishment the building constraints may mean some derogations are inevitable due to the constraints of the existing environment on the room design.

All ventilation derogations must comply with legislation, and be reviewed, risk assessed, and any mitigations agreed by the ventilation safety group (VSG) ensuring that infection control is not compromised as well as many other non-IPC risks. An agreed process for derogations and governance regarding derogations should be developed and approved at the onset of the project. For more information on ventilation, its purpose, airflows and cascades refer to SHTM 03-01 Part A v3.0 Feb 2022 [14]

The different types of specialised ventilation isolation rooms are as follows:

Negative pressure room [13,14]

Source isolation: The aim of the ventilation design within negative pressure rooms is to protect staff and all other occupants within the building from airborne dispersal of

pathogens by a patient with an infectious disease. The air supplied to this room is extracted through the en-suite and where applicable via low level extract within the room. The result is the room being negatively pressured to the corridor. When the room door is opened the air from the corridor or lobby is pulled into the room and air is pulled out via the extract within the en-suite and the room if extract has been provided. Typical design features of this type of room would be supply air from the corridor. The number of air changes and the pressure differentials should be in line with current guidance.

- The extract should be set to achieve 10 ac/h to the patient's bedroom
- Supply adjusted to give the required differential pressures.
- The pressure stabiliser or baffle should be adjusted to be open and stable at the required pressure differential and should not fluctuate under steady air flow conditions.
- Extract ventilation should be discharged at height to the building and/or HEPA filtered depending on height of the building.
- Optimally 1 Air handling unit (AHU): 1 isolation room.
- Rooms must be sealed.

Positive pressure room [13,14]

Protective isolation: A patient within this type of room is protected from exposure to harmful airborne pathogens from elsewhere in the building or from the outside air. This means that air is supplied to the patients' room through filters at a higher pressure than the surrounding environment to ensure that the pressure within the room is higher than that of outside. The air supply to these rooms should pass through HEPA filters to ensure no pathogens or contaminants enter the room via the supply. The number of air changes and the pressure differentials, and the grade of filter for the incoming air should be in line with current SHTM 03-01 guidance.

- The supply should be set to provide 10 ac/h to the patient's bedroom.
- The extract adjusted to give the required differential pressures.
- The pressure stabiliser should be adjusted to be open and stable at the required pressure differential and should not fluctuate under steady flow conditions.

Positive pressure ventilated lobby room (PPVL)[13,14]

Combined source and protective isolation: Both the patient inside the room and staff and patients outside the room are protected from harmful airborne pathogens. Filtered air is supplied to the lobby at a positive pressure compared to the surrounding environment meaning that clean air flows into the patients' room and the corridor creating a barrier between the patient's room and the outside environment. Air supply to these rooms can be filtered using HEPA filters if they are going to accommodate immunocompromised patients.

- The lobby should have a positive pressure of between 10-12pa between the entry lobby and the corridor and a positive pressure between the entry lobby and the patients' bedroom.
- The patients' bedroom should have at least 10ac/h and be neutral pressure to the corridor.
- The en-suite should be at negative pressure to the patients' room.

An alternative to this type of room is a positive pressure room with a negative pressure lobby or anteroom which is available in some hospitals. This type of room performs the same function as above and can be used to care for severely immunocompromised patients who are suspected or confirmed as having a transmissible infection[16].

When to use special ventilated rooms for patient isolation

The clinical decision making around patient isolation will be undertaken by the clinical team. The NIPCM A-Z of pathogens alongside Appendix 11 of the NIPCM provides further guidance on the type of isolation room required for different pathogens. Below are some common reasons for patient isolation within specialised ventilated rooms, but this is not an exhaustive list.

- Where a patient has a confirmed or suspected infectious disease spread by the airborne route (source isolation), they should be cared for in a **Negative pressure isolation room.** These rooms can be used for all infections however if there are limited numbers of them, risk asses to prioritise their use for infections spread by the airborne route.[13,6.3,6.4]

- Where a patient is admitted with an infection that is unknown (for example, a patient that has a specific travel history and is presenting with infectious disease symptoms), provide care in a **Negative pressure isolation room** if available, if one is not available they should be cared for in a single room preferably with an en-suite with doors and windows closed until an appropriate isolation facility is available either onsite or by transfer to another facility.[13,6.3,6.4]
- Where a patient is being treated with gene therapy (protective isolation), provide care in a **Positive pressure room.**[14]
- Where a patient is known to be especially susceptible to infection or at risk of contamination from other sources, for instance they are immunocompromised (protective isolation), provide care in a **Positive pressure room** or a PPVL room.[13]
- Where a patient is both susceptible to infection and presents an infection risk to others (for example, an immunocompromised individual who has chickenpox) (Both protective and source isolation), provide care in a **Positive pressure ventilated lobby room.** [13]

Relevant technical standards and guidance on types of isolation rooms and ventilation

- SHPN 04 In-patient accommodation: Options for choice Supplement 1: Isolation Facilities in Acute Settings (2008)
- In-patient care Scottish Health Planning Note (SHPN) 04-01 Adult in-patient facilities (2010)
- HBN 04-01 Supplement 1: Special ventilated isolation facilities for patients in acute settings (2024)
- SHTM 03-01 (Interim version – additional guidance related to COVID-19 to be added in an update in 2022) Specialised ventilation for healthcare premises Part A: The concept, design, specification, installation and acceptance testing of healthcare ventilation systems

- Centres for Disease Control and Prevention (CDC): Environmental Infection Control Guidelines
- ARHAI Scotland (2021) SICPs & TBPs literature review: Patient Placement, Isolation and cohorting, ARHAI Scotland

Question 4: Where should patient isolation facilities be located within a healthcare establishment?

Answer

In-patient accommodation should have a degree of flexibility to allow for safe and appropriate care. [9]

When designing a new facility, the placement of specialised isolation facilities within the facility or general ward should complement the layout of the ward and allow for safe access to the patients and supporting facilities. [9]

Adjacencies should be considered – relationship to the rest of the ward to reduce risk of exposure to other patients, as well as access to supporting facilities, patient population and specialty.[9] Space for specialised plant such as air handling units (AHU), ductwork and supporting infrastructure will also need to be considered by the designer.[13,14]

Where a lobby is not available (for example facilities predate current guidance) there should be sufficient space outside the room for donning and doffing of PPE, small amount of PPE storage and disposal of PPE waste. This should not cause an obstruction or risk those in the vicinity especially if this is a corridor or thoroughfare.

Typically, one PPVL per 2 or 3 general wards are required as a minimum. They should be situated near the entrance to the unit to reduce transit risk through the ward, but also ideally away from main public or heavily trafficked route. PPVL rooms should be assessed for the requirement within Emergency departments and Critical Care units as well as oncology and renal facilities.

Relevant technical standards and guidance:

- SHPN 04-01 Adult in-patient facilities (2010)
- SHPN 04 In-patient Accommodation: Options for Choice Supplement 1: Isolation Facilities in Acute Settings (2008)
- Health Building Note (HBN) 04-01 Supplement 1: Special ventilated isolation facilities for patients in acute settings (2024)

Question 5: What are the risks associated with patient isolation?

Answer:

Some patients may require isolation for long periods of time therefore it is important for their wellbeing that they feel connected to the rest of the world and not segregated. [6]

Consideration should be given to patient safety and visibility. It is important that the patient is visible to staff from outside the room without compromising patient privacy. Room design should ensure that the patient can see outside of the room both to the ward area and external views. This may not be possible in existing builds but should be considered for new builds and refurbishments. Observation windows should have integral privacy blinds where possible.[13]

Other risks to consider:

- Patients with cognitive impairment may be at risk of falls or accidents if they are isolated.
- Staff may also be at risk of harm from patients in isolation.
- Patients may be at risk of self-harm.
- Paediatric and neonatal patients who require supervision.

All risks should be identified and taken into consideration during of the design process and when making decisions about patient placement.

Relevant technical standards and guidance:

- Health Building Note (HBN) 04-01 Supplement 1: Special ventilated isolation facilities for patients in acute settings (2024)
- National Infection Control Manual NIPCM for Scotland, Chapter 1 & 2: National Infection Prevention and Control Manual: Home

Question 6: What are the IPC risks associated with specific design features of isolation facilities?

Answer:

Infection risks related to ventilation

In relation to ventilation, there could be a risk of inappropriate patient placement, it is important that clinical staff are familiar with ward layouts and what type of isolation facilities are available to ensure patients are not placed in a room with the wrong type of ventilation. Signage outside rooms can help staff with the identification of the type of room, especially if they are unfamiliar with the ward.[13]

Staff should also be familiar with operational aspects of how the rooms function in order to be able to identify a fault and alert estates in a timely manner.[13] Health boards should ensure all staff expected to care for patients in special ventilated isolation rooms should receive training regarding room specification and function.[13]

Poorly designed and constructed air handling units (AHUs) that allow water to stagnate inside can cause an airborne infection risk to individuals. This could be water from condensate or water ingress to the AHU or ducting. Ventilation systems not performing to the design specification can also pose a risk to patients, staff and service users. All components should be designed, constructed, commissioned and validated and maintained as described in SHTM 03-01[14] (aspects of this will be covered in question 9).

There may be a risk of faults developing or damage to components that are essential to the ventilation of an isolation room. Clinical staff should be trained on the purpose of pressure gauges, pressure stabilisers or baffles, vents and other equipment that

have a function related to the room ventilation in order to be able to identify faults or damage.[13] Building management systems should also detect issues and inform estates colleagues however clinical staff should not assume this is the case and report any faults noted. Pressure gauges should be visible prior to room entry and will usually have a green light (if a different type of dial is being used ensure staff can identify when there is a fault) to indicate they are functioning correctly.[13] If pressures are outwith appropriate limits an audible alarm should sound at the room and the nurse's station.[13] Ventilation systems should also alarm centrally via the building management system (BMS) to ensure estates are alerted to faults promptly.[14] When a fault is detected at ward level, the estate's department should be contacted immediately.

Guidance advises against having rooms where ventilation can be altered by clinical staff within the ward to alternate between negative and positive pressure manually due to the risk of human errors.[13] Baffles should be able to move freely and not held open or blocked by furniture.

Risk of infection from water outlets and drains or infrequently used water outlets

Infrequently used outlets are a risk in any healthcare setting but particularly in areas where high risk patients will be housed. Care must be taken to monitor usage of outlets and identify if outlets are little used. Flushing protocols should be implemented, or removal of outlets should be considered if the reduce use is long standing. [17,18] Single rooms or isolation facilities where patients are bed bound and therefore showers and outlets may not be in frequent use and may also become a risk. Flushing protocols should be implemented to ensure water does not become stagnant until they come back into use.

The number and location of outlets should be subject to a risk assessment when planning either a new build facility to ensure outlets are not installed which could be a little used outlet and pose a risk to the water system and high-risk patient groups. For operational facilities any refurbishment plans should include an assessment of current outlets and identify any little used outlets which could be removed.[18]

Clinical equipment should not be stored within the splash zone of water outlets as this may also poses an infection risk. Splash zones may occur up to two metres from the water outlet, however risks should still be considered in areas where splash or spray exceeds this distance to manage these risks locally. If there is splashing of surrounding areas and relocation or reconfiguration of the water outlet is not possible, physical barriers such as impermeable, wipeable screens capable of withstanding cleaning agents can be considered[6].

Fixtures and fittings

Damaged or unsuitable surfaces and fixtures could harbour pathogens and may become reservoirs for infectious agents. As with all healthcare environment care should be taken to select appropriate materials for floor coverings and walls that can withstand the rigorous cleaning regimes that exist in healthcare and in particular isolation areas. Robust fit for purpose furniture that is comfortable but can withstand repeated cleaning and use over a prolonged period of time should be selected.

General

It is important to identify any risks IPC or otherwise at design stages of any project. The risks identified above are examples and not an exhaustive list and there may be local risks identified either operationally or at the start of a new build or refurbishment.

Storage of consumables and other items should be kept to a minimum within isolation rooms.

Only necessary horizontal surfaces should be designed within the isolation suite and should not be placed adjacent to any water outlets.

Relevant technical standards and guidance:

Ventilation

- SHTM 03-01 Part A (2022) (Interim version – additional guidance related to Covid 19 to be added in an update in 2022) Specialised ventilation for healthcare premises Part A: The concept, design, specification, installation and acceptance testing of healthcare ventilation systems

- SHTM 03-01 Part B (2022) Specialised ventilation for healthcare premises (Interim Version – Additional guidance related to COVID 19 to be added in an update in 2022) Part B: The management, operation, maintenance and routine testing of existing healthcare ventilation systems
- HBN 04-01 Supplement 1: Special ventilated isolation facilities for patients in acute settings (2024)

Water

- CEL 08 (2013) Water Sources and potential risk to patients in high risk units – revised guidance
- CEL 03 (2012) Water Sources and potential infection risk to patients in high risk units
- SHTM 04-01 Water safety for healthcare premises Part B: Operational management
- Chapter 4 NIPCM: National Infection Prevention and Control Manual: Chapter 4 - Infection Control in the Built Environment and Decontamination

General, fixtures and fittings

- SHPN 04-01 Adult in-patient facilities (2010)
- SHFN 30, Part A: Manual, Information for Design teams, Construction Teams, Estates & Facilities and Infection Prevention & Control Teams (2014)

Question 7: What are the key commissioning, validation and handover requirements for patient isolation safety?

Answer:

It is expected that ongoing monitoring and checks are carried out by the project team or clerk of works during the construction phase of the project to provide assurance that contractors are following the design brief. Installation checks of any water and ventilation systems should be carried out regularly. The IPCT should be involved

throughout the healthcare build project and provide IPC advice in relation to the project as part of the multidisciplinary project team.

As well as complying to specific HBNs, SHPNs, HTMs, SHTMS and the guidance within these documents, it is expected that any healthcare new builds or refurbishments will conform to building regulations and any other legislation such as fire, health and safety at work, and also COSHH regulations. These are referred to within the guidance signposted throughout this document but will not specifically be covered as part of these questions and answers. Key stage assurance reviews (KSARs) should also be in place throughout the project.[23]

Commissioning

Upon completion of the project the facility will be brought into use, but only after commissioning and validation. Commissioning is an essential part of any new build or refurbishment project carried out by an external independent contractor. The commissioning of the ventilation system and validation of special ventilated isolation rooms will be undertaken as part of the overall commissioning process for the new build and should be consistent with guidance. If the rooms are built as a standalone project or as part of a refurbishment, the commissioning process will be the same. [14]

The commissioning process enables demonstrable assurances for the board and other stakeholders that the design brief has been followed, and any systems are installed as per design, safe to use, and fit for purpose. (Note. The design brief should comply with national guidance, and if not, there should be demonstratable evidence of any derogations and how they have been managed.)[14] Commissioning and validation must take place prior to any operational use of the isolation facility and for maximum safety in advance of any clinical occupation. The IPCT and estates and facilities team including maintenance personnel are required to be engaged with the technical and operational elements of the overall commissioning process for the facility.

Commissioning aspects of particular importance for IPC will include ventilation and water systems.[14,18] The IPCT should have oversight of independent validation results and with advice from the Authorising Engineers for water and ventilation and the commissioning engineer for acceptance against the commissioning plans.

Acceptance testing: Validation or Verification

Validation is a process that differs from commissioning. For ventilation, this process should be carried out by a suitably qualified engineer appointed by the NHS Board. They will be completely independent of the system designers, contractors, suppliers, installers, commissioners, and those who will eventually operate and maintain the system. [14]

The final acceptance validation will ensure the system is checked and tested to ensure it is functioning correctly as a whole, and as described in the commissioning plan. Rooms will have permeability tests carried out. **"The system will be acceptable to the client if at the time of validation, it is considered fit for purpose and will only require routine maintenance in order to remain so for its projected life."** Full details of this process can be found in SHTM 03-01 Part A.[14]

Handover

Handover is the process that takes place after independent validation and acceptance testing and will include a final check of the building and all associated documentation. It will include visual checks of fixtures, furnishings and fittings, as well as the overall finish of the rooms to check for imperfections, flaws and damage before handover. Any operational procedure requirements for the water and ventilation systems should be developed by the contractor and agreed by the board prior to handover of the facility. Board estates team and clinical users of facilities should be given training on the requirements of the new facilities and the operational requirements.

The checklist within Development stage 4 of SHFN 30 HAI SCRIBE will assist with the commissioning and handover process. This is not solely an IPC responsibility but should involve the whole project team. [22]

NHS Scotland Assure and KSAR reviews should be followed at every stage of the project as appropriate.[23]

Relevant technical standards and guidance relevant to commissioning, validation, and handover:

- SHTM 03-01 (Interim version – additional guidance related to COVID-19 to be added in an update in 2022) Specialised ventilation for healthcare premises Part A: The concept, design, specification, installation and acceptance testing of healthcare ventilation systems
- HBN 04-01 Supplement 1: Special ventilated isolation facilities for patients in acute settings
- SHTM 04-01: Water Safety for Healthcare premises Part A: Design, Installation and Testing
- SHFN 30 Part A: Manual Information for design Teams, Construction Teams, Estates & Facilities and Infection Prevention & Control teams
- Key Stage Assurance reviews (KSAR): Key Stage Assurance Reviews (KSAR) | National Services Scotland
- SHFN 30 HAI SCRIBE question sets and checklists

Question 8: What are the key operating and resilience requirements for patient isolation safety?

Answer:

It is important when planning for a service such as special ventilated isolation rooms to consider at the outset how the service will be delivered in the event of an associated system failure, like ventilation or power failure. [14] In order to ensure continuity of service ventilation, systems should be designed so they can be quickly and easily repaired and maintained. This may require easy access to spare parts on the site or resilience in the design such as spare fan capacity in an AHU and sufficient access points for routine ductwork cleaning.

Organisations have a statutory duty under COSHH to ensure where specialised ventilation is installed as part of protection measures that it be correctly designed, installed, commissioned, operated and maintained. [14]

Inspection, annual verification, and ongoing maintenance of systems are essential to ensure systems are functioning and operating as they should be potentially reducing the risk of breakdowns and failures. [14] Ensuring systems are on an uninterruptible power supply keeps systems working in the event of a power failure.[13,14] Boards should have a clear process or SOP of what to do in the event of a power failure breakdown, or fault, for each area where special ventilated isolation rooms are located. This should include what other isolation facilities are available. The procedures below should be built into the day-to-day operational use of the isolation facilities. Contingency plans should be easy to access and communicated to clinical staff as part of induction and ongoing training updates to an area where these facilities are in use.

Monitoring of pressure differentials pressure gauges on the ward

- Staff education on ventilation parameters and alarms. What they should do when alarm sounds. Reporting to estates but also regarding any patients isolated within the affected room. This operational process should be developed with IPCT and local estates.

Vents, pressure stabilisers or baffles and filters

- Staff know how they should work and what to look for if not functioning correctly, for instance clean vents, baffles moving when doors open.

Emergency power, uninterruptible power supply – risks ventilation failure

- Process should be developed for ventilation failure.
- What other isolation facilities are available in the healthcare facility? Or within another healthcare facility? Or another health board.
- Use of portable HEPA filters in short term for immunosuppressed patient groups.
- Risk assessment for patient safety to remain or to be transferred.

Relevant technical standards and guidance:

- SHTM 03-01 (Interim version – additional guidance related to COVID-19 to be added in an update in 2022) Specialised ventilation for healthcare premises Part A: The concept, design, specification, installation and acceptance testing of healthcare ventilation systems
- SHTM 03-01 (2022) Specialised ventilation for healthcare premises (Interim Version – Additional guidance related to COVID 19 to be added in an update in 2022) Part B: The management, operation, maintenance and routine testing of existing healthcare ventilation systems

Question 9: What are the key maintenance consideration requirements for patient isolation safety?

Answer:

Inspection and verification requirements

In general, all special ventilated isolation rooms ventilation systems irrespective of installation date require to be inspected annually in line with the requirements of SHTM 03-01 Part B [14]. These inspections are designed to:

- assure the quality of intake air
- ensure that extract air is discharged to a suitable location
- prevent or control risks associated with Legionella and other potential hazardous organisms
- ensure safe access when carrying out routine service and maintenance activities
- provide documentary proof of performance

All AHUs and their associated ventilation systems should achieve the minimum standard as set out within SHTM 03-01-part B (2022) section 3. [14]

Some ventilation systems are classed as ‘critical healthcare ventilation systems’, isolation facilities fall into this category. This means that the ventilation system

requires to be inspected quarterly and verified at least annually. Members of the IPCT should review annual verification reports and undertake risk assessments of any failings in collaboration with AE ventilation and local estates. The full details of what this entails can be found in SHTM 03-01-part B.[14]

If any doubt exists as to whether a system falls within the critical ventilation category the VSG should be consulted regarding the risk to patient safety and business continuity.

Risk assessment for changes to the system

Any planned changes to the ventilation system must go through the board VSG and will require a review of the whole system, as adjustments may need to be made to accommodate the change. As well as engineering considerations, the fire safety strategy also requires to be reviewed if there are changes to the ventilation system. This should be considered under risks at the design stage.

The same applies to water systems where any proposed changes to the system should be appraised by the board water safety group (WSG).

General maintenance

Specialist ventilation systems for isolation rooms should be on a schedule for planned preventative maintenance which may be part of a whole hospital or ward plan.

Water systems for isolation rooms will be part of a wider hospital system and should be monitored as such.

These rooms may or may not have a higher demand for occupancy than general ward beds. If rooms are unoccupied for any period of time water flushing should be commenced. Moveable shower heads should be fixed to the shower rail by a retaining ring and not allowed to dangle into drains to avoid contamination. [24]

All hospital rooms must be monitored for damage and breakages to fixtures and fittings as these can prove difficult to clean and could harbour potentially harmful pathogens. However, isolation rooms may pose a higher risk for harbouring virulent micro-organisms from damaged surfaces facilitating infection transmission therefore

care must be taken to ensure all fixtures and fittings are intact and any damage or breakages should be repaired promptly to avoid this risk.

Relevant technical standards and guidance related to key maintenance consideration requirements for patient isolation safety:

- SHTM 03-01 (2022) Specialised ventilation for healthcare premises (Interim Version – Additional guidance related to COVID-19 to be added in an update in 2022) Part B: The management, operation, maintenance and routine testing of existing healthcare ventilation systems
- SHTM 04-01 (2014) Parts A, B, C, D, E F and G: water safety for healthcare premises
- SHFN 01-02 (2016) NHSScotland national cleaning services specification

Question 10: What design and maintenance considerations are essential to minimise infection risks within the ventilation system for isolation rooms?

Answer:

Design or Maintenance

There are some basic requirements that can reduce factors that could lead to infection risks. These considerations are essential to reduce the risk within the ventilation system, they are not specific to ventilation within isolation rooms but apply to all systems. This list is not exhaustive, and the full technical requirements are available within SHTM 03-01 Part A and Part B .[14]

- The ventilation system should not contain any material or substance that could support the growth of microorganisms.

- Intake and discharge points should be situated appropriately to avoid any contamination of air, that is, the intake should not be in a position where there is a risk of taking contaminated air into the supply system from the discharge point.
- Steps should be taken to avoid birds landing or roosting near the intake point.

Planned preventative maintenance

Planned maintenance is essential to critical ventilation systems such as isolation facilities ventilation, to ensure the smooth and safe running of the system. It is important that quarterly inspections and maintenance are carried out on these systems.

For maintenance and annual verification to take place it may be necessary to have contingency plans if the air handling units are shared between facilities.

Maintenance of these systems will include AHU routine inspection, AHU drainage inspection, filter changing and cleaning of housing.

There should be regular ductwork cleaning and that regular PVT testing should give assurance that dust levels are within the tolerance for a healthcare facility as per BS EN 15780 Ventilation for Buildings - Ductwork - Cleanliness of ventilation systems

Plantroom cleanliness and quality assurance is also relevant.

At ward level pressure stabilisers and transfer grills on doors need to be inspected and cleaned.

Records of all maintenance activities must be kept for a minimum of five years.[14]

Annual Verification

All critical healthcare 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 purpose of the annual verification will be to additionally ensure that the system:

- achieves minimum standards specific to the application
- is operating to an acceptable performance level
- remains fit for purpose

More information about this process can be found within SHTM 03-01 part B.[14]

Commissioning

If any alterations are made to the system, revalidation will have to be carried out prior to the system going back into operational use.

Relevant technical standards and guidance:

- SHTM 03-01 (2022) Specialised ventilation for healthcare premises (Interim Version – Additional guidance related to COVID-19 to be added in an update in 2022) Part B: The management, operation, maintenance and routine testing of existing healthcare ventilation systems
- SHTM 03-01 (2022) Specialised ventilation for healthcare premises (Interim Version – Additional guidance related to COVID-19 to be added in an update in 2022) Part A: The concept, design, specification, installation, and acceptance testing of healthcare ventilation systems
- BS EN 15780 Ventilation for Buildings - Ductwork -Cleanliness of ventilation systems
- Managing the Risk of Contamination of Ventilation Systems by Fungi from Bird Droppings (2019), NSS

Glossary

Derogation

In construction, a derogation refers to a lesser or deviation from a technical standard, regulations or requirement. In healthcare it is vital that regulations, legislation and standards are adhered to.

Lobby/anteroom/vestibule

A smaller room at the entrance/ exit of a patient room which enhance control of flows, such as people, equipment and air into the patient room. These rooms may or may not be mechanically ventilated depending on the function of the patient space.

Negative pressure

This is created when the air pressure inside a space is lower than the surrounding area. Typically created in a room in which more air is extracted than supplied. It is designed to control airflow, by ensuring air leakage is into the room.

Positive pressure

This is created when the air pressure inside an area is greater than the pressure outside the area. Typically created in a room in which more air is supplied than extracted. It is designed to control airflow, by ensuring air leakage is out of the room..

Pressure differential

This term refers to the difference in air pressure between two adjacent areas or compartments. In relation to air pressure, it is measured in units called Pascals (Pa).

Protective isolation

This is when a known severely susceptible to infection patient is protected from being exposed to harmful pathogens elsewhere in the facility or from outside air. Prioritises individual safety, above that of the public or staff outside room. (Internationally called Protective Environment or PE room)

Source isolation

This is when a patient with a known primarily airborne infection is placed in isolation to protect others from exposure to the infection. Prioritises public or staff safety, above that of the individual inside room. (Internationally called Airborne Infection Isolation or AII room)

Combined Source and Protective isolation

This isolates individuals who are suspected to be either highly susceptible to infection or potentially airborne infectious; or suspected or known to be both. Provides simultaneous protection to people both inside and outside. This versatile isolation utilises a positively pressurised lobby (PPVL). (Internationally called a combined AII or PE suite)

Other reading

Also see for example : Isolation anterooms: Important components of airborne infection control - American Journal of Infection Control

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5. Health Protection Scotland. Standard Infection Control Precautions and Transmission Based Precautions Literature Review.
6. National Infection Prevention and Control Manual. [online]

   Chapter 1 - Standard Infection Control Precautions (SICPs).

   Chapter 2 - Transmission Based Precautions (TBPs).

   A-Z Pathogens.

   Appendix 11 - Aide memoire for Patient Placement considerations and Respiratory Protective Equipment (RPE) or Fluid Resistant Surgical Facemasks (FRSMs) for Infectious Agents.
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