

Scottish Health Planning Note 04

In-patient Accommodation: Options for Choice
Supplement 1: Isolation Facilities in Acute Settings

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1. Introduction

Context

- 1.1 Healthcare Associated Infection (HAI) is a burden on the NHS. It affects an estimated one in ten NHS hospital patients each year (DH, 2003) at an annual cost of £1bn (National Audit Office, 2000).
- 1.2 Many patients with an infection require physical isolation. However, often patients cannot be isolated because of a shortage of single rooms and isolation suites.
- 1.3 The key to effective isolation on acute wards is the provision of single rooms with en-suite sanitary facilities. Single rooms reduce the risk of cross-infection for non-airborne diseases and help to lower the incidence of HAI. Most patients on acute wards can be isolated in single rooms with en-suite facilities. All single rooms in new-build hospitals should have en-suite facilities so that they can be used to isolate patients for a variety of reasons and not just for infection control purposes.

Purpose of the guidance

- 1.4 This Supplement to SHPN 04: 'In-patient accommodation: options for choice', provides guidance on the facilities required for isolating patients on acute general wards.
- 1.5 For infection control purposes, a single room without en-suite is better than no single room at all. However, the guidance in this Supplement is based on best practice, and describes how a single room can be enhanced to provide an effective isolation facility for patients on acute general wards. The Supplement has two aims:
- to set a standard for new-build facilities;
 - to provide Health Boards wishing to convert existing accommodation with simple design options that can be implemented relatively quickly and cost-effectively.
- 1.6 This guidance:
- explains how a single room with en-suite sanitary facilities can be enhanced to provide effective isolation for patients with infections that could be transmitted within healthcare;
 - describes how an enhanced single room with en-suite facilities and a ventilated lobby can provide an isolation suite for patients who have airborne infections or who need to be protected from them;

- can be used for both new-build schemes and the upgrading of existing accommodation.

1.7 The guidance also contains examples of room layouts.

1.8 The guidance on isolation suites in this Supplement is based on a validated design model. The aim of this Supplement is to provide practical guidance on how to provide isolation facilities that are simple to use and meet the needs of the majority of patients on acute general wards.

1.9 Information about how good design can prevent cross-infection in healthcare premises generally is provided in SHFN 30 Version 3: 'Infection control in the built environment: design and planning' and Healthcare Associated Infection-System for Controlling Risk in the Built Environment (HAI-SCRIBE). SHPN 04 Supplement 1 should be read in conjunction with SHFN 30 and HAI-SCRIBE.

Exclusions

1.10 This Supplement does not describe the specialist facilities required in infectious disease units or on wards where severely immuno-compromised patients are nursed. Guidance for these facilities will follow in a further Supplement to SHPN 04.

2. Operational policies and planning principles

The need to isolate patients

- 2.1 Historically, isolation in general wards has been provided in single rooms, sometimes without en-suite facilities. Rooms without en-suite facilities often cannot be used to isolate patients effectively.
- 2.2 Ventilated isolation suites with en-suite facilities have also been provided. They may have a ventilation system that provides a positive pressure in the room to protect the patient from infection, or a negative pressure to prevent a patient from infecting others, or the ventilation may be switchable from positive to negative. These rooms rely on staff being able to assess the type of ventilation required when a patient arrives on the ward and, for switchable systems, knowing how to select the correct ventilation mode. Patients can be put at risk by user error if the ventilation mode is not set correctly.
- 2.3 The provision of isolation rooms which are switchable from positive to negative air pressure is no longer recommended because of the risk of cross contamination in the event of the setting being incorrect.
- 2.4 There are four main reasons for caring for patients in single rooms:
- patient susceptibility to infection from other sources;
 - where a patient presents an infection risk to others;
 - non-medical, for example patient preference;
 - clinical but not infection-related.

In terms of infection control, only patients in the first two categories require isolation. Patients in the latter two categories can be cared for in standard single en-suite rooms.

Isolation facilities

- 2.5 In order to simplify the use of isolation facilities, this Supplement proposes two room designs for isolating patients in acute general settings:
- enhanced single room with en-suite facilities;
 - enhanced single room with en-suite facilities and ventilated bed access lobby (isolation suite).

Enhanced single room with en-suite facilities

- 2.6 An enhanced single room with en-suite sanitary facilities having extract ventilation is a simple, cost-effective way to provide isolation, and will meet the needs of most patients on general wards.
- 2.7 The room does not require any specialist knowledge or action by the nursing staff to operate it. When not being used for isolation the room can be used for general nursing.
- 2.8 See [Section 3](#) for detailed design guidance.

Enhanced single room with en-suite facilities and ventilated lobby (isolation suite)

- 2.9 An enhanced single room with a positive pressure ventilated bed access lobby and en-suite facilities with extract ventilation provides both source and protective isolation.
- 2.10 The positive pressure lobby ensures that air from the corridor does not enter the isolation room, and that air from the room does not escape into the corridor. This simple design enables the suite to be used for both source and protective isolation without the need for switchable ventilation or special training for staff. It also provides safe isolation for patients whose exact condition is unknown.
- 2.11 See [Section 3](#) for detailed design guidance.

Advantages

- 2.12 Both rooms are suitable for caring for patients not in isolation but who require a single room for other reasons. In addition, both room designs are simple in concept, by default safe in operation, and do not require the nursing staff to have any specialist ventilation knowledge.

Creating pleasant environments

- 2.13 Some patients with infections need to stay in isolation in hospital for long periods of time. The number of visitors they receive and the length of time they can spend with them may be restricted. This means that patients who are already vulnerable, but not necessarily physically severely incapacitated, will be confined to the room for sometimes several weeks and can experience long periods of boredom.
- 2.14 Accommodation for these patients should be stimulating and as comfortable as possible. Designers should try to achieve a balance between the need for a clean environment and the comfort of patients. There are a number of publications that describe in detail, evidence that supports the concept that a therapeutic environment has a positive effect on a patient's general feeling of well-being, reduces the length of stay for many patients, reduces depression,

confusion and aggressive episodes and significantly increases a patient's level of satisfaction with the overall quality of their care.

- 2.15 If patients are to stay in an isolation suite, it is important that they are able to see staff from their beds. Staff should also be able to see the patient in case of emergency. This reduces the psychological problems of isolation. Observation windows should have integral privacy blinds which can be controlled by both staff and patients. The sense of containment can also be reduced by providing outside views using windows with low sills.

Record keeping

- 2.16 Where staff are required to record lobby air pressures as part of the local COSHH assessment, facilities for completing and storing log books should be provided in the lobby.

Maintenance and cleaning

- 2.17 Guidance on the maintenance and cleaning of materials and finishes is contained in SHFN 30: Infection Control in the Built Environment: design and planning, planning teams should also refer to the 'Monitoring Framework for NHSScotland National Cleaning Services Specification-Guide for NHS Managers'. All surface finishes must be washable and moisture-resistant. This does not include emulsion paint.



Single Room



En-Suite Bathroom

3. Design guidance

New build isolation facilities

Enhanced single room with en-suite facilities

- 3.1 The design for a new-build enhanced single room with en-suite facilities is shown in [Appendix 1 Sheet No 1: Example room layouts](#).
- 3.2 The general specification for single rooms is provided in SHPN 04 (2000). The enhancements and modifications recommended for isolating patients are:
- a clinical hand-wash basin, with non-touch, fixed temperature mixer tap ([see paragraph 3.20](#)) adjacent to the exit door;
 - wall-mounted hand hygiene dispensers including alcohol hand rub dispensers, and disposable towel holders;
 - a foot operated lidded bin for disposing of paper towels and other non-clinical items;
 - suitable extract to the en-suite bathroom;
 - transfer grille in en-suite door;
 - en-suite WC to be non-touch flush and hand-wash basin to have single tap with flow and temperature control ([see paragraph 3.20](#));
 - external windows should be openable, but with a fixed maximum opening width for safety. They should also be lockable. Internal windows should be fixed;
 - observation window in corridor wall with integral privacy blinds that can be controlled by both patients and staff;
 - all windows, including observation windows, should be low enough to provide a view for patients lying in bed.

Enhanced single room with en-suite facilities and ventilated bed-access lobby (isolation suite)

- 3.3 The design for a new-build enhanced single room with en-suite facilities and ventilated lobby, with bed access through the lobby, is shown in [Appendix 1 Sheet No 2 Example Room layouts](#).
- 3.4 The ventilated bed access lobby ensures that:
- air entering the bedroom is the clean ventilation supply from the lobby. Air from the corridor is blocked by the ventilation supply in the lobby, that is, the patient in the bedroom is protected from air from the corridor;

- potentially contaminated air from the bedroom is prevented from escaping into the corridor by the ventilated lobby, so the patient will not present a risk of infection to others.

As the lobby simultaneously prevents unfiltered air entering the room and potentially contaminated air escaping from it, the room can be used by both infectious patients and those at risk of infecting others.

- 3.5 The use of personal protective equipment (PPE) will be determined by local infection control policy. Facilities for putting on and removing PPE, and washing hands, are provided in the lobby. The risk of contaminants being dislodged from used PPE by the ventilation system and blown out into the corridor is considered negligible. However, a hand-wash basin and pedal operated lidded bin are also provided in the bedroom close to the exit door so that PPE can be removed in the bedroom should local policy require.
- 3.6 The benefits of the isolation suite are that it is simple in concept, requires no specialist knowledge by healthcare staff to operate it, and can also be used for general nursing. In addition, if the ventilation system fails the layout of the suite still ensures a degree of protection.
- 3.7 The general specification for single rooms is provided in SHPN 4. The enhancements and modifications recommended for isolating patients are:

In the bed access lobby:

- a clinical hand-wash basin with non-touch, fixed temperature mixer tap ([see paragraph 3.20](#));
- wall-mounted soap dispensers, disinfectant hand rub dispensers, and disposable towel holders;
- wall-mounted plastic apron and glove dispensers and storage for other clean PPE items;
- a clinical waste bin for disposal of used PPE;
- a bin for disposing of paper towels and other non-clinical items;
- storage for room cleaning equipment;
- a suitable air supply;
- In the isolation room;
- a clinical hand-wash basin, with non-touch, fixed temperature mixer tap (see paragraph 3.20) adjacent to the exit door;
- wall-mounted hand hygiene dispensers, including alcohol hand rub dispensers, and disposable towel holders;
- a clinical waste bin for disposal of used PPE;
- observation window in corridor wall with integral privacy blinds;
- a pressure stabiliser above bedroom door.

In the en-suite bathroom:

- suitable extract system to the en-suite bathroom;
- transfer grille in the en-suite door;
- en-suite WC to be non-touch flush and wash basin to have single tap with flow and temperature control ([see paragraph 3.20](#)).

For the suite as a whole:

- sealed, solid ceiling;
- windows to the exterior and interior to be locked shut and sealed;
- recessed luminaire rated IP44;
- where the configuration of the building permits (e.g. roof space above) consideration should be given to accessing luminaires from above for lamp changing. This will avoid the need for maintenance staff to access isolation facilities to undertake this activity.

3.8 Heating and cooling of the isolation suite will normally be provided via the ventilation system.

3.9 The provision of a two-way intercommunication system between the patient's bedroom and the nurses' base should be provided (see SHTM 2015: 'Bedhead Services').

Converting existing facilities

3.10 The majority of patients requiring isolation can be cared for in enhanced single rooms with en - suite facilities that have an extract system. Only a small number of patients will need an isolation suite.

3.11 Acute general hospitals can create enhanced single en-suite rooms and isolation suites by converting bays and adapting existing single room accommodation. The layout of existing facilities may impose constraints on design, however, and planning teams will sometimes have to resolve the conflict between what is desirable and what is achievable.

3.12 For Health Boards wanting to convert existing accommodation into isolation facilities, the easiest and least expensive option is to adapt existing single rooms with en-suite sanitary facilities. However, where existing single rooms do not have en-suite facilities, Health Boards will need to reconfigure the accommodation ([see paragraph 3.16](#)).

Converting a single room with en-suite facilities

3.13 The standard furnishing and fitment requirements for a single room are described in SHPN 04: 'In-patient accommodation: options for choice'.

3.14 The additional requirements for isolation of a single en-suite room are:

- a clinical hand-wash basin, with non-touch, fixed temperature mixer tap ([see paragraph 3.20](#)) adjacent to the exit door;
- wall-mounted hand hygiene dispensers including alcohol hand rub dispensers, and disposable towel holders;
- a foot operated lidded bin for disposing of paper towels and other non-clinical items;
- suitable extract to the en-suite bathroom;
- transfer grille in en-suite door;
- en-suite WC to be non-touch flush and hand-wash basin to have single tap with flow and temperature control;
- external windows should be openable, but with a fixed maximum opening width for safety. They should also be lockable;
- observation window in corridor wall with integral privacy blinds that can be controlled by both patients and staff;
- all windows, including observation windows, should be low enough to provide a view for patients lying in bed.

3.15 A typical layout for converting an existing single room with en-suite facilities is shown in [Appendix 1 Sheet No 3: Example room layouts](#).

Converting a single room without en-suite facilities

3.16 In an existing building it may be possible to modify three adjacent single bedrooms into two enhanced single bedrooms each with en-suite facilities - [see Appendix 1 Sheet 4: Example room layouts](#).

3.17 The requirements for disabled access, as set out in sections 4.2 and 4.7 of The Building (Scotland) Regulations, should be met.

Creating an enhanced single room with en-suite facilities and ventilated bed access lobby (isolation suite)

3.18 When converting a single room into an enhanced single room with en-suite and ventilated lobby, any suspended ceiling must be replaced with a sealed solid ceiling. If a single room has a suspended ceiling to permit access to overhead services, a Health Board should install a sealed ceiling with sealable access hatches or move the services.

3.19 The additional requirements for upgrade to an isolation suite are as follows:

In the bed access lobby:

- a clinical hand-wash basin with non-touch, fixed temperature mixer tap ([see paragraph 3.20](#));

- wall-mounted soap dispensers, disinfectant hand rub dispensers, and disposable towel holders;
- wall-mounted plastic apron and glove dispensers and storage for other clean PPE items;
- a clinical waste bin for disposal of used PPE;
- a bin for disposing of paper towels and other non-clinical items;
- storage for room cleaning equipment;
- a suitable air supply.

In the bedroom:

- a clinical hand-wash basin, with non-touch, fixed temperature mixer tap ([see paragraph 3.20](#)) adjacent to the exit door;
- a clinical waste bin for disposal of used PPE;
- non-opening observation window in corridor wall with integral privacy blinds;
- a pressure stabiliser above the bedroom door into the lobby;
- In the en-suite bathroom;
- suitable extract system to the en-suite bathroom;
- transfer grille in the en-suite door;
- en-suite WC to be non-touch flush and wash basin to have single tap with flow and temperature control ([see paragraph 3.20](#)).

For the suite as a whole:

- sealed, solid ceiling;
- windows to the exterior and interior to be locked shut and sealed;
- recessed luminaire rated IP44;
- where the configuration of the building permits (e.g. roof space above) consideration should be given to accessing luminaires from above for lamp changing, This will avoid the need for estates staff to access isolation facilities to undertake this activity.

3.20 Point of use oversink, non-touch, fixed temperature water heaters may be used as an alternative to 'fixed temperature mixer taps'.

3.21 The provision of a two-way intercommunication system between the patient's bedroom and the nurses' base should be provided (see SHTM 2015: 'Bedhead services').

3.22 An option for reconfiguring two existing single rooms to provide one enhanced single room with en-suite facilities and ventilated lobby, with bed access through the lobby, is shown in [Appendix 1 Sheet 5: Example room layouts](#). Where space restrictions mean bed access through the lobby is not possible, an

alternative layout gives bed access directly to the bedroom from the corridor shown in [Appendix 1 Sheet 6: Example room layouts](#). In this case the lobby would be sized for personnel access only.

Converting a multi-bed bay

- 3.23 An existing four-bed bay may be converted to provide two enhanced single rooms with en-suite facilities in [Appendix 1 Sheet 7: Example room layouts](#).
- 3.24 In this configuration it is not possible to provide a normal observation window. As observation is critical, however, one option would be to provide fully-glazed lobby and bedroom doors, with integral privacy blinds, to enable observation from the corridor and to provide a view out for the patient.



Hand rub dispenser

4. Engineering requirements

Engineering design philosophy

- 4.1 This Section describes the ventilation system philosophy for an isolation suite with a patient's bedroom, en-suite sanitary facilities and ventilated lobby. A methodology for validation of the performance standard is given in [Appendix 2](#).
- 4.2 The isolation suite and its ventilation system are based on a validated design. The engineering guidance given in this Section aims to provide a practical, 'fail-safe' design solution for isolating patients on acute general wards.
- 4.3 The ventilation system is designed on the basis that all its constituent parts, as described in [Table 1](#), work together to form an integrated system. For example, air to the suite is supplied at high level in the lobby, with extract in the en-suite bathroom. This ensures good airflow through the entire isolation suite. Similarly, the volumetric airflow rate in the lobby is determined by the number of air changes required in the patient's bedroom. Modifying or failing to provide one element of the system will jeopardise the performance of the system as a whole.

Basic design parameters

- 4.4 The patient's bedroom is to have 10 air changes per hour. The entry lobby is to be at +10 Pascals with respect to the corridor. The en-suite room is to have at least 10 air changes per hour and be at a negative pressure with respect to the patient's bedroom. [Table 1](#) gives nominal design values calculated for rooms of the size stated. The air change rates and pressure differentials below should be maintained when filters are dirty. Variable-speed control of fan motors would be an acceptable method of flow control, within the normal operating range of the fan's speed.

Room	Parameter	Nominal Design Values
Lobby	Room volumes	
	Bed access lobby (5m ² x 2.7m)	13.5 m ³
	Personnel access lobby (4m ² x 2.7m)	10.8 m ³
	Pressure differential to corridor	Nominally 10 Pascals
	Supply air flow (for a room of this size)	Bed access lobby - 238 l/s Personnel access lobby - 208 l/s
	Air change rate	Bed access lobby – 63 per hour Personnel access lobby – 69 per hour
Isolation Room	Room volume (19m ² x 2.7m)	51.3m ³
	Pressure differential to corridor	Nominally zero
	Room air flow (for a room of this size)	158 l/s
	Air changes rate	10 per hour
En-suite	Room volume (6m ² x 2.7m)	16.2m ³
	Pressure differential to isolation room	Negative
	Extract air flow (for a room of this size)	158 l/s (If extract is fitted in the isolation room this reduces to 45 l/s in the en-suite with 113 l/s extract in the isolation room)
	Air change rate	At least 10 per hour

Table 1: Isolation Suite – Ventilation Parameters

Note: In this example the design parameters are based on SHPN 04: 'In-patient accommodation: options for choice'. The en-suite is sized to comply with BS 8300 accessibility requirements.

The airflow rates quoted do not include any allowance for construction leakage. This has been set at 1 l/s of air per 1m³ of suite envelope volume ([see Appendix 2](#)).

Where immuno-compromised patients are to be accommodated, such as in transplant units or specialist cancer units, there could be a need for positive pressure isolation rooms.

Isolation Suite

Ventilation – general

4.5

Ideally each suite should have its own dedicated supply and extract system. If two or more suites share a ventilation system there will be an inevitable increase in the complexity of the system and a corresponding reduction in reliability and serviceability. Further complications will occur when individual suites have to be isolated for deep cleaning following occupation. Routine maintenance of the ventilation system will result in complete closure of all suites

that it serves. For these reasons it is strongly recommended that each suite should have its own ventilation system. However, refer also to paragraph 4.8.

- 4.6 The object should be to keep the ventilation systems as simple as possible. Standby fans or motors are not required for either supply or extract. This is because the system as designed is robust enough to withstand fan failure without significantly compromising the level of protection. A flow sensor should be fitted to each system that will alarm on fan failure at a designated nurse station and the estates department.
- 4.7 Ductwork should be kept as direct and simple as possible. In order to facilitate duct cleaning, volume control devices and other obstructions in the distribution ducts should be avoided. Supply and extract flow rates should, where possible, be set by terminal and duct size design. In the unlikely event that volume control devices are required, iris dampers are the preferred type.
- 4.8 In a high-rise building a common supply and extract system may be the only feasible solution. In this case, run and standby fans would be required for the extract and a duplicate supply unit may be considered necessary. The supply and extract branches to each isolation suite should be fitted with spring-close gas-tight dampers. This will permit individual suites to be shut down for cleaning and maintenance. The common supply and extract systems will need to be controlled to ensure a constant volume in each isolation suite branch regardless of the number in use. The overall design should ensure that short-circuiting couldn't occur between isolation suites.

Fire strategy

- 4.9 The isolation suite is intended to be built as a single fire compartment. The positive pressure in the lobby will deter smoke originating in the corridor from entering the room. Smoke from a fire in the room will be contained within the suite and extracted via the en-suite extract. Due to this, the ventilation system serving the isolation facility should be kept running in the event of a fire.
- 4.10 Fire rated ductwork should be provided such that ducts can be considered an extension of the isolation suite. Fire dampers, where the ducts penetrate walls and floors, will not then be required.
- 4.11 A motorised smoke/fire damper should be fitted at the discharge of the supply air handling unit (AHU). The damper should close in the event of an AHU or intake fire under the control of a smoke detector mounted in the AHU.

Extract ventilation

- 4.12 An extract terminal should be fitted at high level in the en-suite room. An additional terminal may be fitted in certain circumstances at low level adjacent to the bedhead in the bedroom. The clinical requirement for this should be verified and such requirements would probably relate to highly infectious patients.

- 4.13 A transfer grille should be fitted at low level in the door between the bedroom and en-suite room.
- 4.14 The extract duct should be fitted with a spectacle plate or gas-tight damper so that the system can be sealed to allow the isolation suite to be disinfected. The plate or damper should be fitted at the inlet of the extract fan. This will also permit isolation of the extract fan for service and maintenance.
- 4.15 The extract fan unit should be located outside the building so that all ductwork within the building is under negative pressure. Access and cleaning hatches should only be fitted where absolutely necessary. If fitted they should be of the sealed type and marked with a bio-hazard symbol. If the fan has to be located inside the building it should be as close as practicable to the outside. The extract fan motor should be mounted out of the air stream and should be capable of being changed without withdrawing the impeller or opening up the ductwork. The extract fan should draw its power from the essential electrical system.
- 4.16 Extract filters will not be required provided that the fan can discharge in a safe location 3 m above the building height. If extract filters are fitted they should be in a 'safe change housing' outside the building on the suction side of the fan. Extract filters, where fitted, should be of H14 grade. Even if filtered, extract air must not be re-circulated.
- 4.17 Extract ductwork, the fan and discharge stack must be clearly marked to identify the isolation suite that they serve. Service, maintenance, cleaning and filter change of the system will be subject to a 'Permit to Work'.

Supply ventilation

- 4.18 The supply AHU should comply in all respects with the minimum standards set out in SHTM 2025: 'Ventilation in Healthcare Premises'. (*This SHTM is under review and is listed for replacement by SHTM 03*). Heating and cooling should be provided, but not humidification. The fire/smoke damper fitted in the discharge from the AHU should close on plant shutdown and/or airflow failure, sealing the AHU from the distribution ductwork. This will prevent any reverse airflow and permit routine maintenance or system disinfection. The supply fan should draw its power from the essential electrical system.
- 4.19 The supply AHU and distribution ductwork must be clearly marked to identify the isolation suite that they serve. Access and cleaning hatches should only be fitted where absolutely necessary. They should be of the sealed type and marked with a bio-hazard symbol. Service, maintenance, cleaning and filter change of the system will be subject to a permit to work.
- 4.20 A G3 pre-filter and final filter should be fitted in the AHU. The lobby air supply terminal should be of a type into which a HEPA filter can be fitted. While it is not envisaged that a HEPA filter will be routinely required, this arrangement will allow for subsequent fitting when appropriate with the least disturbance. A

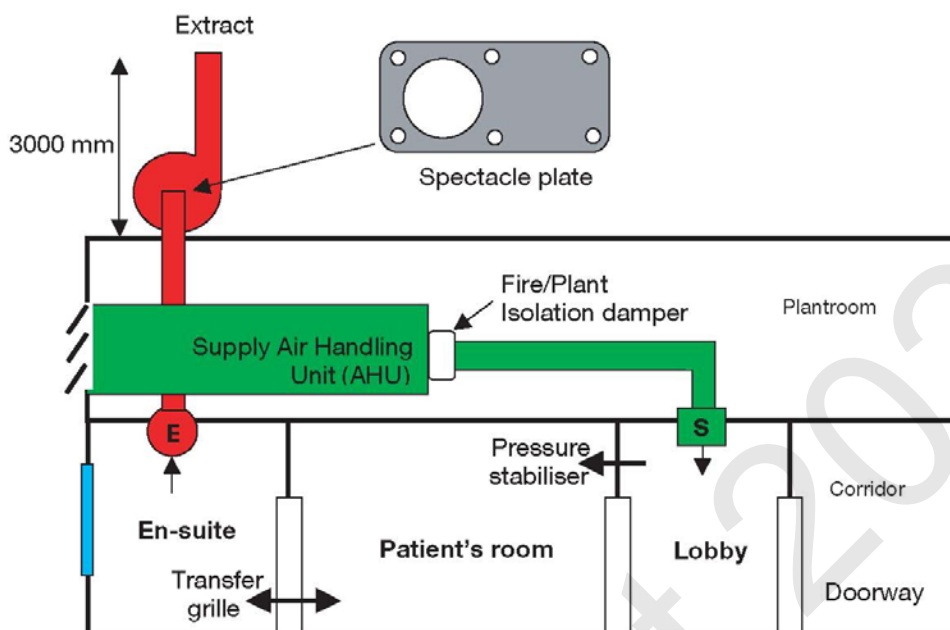
sealable upstream DOP injection test point will be required in the supply duct so that, if a HEPA filter is fitted, it can be challenge tested on installation.

- 4.21 A pressure stabiliser of the balanced blade type, set to operate at 10 Pascals, should be fitted above the door between the lobby and the bedroom. The stabiliser should be visible so that its correct operation can be seen. It should be of a style that will operate silently, and be correctly sized and positioned so that it does not cause a draught that would be uncomfortable for patients.
- 4.22 A direct reading gauge showing the pressure in the lobby with respect to the corridor should be mounted at eye level on the corridor wall adjacent to the lobby entry door. The gauge and lobby entry door must be clearly marked to identify the isolation suite to which they refer. In common systems serving more than one isolation room, automatic closing backdraught dampers will be required. Where HEPA filters are installed, these should be located so that staff can access them without recourse to entering isolation suites. Audio and visual alarms must be located at the entrance to the lobby and bedroom to warn nursing and maintenance staff of potential unsafe conditions. Continuous monitoring should be provided with remote indication at nurses stations, interlinked to the Building Management System with time delay (adjustable by Estates personnel) to take account of running-up of standby motors or damper operations or other plant items that may take time to open or close. Alarms based on sensing airflow failure should be provided rather than electrical failures. Alarm sound levels should be sufficient to attract attention without distress or annoyance and, if muted, should re-activate at 5-10 minute intervals.

Record keeping

- 4.23 A logbook will be required for each isolation suite. It should contain the following information:
 - a schematic layout of the isolation suite and ventilation system serving it;
 - information on the ventilation design parameters;
 - a record of the actual ventilation performance at initial validation. (All of the tests set out in [Appendix 2 'Acceptance testing of isolation suite'](#) should be carried out);
 - records of the annual validations. (The parameters set out in [Appendix 2](#) should be measured);
 - records of the lobby pressure, taken by ward staff from gauges and monitoring devices provided;
 - records of any routine service and maintenance activities;
 - records of any repairs or modifications;
 - a method statement for disinfecting the system.

Estates management should ensure that nursing staff are familiar with pressure gauges and able to record readings in the appropriate log book.



Isolation suite ventilation system – example layout

When the suite is taken out of use, the logbook should be preserved for at least five years.

Other considerations

- 4.24 As far as practicable, access to domestic hot and cold water services and their associated thermostatic mixing valves should be via access panels in the lobby or corridor. Every effort should be made to avoid service and maintenance staff having to enter or pass through the bedroom when carrying out routine service and maintenance tasks.

Service and maintenance

- 4.25 Spectacle plates or gas-tight dampers should be used to seal the system, should the suite and/or its ventilation system require disinfection. A method statement should be prepared detailing the procedure. For further guidance on disinfection refer to 'Biological agents: Managing the risks in Laboratories and healthcare premises' by the Advisory Committee on Dangerous Pathogens, available from HSE. All works of service and maintenance should be subject to a permit to work.

Appendices

**Appendix 1: Example room layouts – Use of single rooms for Isolation:
Key Design Principles**

Appendix 2: Acceptance testing of isolation suite

Appendix 1 : Example room layouts

Use of single rooms for Isolation: Key design principles

The room layouts in this Appendix are examples and are intended as a guide. Other room configurations are possible.

Current guidance (Scottish Health Planning Note 04: In-patient accommodation: Options for choice, May 2000) recommends that "*where not in a single-bed room each bedspace should not be less than 3.0m x 2.7m*". However interim guidance, issued on the 21st February 2007 by the Scottish Executive states that having regard to ergonomic criteria, primarily the space required for patient handling and other activities which take place in the immediate vicinity of the bed it is recognised that the minimum bedspace should not be less than 3.6m x 3.7m. It also states that when planning any new in-patient accommodation or any major refurbishments of existing accommodation it is recommended that the increased bedspace is adopted.

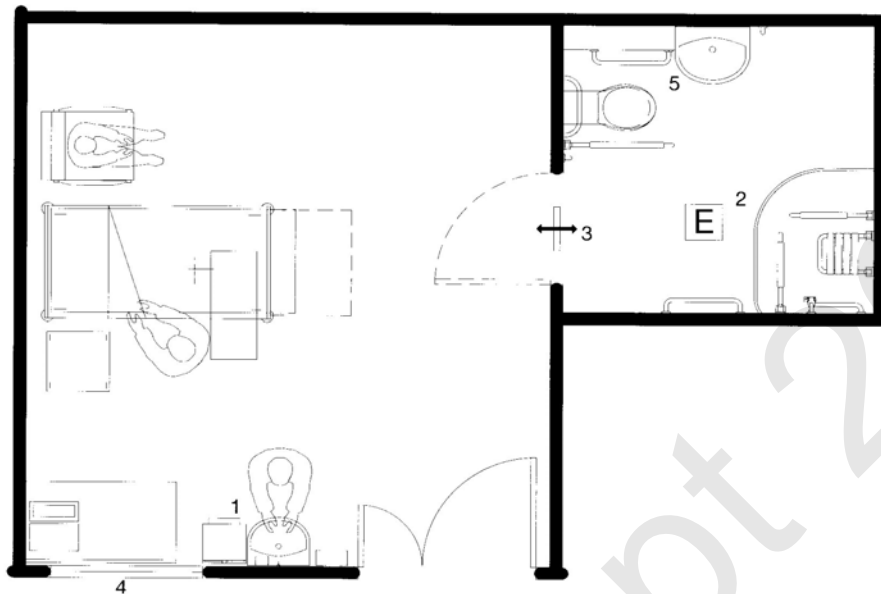
In planning for the construction or major refurbishment of healthcare facilities it is appropriate to provide an overall single occupancy room level of between 50% and 100%.

The appropriate level within that range is a matter for each individual NHSScotland Board to consider based on the following broad criteria:

- science-based decisions relating to the clinical and nursing care of patients and overall hygiene standards;
- value-based judgements about the nature of personal services and responsiveness to the local community and generational cultures;
- operational needs, for example managing volatility in demand or changing clinical needs and priorities; and
- the need to balance these against economic considerations.

Each Board may also want to give consideration to the patient group being treated.

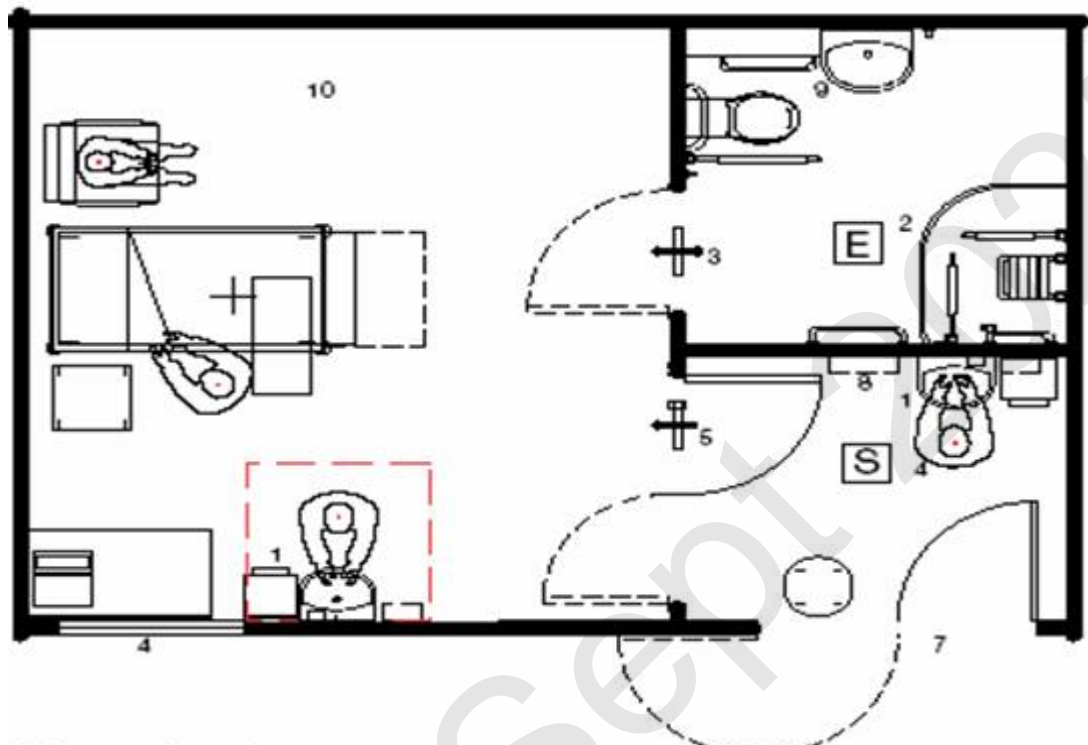
Sheet 1: New build single room with en-suite facilities.



Minimum requirements:

1. Clinical hand-wash basin with non-touch, fixed temperature mixer tap.
2. Provide suitable extract fan.
3. Transfer grille to en-suite door.
4. Observation window in corridor wall with integral privacy blinds to allow for staff observation and patient views out.
5. En-suite WC to be non-touch flush and hand-wash basin to have single tap with flow and temperature control.

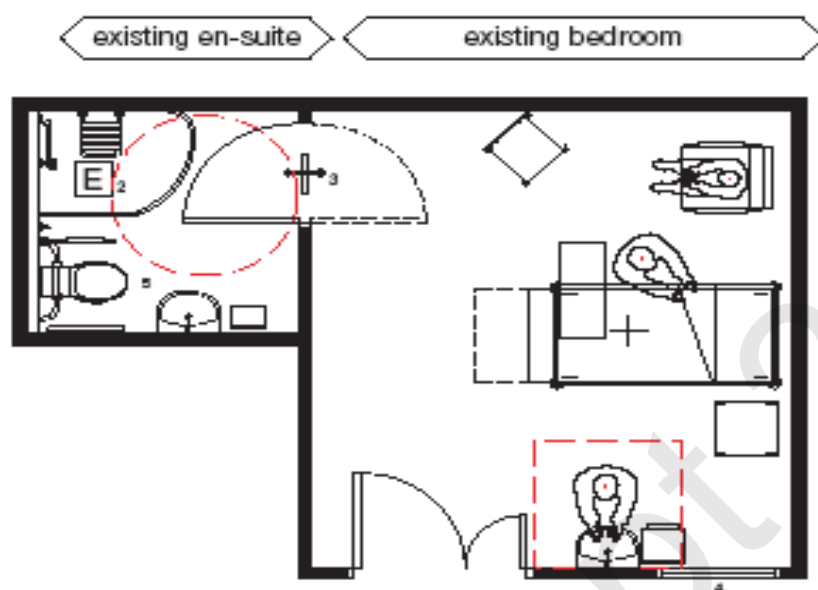
Sheet 2: New build single room with en-suite facilities and bed-access lobby (isolation suite)



Minimum requirements:

1. Clinical hand-wash-basin with non-touch, fixed temperature mixer tap.
2. Provide suitable extract fan.
3. Install transfer grille to en-suite door.
4. Supply air.
5. Pressure stabiliser.
6. Observation window in corridor wall with integral privacy blinds to allow for staff observation and patient views out.
7. Double door for personnel and bed access.
8. Disposable apron dispenser.
9. En-suite WC to be non-touch flush and hand-wash basin to have single tap with flow and temperature control.
10. Ceiling to be sealed solid construction, external window to be sealed.

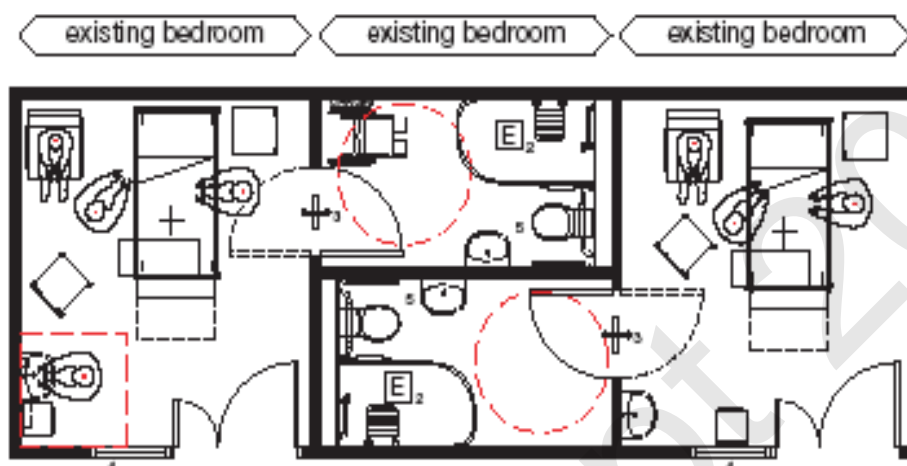
Sheet 3: Existing single room with en-suite facilities



Minimum requirements to upgrade existing facilities

1. Add clinical hand-wash basin with non-touch, fixed temperature mixer tap.
2. Upgrade existing extract fan.
3. Install transfer grille to en-suite door.
4. Observation window in corridor wall with integral privacy blinds to allow for staff observation and patient views out.
5. En-suite WC to be non-touch flush and hand-wash basin to have single tap with flow and temperature control.

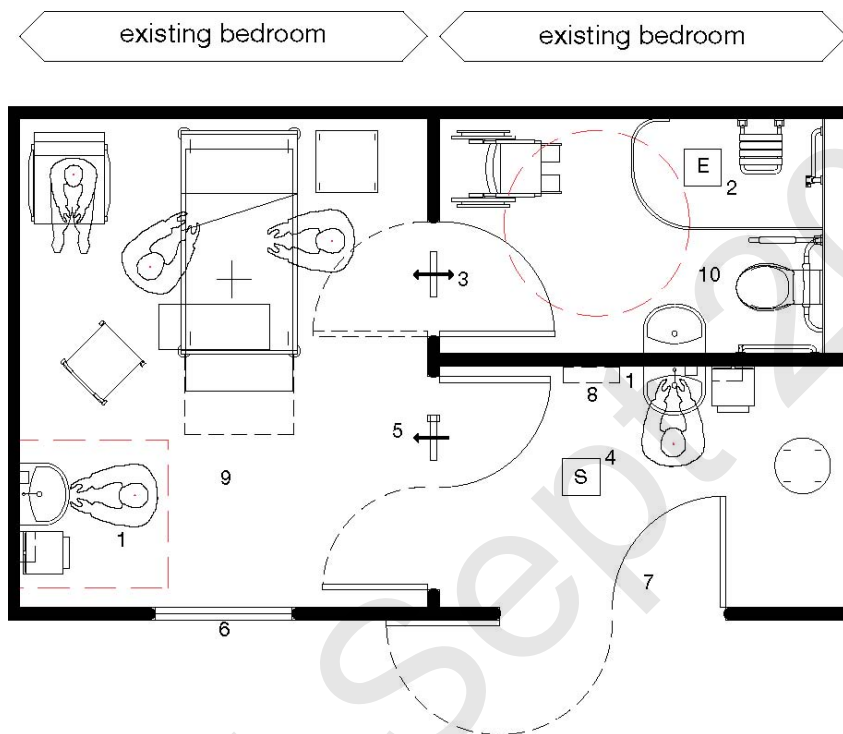
Sheet: 4 Single rooms without en-suite facility. Upgrading three existing single rooms to provide two single rooms with en-suite facilities



Minimum requirements to upgrade existing facilities:

1. Add clinical hand-wash basin with non-touch, fixed temperature mixer tap.
2. Provide suitable extract fan.
3. Install transfer grille to en-suite door.
4. Observation window in corridor wall with integral privacy blinds to allow for staff observation and patient views out.
5. En-suite WC to be non-touch flush and hand-wash basin to have single tap with flow and temperature control.

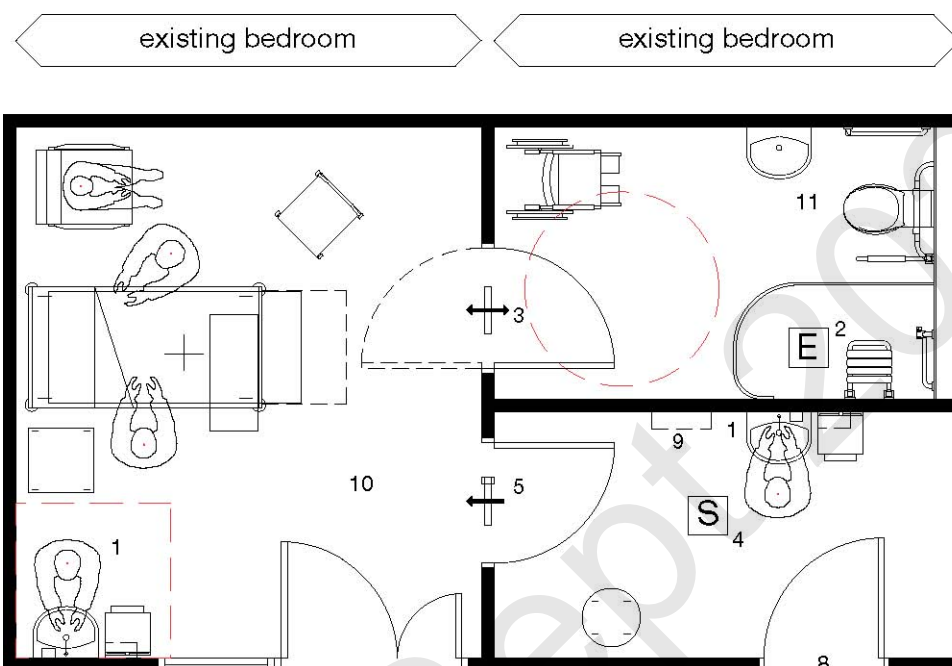
Sheet 5: Single rooms without en-suite facility. Upgrading two existing single rooms to provide one single room with en-suite facilities and bed access lobby



Minimum requirements to upgrade existing facilities

1. Add clinical hand-wash basin with non-touch, fixed temperature mixer tap.
2. Provide suitable extract fan.
3. Install transfer grille to en-suite door.
4. Supply air.
5. Pressure stabiliser.
6. Observation window in corridor wall with integral privacy blinds to allow staff observation and patients views out.
7. Double door for personnel and bed access.
8. Disposable apron dispenser.
9. Upgrade ceiling to sealed solid construction, external windows to be sealed.
10. En-suite WC to be non-touch flush and hand-wash basin to have single tap with flow and temperature control.

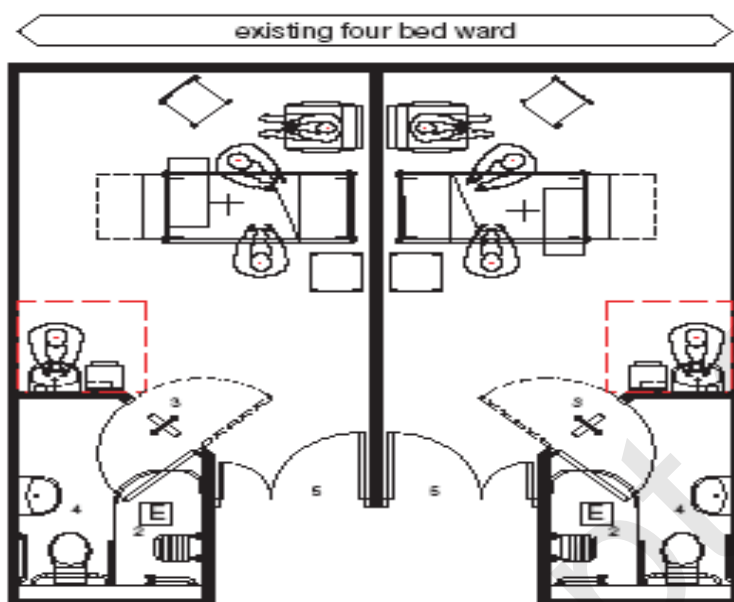
Sheet 6: Single rooms without en-suite facility. Upgrading two existing single rooms to provide one single room with en-suite facilities and personnel access lobby



Minimum requirements to upgrade existing facilities

1. Add clinical hand-wash basin with non-touch, fixed temperature mixer tap.
2. Provide suitable extract fan.
3. Install transfer grille to en-suite door.
4. Supply air.
5. Pressure stabiliser.
6. Observation window in corridor wall with integral privacy blinds to allow for staff observation and patient views out.
7. Existing door and a half for bed access only must be kept locked and have seals to minimise air transfer.
8. Single door access via lobby.
9. Disposable apron dispenser.
10. Upgrade ceiling to sealed solid construction, external windows to be sealed.
11. En-suite WC to be non-touch flush and hand-wash basin to have single tap with flow and temperature control.

Sheet 7: Upgrading existing four bedded room to provide two single rooms with en-suite facilities.



Minimum requirements

1. Clinical hand-wash basin with non-touch, fixed temperature mixer tap.
2. Provide suitable extract fan.
3. Transfer grille to en-suite door.
4. En-suite WC to be non-touch flush and hand-wash basin to have single tap with flow and temperature control.
5. Doors to be fully glazed, with integral privacy blinds, to allow staff observation and patients views out.

Appendix 2: Acceptance testing of isolation suite

Definitions

Isolation suite

Includes the entry lobby, patient's room, en-suite facility and any storage or other area directly accessible from the patient's or en-suite room.

Isolation suite envelope

The isolation room suite bounded by a solid floor, solid ceiling and full-height walls that separate it from any other adjoining space or the outside.

Validation – Isolation suite air permeability (leakage rate)

The suite will be considered fit for purpose if at a test pressure of +20 and –20 Pascals it has an average leakage rate of not more than 1 l/s of air per 1m³ of envelope volume. The method of testing is set out below.

Rationale: To ensure effective isolation, it is important that air leakage to or from adjacent areas is kept to a minimum. Construction gaps should be minimised and service penetrations sealed before the suite is tested. The test pressures are significantly more than would be achieved under a ventilation fault condition within the isolation suite. When in operation, the patient's room and en-suite are designed to be at a neutral or slightly negative pressure so the actual leakage between adjoining spaces should be insignificant.

Validation

Filtration test standards

General and fine filter grades to BS EN 779:2002 should be visually inspected to ensure that they are free from tears or other damage at the time of installation. They should be a good fit in their housing, with no obvious gaps that could allow air bypass.

High Efficiency Particulate Air (HEPA) filters, where fitted, should be certified by their manufacturer for conformity to BS EN 1822:2000. When installed, their performance should be checked with a particle counter using the method set out in BS EN 1822:2000 for in situ aerosol testing.

Air permeability – Tests method

1. Establish the volume of the isolation suite envelope as defined above.
2. Turn off the suite supply and extract ventilation systems and those serving adjoining spaces. (Rationale: All adjoining spaces need to be at atmospheric pressure in order to establish the true leakage rate.)
3. Seal all supply and extract terminals.
4. Wedge all internal doors open.
5. Fit a temporary board seal and test fan in the lobby to corridor doorway.
6. Run the fan to maintain a positive test pressure of 20 Pascal for at least two minutes.
7. Measure the airflow rate of the fan.
8. Reverse the fan and run it to maintain a negative test pressure of 20 Pascal for at least two minutes.
9. Measure the airflow rate of the fan.
10. Average the two airflow readings obtained.
11. Calculate the leakage rate in l/s of air per m³ of envelope volume. If the isolation suite envelope is correctly sealed the readings should be within 5% of each other.

Further details of the test method are contained in 'Testing buildings for air leakage', CIBSE, TM23, 2000.

Close all internal doors and, using the test fan, check that the pressure stabiliser opens at 10 Pascal and that it will carry the design airflow without flutter.

These tests should be carried out at initial commissioning and as necessary thereafter following works of refurbishment or when there is any doubt as to the actual performance standard of the suite.

System operating standard

The suite will be considered fit for purpose if, with the ventilation system operating and all doors closed, the following parameters are achieved:

- a positive pressure of between 10 and 12 Pascals between the entry lobby and the corridor;
- the patient's room has an air change rate of at least 10 per hour;
- the en-suite room is at a negative pressure with respect to the patient's room;
- a failure of either the supply or extract fan will be indicated at a designated nurse station and the estates department.

The suite should be tested following initial commissioning and thereafter re-tested at least annually for conformity with this operating standard.

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References

Acts and Regulations

Control of Substances Hazardous to Health (COSHH) Regulations 2002 and subsequent amendments, SI 2002 No 2677. The Stationery Office.
<http://www.opsi.gov.uk/si/si2002/20022677.htm>

The Building (Scotland) Regulations 2004 and Amendment Regulations 2006, 2007, SI 2000 No 2531. The Stationery Office.
<http://www.hmsi.gov.uk/legislation/scotland/ssi2004/20040406>

British Standards etc

BS 8300: 2001 Design of buildings and their approaches to meet the needs of disabled people – Code of practice. British Standards Institute, London.

BS EN 779:2002 Particulate air filters for general ventilation. Determination of the filtration performance.

BS EN 1822-4:2000 High efficiency air filters (HEPA and ULPA). Determining leakage of filter element (scan method).

BS EN 1822-5:2000 High efficiency air filters (HEPA and ULPA). Determining the efficiency of filter element.

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Scottish Health Facilities Note (SHFN) 30: 'Infection control in the built environment: design and planning'. Health Facilities Scotland, 2007.

Scottish Health Planning Note (SHPN) 04: 'In-patient accommodation: options for choice'. Health Facilities Scotland 2001.

Scottish Health Technical Memorandum 2015: 'Bedhead Services' Health Facilities Scotland 2001.

Scottish Health Technical Memorandum 2025: 'Ventilation in healthcare premises'.
Health Facilities Scotland, August 2001. (new edition forthcoming 2008, 'SHTM 03')

Scottish Health Technical Memorandum 2027: 'Hot and cold water supply, storage and mains services'. Health Facilities Scotland, December 2001.
(Revised version SHTM 04 in preparation for publication in 2008).

Scottish Health Technical Memorandum 2040: 'The control of legionellae in healthcare premises: a code of practice'. Health Facilities Scotland December 2001. (Revised version in preparation for publication in 2008 within SHTM 04).

Other publications

The management and control of hospital acquired infection in acute NHS Trusts in England. National Audit Office, 2000.

Biological agents: Managing the risks in Laboratories and healthcare premises. Advisory Committee on Dangerous Pathogens, The Stationary Office.

<http://www.hse.gov.uk/biosafety/biologagents.pdf>

Testing buildings for air leakage. CIBSE, TM23, 2000.

Useful websites

Hospital Infection Society

<http://www.his.org.uk>

**Infection Control Nurses'
Association
Health Protection Agency**

<http://www.icna.co.uk>

<http://www.hpa.org.uk>

Royal College of Nursing

<http://www.rcn.org.uk>

Health Facilities Scotland

<http://www.hfs.scot.nhs.uk>

Health Protection Scotland

<http://www.hps.scot.nhs.uk>