حكومة دبي
GOVERNMENT OF DUBAI

هيئة الصحة بدبي
DUBAI HEALTH AUTHORITY

DHA Health Facility Guidelines 2019

PART D – Infection Control

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Introduction

Infection control involves the prevention of the possible spread of infection by minimising the transfer of micro-organisms from person to person.

A number of strategies contribute to the control of infection, such as hand washing, careful aseptic technique and the observance of 'standard precautions' as determined by the operational policy of the particular healthcare facility.

By far the most important of the infection control strategies is effective hand hygiene. Hand hygiene facilities should be installed in all Patient Care Areas, and also in all areas where careful attention to hygiene is essential - such as Kitchens, Laundries, Pharmacies and Laboratories. Staff Amenities areas, such as Bathrooms, Toilets and Change Rooms should also be equipped with hand-washing facilities. Refer to the heading 'Hand Hygiene' for further discussion and detailed requirements.

Facets of construction and fit-out that contribute to effective infection control are covered in various sections of these Guidelines. They include selection of materials, separation of dirty and clean areas, adequate ventilation; floor coverings; waste management; provision for ease of cleaning; provision for sterilisation and disinfection of equipment and instruments; provision for the isolation of infectious patients, and provision for required facility cleaning regimes.

Under no circumstances, should any healthcare facilities be found with pest infestation.

Regular Water Testing for Legionella and Total Bacterial Count (TBC) should be conducted to DHA's requirements and upon requests.

Disclaimer

Although the quality of design and construction has a major impact on the quality of health care, it is not the only influence. Management practices, staff quality and regulatory framework potentially have a greater impact. Consequently, compliance with these Guidelines can influence but not guarantee good healthcare outcomes.

Compliance with these Guidelines does not imply that the facility will automatically qualify for accreditation. Accreditation is primarily concerned with hospital management and patient care practices, although the design and construction standard of the facility is certainly a consideration.

The Dubai Health Authority will endeavour to identify for elimination any design and construction non-compliances through the review of design submissions and through pre-completion building inspections, however, the responsibility for compliance with these Guidelines remains solely with the applicant.

Any design and construction non-compliances identified during or after the approval process, may need to be rectified at the sole discretion of the Dubai Health Authority at the expense of the applicant.

Therefore, the Dubai Health Authority, its officers and the authors of these Guidelines accept no responsibility for adverse outcomes in Health Facilities even if they are designed or approved under these Guidelines.

These Guidelines are not exhaustive and do not cover every eventuality that may or may not occur in the design, commissioning, operation or decommissioning of the health facility. Where there is conflict between DHA-HFG and existing laws, the latter takes precedence.

Live Documents as published on the DHA-HFG website should always be the only source of reference. Printed / downloaded version could go dated as revisions are published on the website.

Structure of the Guidelines

These Health Facility Guidelines are divided into 6 volumes in order to present information in a comprehensive and logical sequence and avoid unnecessary duplication of information between sections:

Part A	**Administrative Provisions** • Approval process for Health Facility Licensing • Prequalification of Health Facility Design cConsultants • Standards and Guidelines applicable to planning and engineering
Part B	**Health Facility Briefing and Planning** • Planning guidelines • Role delineation level • Functional Planning Unit incorporating Description of each Unit • Functional Relationships with diagrams • Schedule of Accommodation for typical units • Standard Components Room Layout Sheets and Room Data Sheets
Part C	**Access, Mobility and OH&S** • Space standards • Human Engineering • Ergonomic considerations • Accessibility requirements • Signage guidance • Safety and mobility considerations for floors, grab rails, doors, windows

Part D	**Infection Control** (this part) • General principles applicable to health facilities • Hand hygiene • Sources of Infection • Isolation Rooms • Surfaces and Finishes • Construction and Renovation
Part E	**Engineering - Building Services** • Electrical / ELV & ICT • Mechanical (HVAC) • Water Systems • Drainage Systems • Medical Gas Systems • Fuel Systems • Pneumatic Tube Systems • Fire Protection Systems (Special Areas Only) • Applicable Standards
Part F	**Feasibility Planning and Costing** A framework related to Part A licensing and methodology covering • Needs analysis • Risk Analysis • Funding strategies • Procurement strategies

Each part includes relevant guidance and reference material for readers to obtain further information.

1. General Principles

1.1 Risk Management

In recent years, a greater focus on improved clinical practices relating to infection prevention and control (IPC) and significant advances in technologies has led to better outcomes for patients.

On-going construction practices however, in new build, renovation, or the maintenance of health care facilities can impact on the well-being of patients. Any risks associated with all forms of construction therefore need to be managed in a recognised and formal manner.

Lack of risk identification or not having appropriate practices in place to control risks, can lead to serious environmental issues within a health care facility.

There is a need to identify the "at-risk" population, which may include patients, patient escorts, staff and visitors; the geographical location of the potential risk, and the possible transmission source/s at an early stage of planning and development. This process is aimed to be all-inclusive so as to educate and bring greater awareness of infection control related issues.

A formalised risk management methodology that includes sound infection control procedures should result in an improved overall outcome, with minimised risks to patients and health facility staff.

Due to the nature of the working environment for healthcare professionals, occupational hazard should be minimised by having all the healthcare professionals immunised at regular intervals as per the DHA Immunisation Guidelines.

1.2 Planning

The Team responsible for IPC strategies should be consulted throughout each stage of a project. Their considerations should be taken into account to ensure the design and physical layout of a facility meets required infection control measures.

It is imperative that IPC measures are "built in" or incorporated at the very outset of the planning and design of health care facilities – and that IPC inputs continue up to, into and beyond the construction completion stage.

The design of facilities should also take into account the movement of people, equipment and materials in ways that minimise the risk of infection transmission.

To facilitate IPC measures, the team should:

- Determine a suitable and appropriate assessment of the IPC risks
- Identify the necessary steps to reduce or control infection risks
- Take records of findings based on the assessment and the necessary steps taken
- Implement the steps that have been identified
- Monitor and determine if further steps are needed to reduce or control infection risk

The objective of these control measures is to ensure the IPC advice is provided at the correct time to prevent delays or costly mistakes.

1.3 Work Flows

1.3.1 General

While the cleanliness of people, tools and supplies within the facility is vital to infection prevention and control, the spaces they enter and how they move between spaces is also critical. This means that spaces must be designed with certain activities separated from others to avoid the risk of infection and cross contamination. A carefully planned workflow is essential to minimising risk of contamination.

1.3.2 Instrument Processing

The planning and design of a facility should provide separate clean and dirty working areas with a defined unidirectional workflow to prevent cross contamination. The flow of instruments, equipment and materials must be linear - from dirty to clean, to sterile, to store, to dispatch. To allow these processes to occur, planning functions should be broken up into the following zones:

Department or Functional Planning Unit (FPU)	Description
Receiving area	Soiled items are received from units throughout the facility and separated into recyclable and non-recyclable items.

Waste disposal	Non-recyclable items are disposed of appropriately.
Decontamination area	All recyclable articles (including delivery trolleys) are sorted, rinsed, ultrasonically cleaned or mechanically washed and dried
Packing area	Instruments and equipment are sorted, counted and packaged for sterilising
Sterilising / cooling areas	Sterilisers are loaded, operated, and unloaded Sterilised items are allowed to cool while still loaded on steriliser trolleys
Sterile Stock	Sterile Stock is a sterile storage area for instruments and packs being off loaded from the Sterilising/ cooling areas. Items will be kept here before dispatch to other units of the facility
Dispatch area	Distribution trolleys are held prior to dispatch to units of the facility. A separate entrance for sterile stock being received from external suppliers should be provided
User areas	Sterile stock is distributed to the units of the facility as required and disposed of or returned to the receiving area after use.

Table 1: Zones for Instrument Processing

Activities carried out within this process must be performed in designated zones to maintain the workflow pattern and thus prevent contamination. Each zone should have sufficient work space to permit the required activity to be performed without the need for any "back tracking". Clean items should not re-enter contaminated areas. Refer to 'Functional and Decontamination Areas' in this section for further discussion and information.

1.3.3 Staff Facilities

Eating and recreation areas for staff must be separate from work areas and patient treatment areas.

Utensils must not be washed in hand basins and hand washing should not occur in sinks for washing equipment.

Refrigerators for food storage must be separate from refrigerators for clinical specimen, medical products such as drugs, vaccines and blood, and other treatment materials.

1.3.4 Operating Rooms (ORs)

Shared use of the corridor for staff and patient access in the OR is acceptable such as in single corridor designs. However, the delivery of sterile supplies and removal of waste to provide sufficient

separation needs to be carefully considered in this model. It is recommended that sterile supplies/ equipment have a separate, dedicated access way into the OR without this conflicting with staff or patient traffic. Sterile supplies to be transported in sealed trolleys.

If the single corridor design model is adopted, then the sterile instruments and supply should be transported to the OR via sealed carts. Similarly, the removal of waste and used instruments should be via separate sealed carts to clean-up rooms, SSU and disposal rooms.

1.4 Air-Conditioning

Health facility air-conditioning and ventilation systems should be monitored regularly and serviced by accredited service technicians. Maintenance schedules should always be documented, and appropriate access given to permit ongoing maintenance.

Air-conditioning or ventilation systems are required for all areas of the building. Critical areas as identified under **Part E - Engineering Services** of these Guidelines should be provided with backup cooling and power.

Air conditioning in Sterile Supply Units should comply with **Part E - Engineering Services** of these Guidelines.

Where there is a risk of airborne transmission of pathogens, there should be a sufficient number of single rooms (minimum of 2 isolation rooms in every 60 beds) with adequately filtered air-conditioning and external exhaust systems. No recirculation of air should be permitted. Clinical planning to determine these requirements.

Negative pressure ventilation should be made available in accordance with these Guidelines for patients infected with tuberculosis (TB), chicken pox, measles, SARS and MERS.

Refer to **Part E - Engineering Services** of these guidelines for further information.

1.5 Operating/ Procedure Rooms

Due to the invasive procedures undertaken in an operating /procedure room, infection control is a key consideration in the design and planning process.

Where bronchoscopy is performed on persons who are known or suspected of having pulmonary tuberculosis or similar infection, the Operating/Procedures Room should meet the negative pressure Isolation Room ventilation requirements. Air to a bronchoscopy suite/room should not be re-circulated, unless this is done via a well-maintained HEPA filtration system. The air should exhaust externally, and any external vents should not be in proximity to other patient areas, or air intake locations. Refer to **Part E - Engineering Services** for Bronchoscopy room design.

All standard Operating Rooms (ORs) or Procedure Rooms are required to be positive pressure rooms, relative to any adjacent area except the attached Sterile Stock/ Set-up Rooms. The pressure gradient must provide an airflow direction from the OR to the surrounding areas.

Relative pressure gradients are represented diagrammatically below:

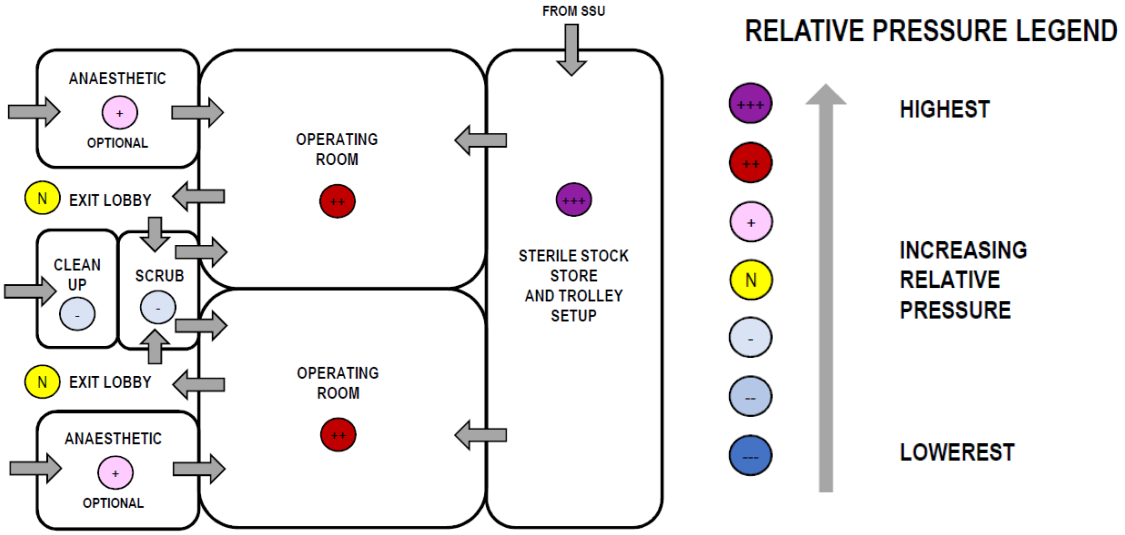

Figure 1: Pressure Gradients for Operating Rooms and surrounding support rooms

In all cases, terminal filters at the point of entry to the OR should be HEPA filters, with provision for testing filter integrity from the room side. HEPA filters should be housed in special housing with sealing and tested air diffusion screens.

A minimum of four exhaust or return air intake grilles should be located in the corners of the OR, 200mm above floor level.

Anything that moves in or out of an OR, including the surgical suite as a whole, should be subject to stringent control. Any moisture in this environment must be rigorously and aggressively controlled by limiting the location and quantum of sources.

Flash sterilisation, or immediate-use steam sterilisation (IUSS) where possible, should be avoided as ideal infection control measures are not assured. It also introduces sources of moisture into a sterile environment and may create cross-contamination where ORs/ Procedure Rooms share the same flash sterilisation area. The provision of flash sterilisation is not mandatory in any circumstances and its usage should be restricted to minimal.

1.6 Separation of Decontamination Areas

Separate and clearly defined decontamination areas from other functional areas are required to maintain effective barriers for infection control. Delineation of these areas facilitates easy identification of surfaces that should be cleaned and disinfected between patients.

A functional area is a zone or group of rooms within a healthcare facility that provides a specific service. For example, functional areas within an Inpatient Unit include patient areas, support areas and staff areas.

Functional areas can be categorised as extreme, high, medium and low risk. The classification of the spaces reflects the frequency and intensity of cleaning required to meet infection control standards; and will influence the design and material specification of the specific area.

Both functional and decontamination areas should have:

- Adequate lighting to minimise the risk of injury and enable inspection of cleaned areas and equipment
- Good ventilation to reduce the risk of cross-infection from aerosols
- Smooth impervious work surfaces made from non-porous materials without crevices
- Slip resistant or non-slip, water-imperious flooring with sealed joints
- Correct bins for the disposal of hazardous waste

Decontamination areas should be divided into separate functional zones for the progressive decrease of contamination towards a relatively clean but not sterile condition. The clean-up/ processing area should be carefully defined and protected from all vapours, splashing or aerosols that may be produced during operating, hand washing, equipment washing, disinfection and ultrasonic cleaning that occurs in the decontamination area.

The area should comply with relevant requirements of these Guidelines and include:

- adequate bench space for dismantling, cleaning and working on equipment
- adequate bench space for drying, processing and packaging cleaned equipment
- sufficient storage for materials and equipment used for cleaning and disinfecting; keeping the work benches free from clutter
- handwash basin with non-refillable soap and paper towel fittings
- at least two deep stainless steel sink or trough for manual cleaning of instruments and other equipment. For smaller facilities where no surgical or dental procedures take place, (e.g.: acupuncture clinics), a small dedicated basin or stainless steel bowl may be used as an alternative. Cleaning sinks must be used only for the decontamination of equipment and instruments and must be located separately to clinical hand washing basins to avoid cross-contamination
- a mechanical disinfector/ washer as required
- a first-aid kit to be provided in the decontamination room

A sterilising area, cooling area for sterile items awaiting storage and sufficient storage for effectively covered or packaged cleaned, disinfected and/or sterilised instruments and equipment will be

required, in a separate zone adjacent to the decontamination area. Also refer to the separate Functional Planning Unit in **Part B - Sterile Supply Unit** in these Guidelines.

2. Hand Hygiene

2.1 General

Hand hygiene consists of washing hands with soap and water or use of antiseptic hand sanitisers.

There are three distinct hand hygiene activities:

- General or routine
- Procedural (prior to gowning, gloving or an aseptic procedure)
- Surgical for operating procedures

As adequate hand hygiene is a major factor in preventing transmission of infections, it is essential that provision of sufficient and appropriate hand hygiene facilities is considered in the early design stage.

The World Health Organisation hand hygiene recommendations for health care workers include:

- Use of antiseptic hand sanitisers (AHS) as the preferred means of routine hand cleaning if hands are not visibly soiled
- Washing hands with soap and water if hands are visibly soiled, if staff have been in contact with spore forming pathogens or when gloves have not been used

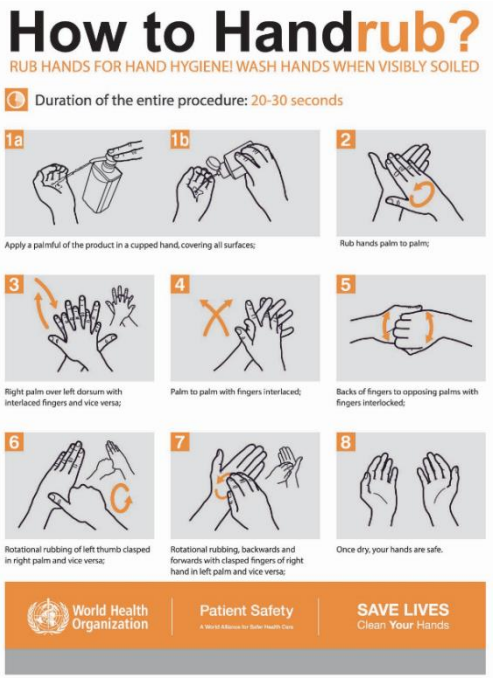

Figure 2: Example of Poster with instruction for Hand Rub

Figure 3: Example of Poster with instruction for Hand Wash

(Source: World Health Organization) **(Source: World Health Organization)**

In patient areas, staff will perform hand hygiene at the following five key events:

1. Before touching a patient
2. Before a clean/ aseptic procedure on a patient
3. After exposure to body fluids
4. After touching a patient
5. After touching patient surroundings

(Source: WHO, Hand Hygiene: Why, How and When brochure, 2009)

A combination of antiseptic hand sanitiser dispensers and handwash basins will be required in all patient areas within the health facility.

2.2 Antiseptic Hand Sanitisers

Current research indicates that Antiseptic Hand Sanitiser (AHS) are the primary and preferred method of hand cleansing. The key advantages are:

- AHS's reduce more bacteria on hands than soap and water
- Take less time to use, (15 to 20 seconds)
- More convenient; easy to install and cost effective (also paper towels are not required)

AHS should be located so they are readily available for use as follows:

- At the point of care
- At the foot of each patient bed or trolley
- In clinical areas

Refer to **Standard Components** in these Guidelines for their required locations.

Antiseptic Hand Sanitisers should be in single-use, non-refillable pouches inserted into dispensers. Alcohol-based Hand Sanitisers should not be used in IVF Units as they are embryo-toxic.

Where alcohol-based AHS are used, they should be stored in accordance to flammable liquid storage requirements.

Antiseptic Hand Sanitisers are not a complete replacement for Handwash Basins. After every 5 to 7 instances of using Antiseptic Hand Sanitiser, full hand wash with water and soap is recommended in order to remove any built-up of AHS.

2.3 Handwash Basins

Handwash basins should be provided in rooms where procedures are likely to occur, including inpatient rooms, ICU bed bays, treatment and procedure rooms. The type of handwash basins in clinical areas such as these should be ideally provided with sensor taps, prevent splashing, and be of sufficient size and height above floor level to permit the washing of forearms.

In areas with physical barriers, e.g.: Emergency Unit cubicles or rooms, a handwash basin should be accessible to each individual space within a short distance.

It is also essential that handwash stations are provided where food, drugs, pathology specimens and contaminated materials are handled or processed.

The Guidelines refer to several categories of hand basins including Type A, B, C and troughs, and the various configurations and placement for different types and placement of tapware. These are addressed in the following sections, diagrams and tables.

Handwash basins need to be selected so as to reduce the risk of splashing in areas where direct patient care is provided. Handwash basins should be installed to ensure a snug fit with wall or countertop, with junctions sealed to prevent water leaks.

Water being present around handwash basins or sinks encourages the development of mould and bacteria in any substrate material. Where countertops occur, these need to be properly sealed and maintained. Integral splashbacks can also help to eliminate the need for junctions that require caulking. Integral splashbacks, however, are not mandatory.

Under-mount handwash basins are difficult to seal or clean and therefore should not be used.

Figure 4: Under mount hand basin not recommended

Handwash basins should be provided with the following:

- Impervious splashback a minimum of 300mm above the handwash basin rim
- Tapware suitable for the type of basin; the water discharge point should be a minimum 260mm above the bottom of the hand wash basin for clinical hand washing
- The bowl should have a nominal size of not less than 0.1m^2 and have a minimum bowl dimension of 230mm
- Soap dispensers should be a non-refillable type and positioned so that any spills from the dispenser during operation can be captured onto the basin for infection control and ease of maintenance; spills onto floors should be avoided
- Wall mounted paper towel dispenser and waste receptacle

Mirrors should not be installed at hand scrub stations or at hand washing stations in food preparation areas, patient areas, consultation rooms or other clinical areas where infection control can be compromised by hair grooming.

For Handwash basins provided in clinical, patient or catering areas (excluding any bathrooms, ensuites, toilets etc.), mirrors cannot be provided over handwash basins.

2.4 Handwash Basin Types

2.4.1 Type A

Type “A” handwash basin refers to a large “Clinical Scrub” type. The tapware is to be wall mounted with hands-free operation (sensor, foot or elbow). This handwash basin is used in areas requiring clinical hand-washing for sterile procedures - for example, ICU Rooms, Treatment Rooms and Cardiac Catheterisation areas.

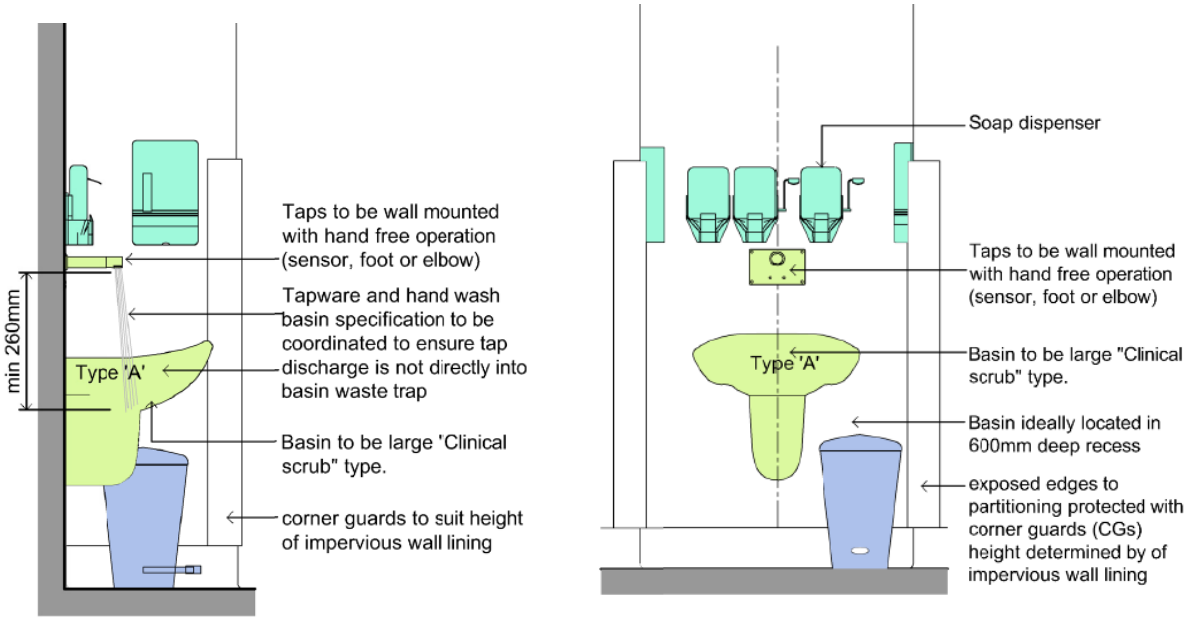

Figure 5: Type A Handwash basin

2.4.2 Type B

Type “B” basin refers to a general staff handwash basin of a medium-sized wall mounted or integral vanity type (moulded basin with the benchtop) type. Tapware can either be wall mounted or basin mounted with hands-free operation (sensor, elbow or foot). This basin is used in areas requiring general staff hand washing, for example Inpatient Unit (IPU) corridors.

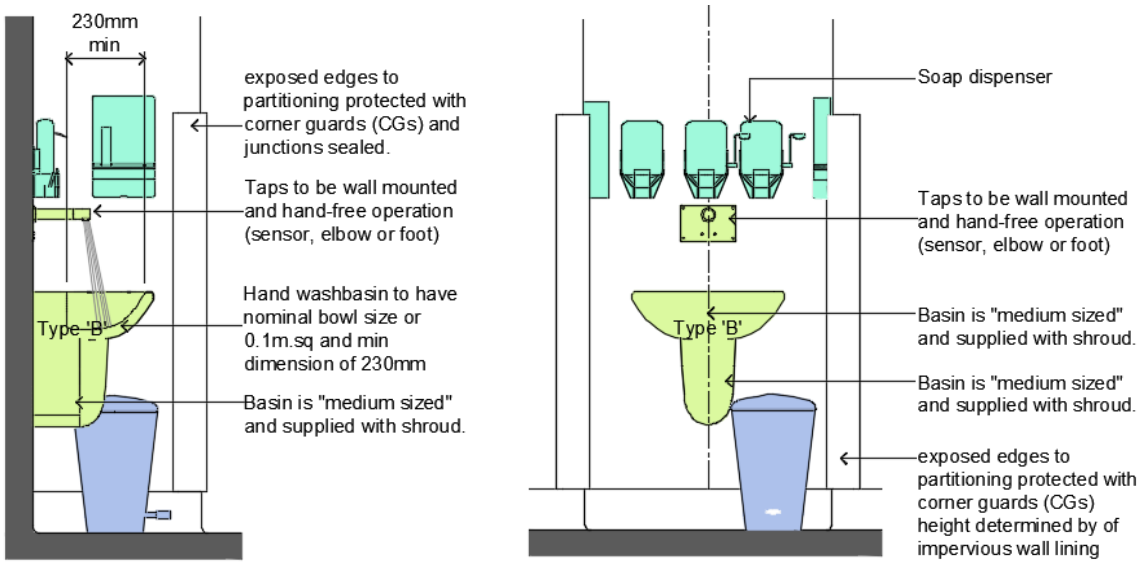

Figure 6: Type B Handwash basin

2.4.3 Type C

Type C basin refers to a small staff hand washbasin that is wall mounted or integral vanity type (moulded basin with the benchtop). The tapware is either wall mounted or basin mounted with hands-free operation (sensor, elbow or foot). This basin is used in areas requiring general staff hand washing, for example Staff Amenities and Toilet Areas. The handwash basin minimum size is a nominal 0.1m^2, with a minimum basin dimension of 230mm.

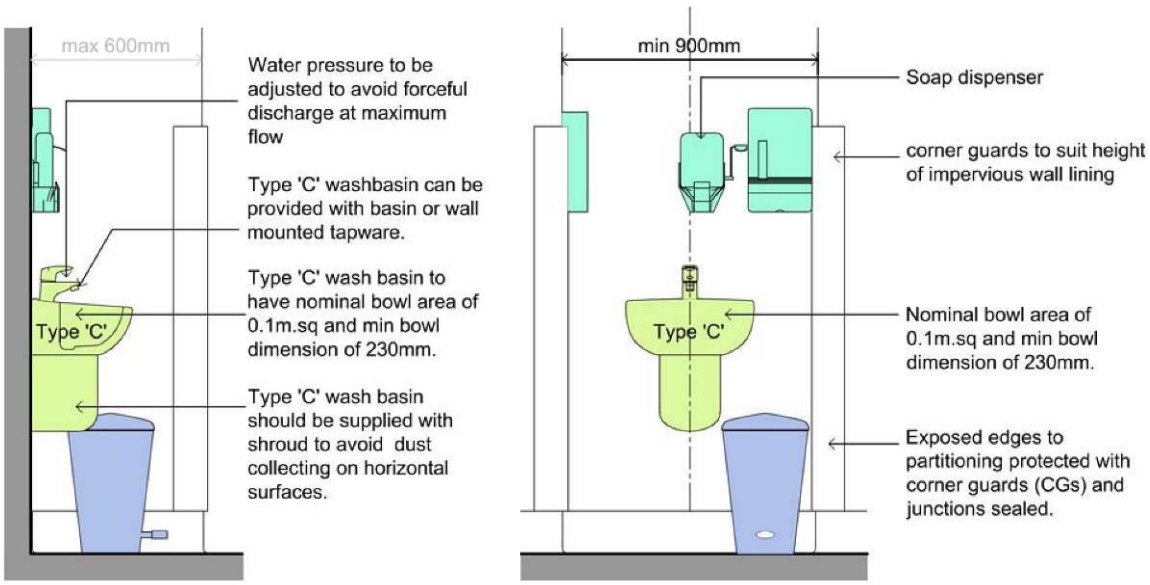

Figure 7: Type C Handwash basin

2.4.4 Scrub Sinks

Scrub sink refers to a long sink that can accommodate one or more staff scrubbing for a sterile procedure at the one time. Refer to Ergonomics for the heights, width of space per person and type of tapware.

To avoid splashing and cross contamination, a decontamination sink should be separated from any clean work area by either a 1250mm distance from the edge of the sink - or by a separating wall or screen. If screening is used, it should extend a minimum of 1250mm above the floor.

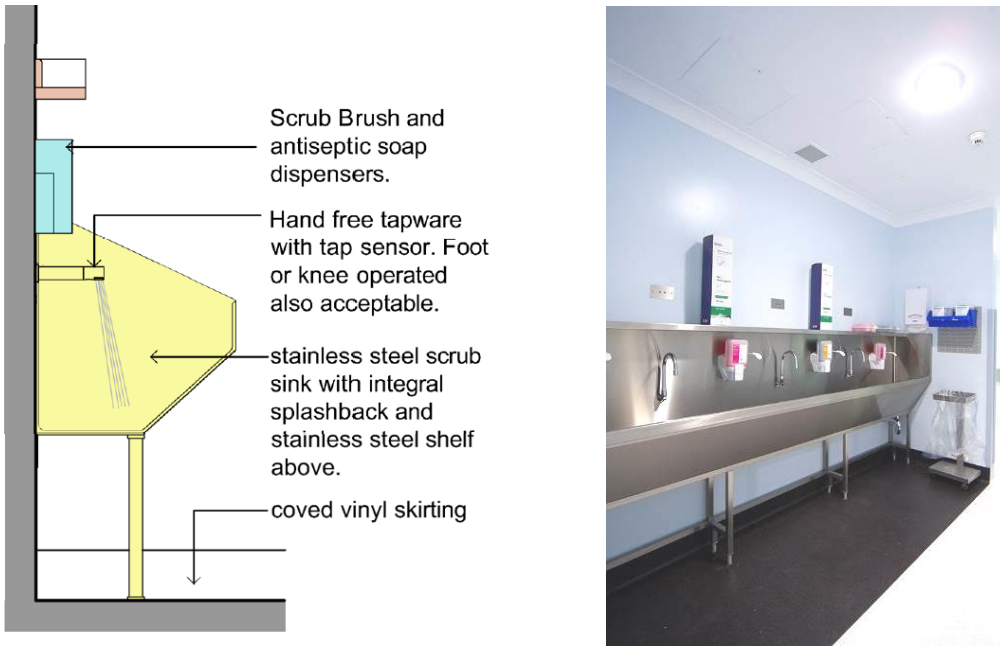

Figure 8: Typical scrub sink

2.5 Handwash Basins – Ratios and Placement

Hand washing basins should be provided in the following ratios:

Location	Quantity
Ambulatory Care Units (Chemotherapy, Renal Dialysis)	1 per enclosed bay; 1 per 4 open treatment bays
Emergency Unit	1 per enclosed treatment bay; 1 per resuscitation bay; 1 per 4 open treatment bays

Inpatient Units	1 per single or shared patient room; additional basins are required outside the patient rooms (in corridors) as per the FPU requirements
Intensive/ Critical Care Units; (ICU, HDU, CCU)	1 per bed in enclosed room or 1 per 2 beds in open bays; additional basins are required outside the patient rooms (in corridors) as per the FPU requirements
Neonatal Intensive Care Nurseries (NICU)	1 per enclosed cot space; 1 per 2 open cot spaces; additional basins are required outside the patient rooms (in corridors) as per the FPU requirements
Neonatal Special Care Baby Unit (SCBU)	1 per cot in enclosed room; 1 per 3 open cot spaces; additional basins are required outside the patient rooms (in corridors) as per the FPU requirements
Patient treatment areas generally	no greater than 10 metres to a hand washing basin

Table 2: Handwash Basin Ratios

Handwash basins are to be located within 6 metres of any food preparation area.

Staff rooms are generally equipped with sinks for food preparation and dishwashing. Hand washing in food preparation sinks should be strongly discouraged. Placement of a handwash basin within, or in close proximity of a staff room should be considered to ensure any risk of infection is minimised.

For the requirement for hand wash basins, also refer to the FPU's and Standard Components in these Guidelines.

2.6 Schedule of Handwash Basin Types

The following indicates recommended handwash basin and tap combinations for particular rooms. For rooms not listed, refer to a similar functional use.

Room / Space	Basin Type	Wall Tap	Basin Tap	Wrist Action	Elbow Action	Sensor Tap	Remarks
Bay - Handwashing	B	Optional	Yes		Yes	Recommended	In Corridors
Bathroom	B		Yes	Yes		Optional	
Birthing Room	A	Yes			Yes	Recommended	
Clean Utility	B	Optional	Yes		Yes	Recommended	
Clean Utility/ Medication Room	B	Optional	Yes		Yes	Recommended	
Clean-Up Rooms	B		Yes		Yes	Recommended	

Room / Space	Basin Type	Wall Tap	Basin Tap	Wrist Action	Elbow Action	Sensor Tap	Remarks
Consult Room	B	Optional	Yes	Yes	Yes	Recommended	Also includes Exam Rooms
Dirty Utility	B		Yes		Yes	Recommended	
Endoscopy Procedure Room	A	Yes			Yes	Recommended	Or scrub trough outside room
Ensuites	B		Yes	Yes		Optional	
High Dependency Unit	A	Yes			Yes	Recommended	
Imaging Rooms – Interventional (eg. Cath Labs)	A	Yes			Yes	Recommended	Or scrub trough outside room
Inpatient Bedrooms	B	Optional	Yes		Yes	Recommended	
Intensive Care Unit (Adult and Neonatal)	A	Yes			Yes	Recommended	
Isolation Room - Airlock / Anteroom	B	Optional	Yes		Yes	Recommended	
Isolation Room/	B	Optional	Yes		Yes	Recommended	
Laboratory	B	Optional	Yes		Yes	Recommended	
Medication Room	B	Optional	Yes		Yes	Recommended	
Mortuary	B	Optional	Yes		Yes	Recommended	
Pantry	B		Yes	Yes		Recommended	Includes Kitchenettes
Pharmacy - General	B	Optional	Yes		Yes	Recommended	
Pharmacy - Preparation Area	A	Yes			Yes	Recommended	
Procedure Rooms	A	Yes			Yes	Recommended	Or scrub trough outside room
Recovery	A	Yes			Yes	Recommended	
Scrub-Up / Gowning	Scrub trough	Yes				Yes	Operating Unit, Day Procedure Unit, Imaging-interventional

Room / Space	Basin Type	Wall Tap	Basin Tap	Wrist Action	Elbow Action	Sensor Tap	Remarks
SSU - De-contamination	B	Optional	Yes		Yes	Recommended	
Staff Room	C	Optional	Yes	Yes		Optional	
Toilet - Patient	B		Yes	Yes		Optional	
Toilet - Public	C		Yes	Yes		Optional	
Toilet - Staff	C		Yes	Yes		Optional	
Treatment	A	Yes			Yes	Recommended	

Table 3: Schedule of Handwash Bain Types

For the requirements in all other room types, refer to the individual Standard Components.

2.7 Hand Dryers

Drying is an essential part of the hand hygiene process.

There are four main groups of hand dryers, namely modern jet-air hand dryers, warm air hand dryers, paper towels and roll cloth towels.

Many studies have been conducted to compare the bacteria levels present after the use of these four different types of hand dryers.

Results have confirmed that only paper towels reduced the total bacteria on the hands.

Tests have also been conducted to establish the impact of potential cross-contamination within the ablution facility environment. Results determined that the jet dryer was capable of blowing micro-organisms some distance from the dryer, potentially contaminating other users of the ablution facility. The warm air hand dryer also spread micro-organisms, albeit to a lesser extent. Paper towels however showed no significant spread of micro-organisms.

Studies have observed that the bacterial count doubled with hot air dryer types, while there was approximately a quarter reduction in the bacterial count with paper towels.

The roll cloth towels are seen as a risk to hygiene due to unreliable operation and control process.

(Refer to TUV Produkt and Umwell GmbH, Report No 425-45206)

Accordingly, all areas in healthcare facilities should be supplied with paper towel dispensers. Use of warm air or jet-air hand dryers in healthcare facilities are not permitted.

Jet Air Dryer

Warm Air Dryer

Roll Cloth Towels

Paper Towel - sheets

Paper Towel - motion sensor

Paper Towel – paper roll

Figure 9: Typical Hand Drying Methods

3. Potential Infection Sources

3.1 Wet Areas in Sterile Stores

Sinks or handwash basins should NOT be provided in sterile environments, such as sterile stock storage areas. Clinical handwash basins should be located external to such areas to avoid any cross-contamination risk.

Figure 10: no sinks or hand basins in sterile stock storage areas

Sterile Store Areas are required to have sensors to monitor the level of humidity and temperature to ensure it is maintained at an acceptable level. Refer to **Part E - Engineering Services** of these Guidelines for further details and requirements. Sinks or handwash basins, where required in Clean Utility or medication rooms, should be positioned to avoid any risk of contamination of sterile stock that may be stored in the room. The "Type B" handwash basin is recommended for this particular application but it is not mandatory.

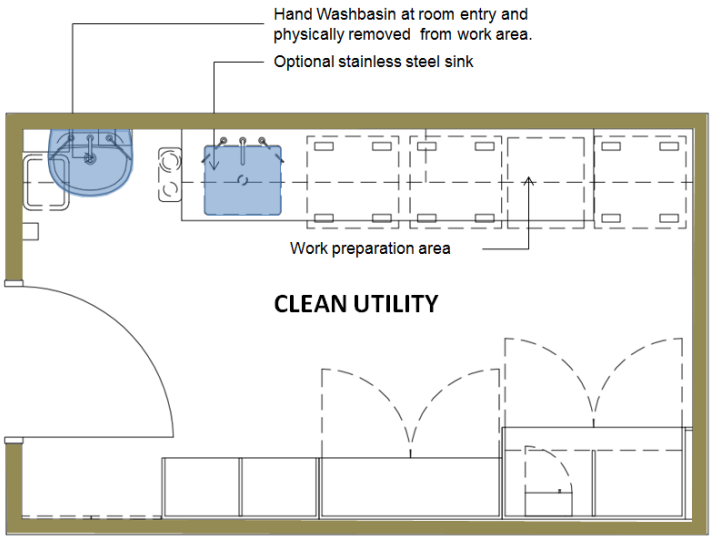

Figure 11: Typical Clean Utility/ Medication Room plan showing preferred location for basin and sink

3.2 Hydrotherapy Pools and Tanks

Infection prevention and control of hydrotherapy pools or tanks can be challenging, as micro-organisms are always present in the water during a treatment procedure.

Warm water temperatures, aeration and agitation of the water, along with the configuration of hydrotherapy tanks or pools create the ideal environment for the proliferation of bacteria. Surface finishes, equipment maintenance, and cleaning or disinfection is therefore paramount.

Potential transferal routes of infection include the accidental ingestion of water, sprays and aerosols, and direct contact with wounds or intact skin.

A written methodology statement describing proposed sanitation procedures and systems should be provided at an early stage of the design process. Based on the proposed strategy, equipment operation and instruction manuals can be produced by the contractor to assist the end user with required operational procedures.

Due to the size of hydrotherapy pools which precludes draining after patient use, stringent management practices are required to maintain constant water conditioning and disinfection. It is

therefore recommended that a regular training program with regard to the proper use of the installed equipment is put in place by the facility operator.

Also refer to **Part E - Engineering Services** of these Guidelines.

Figure 12: Hydrotherapy pool

3.3 Ice Machines and Ice Production

Micro-organisms may be present in ice, ice storage chests and ice-making machines. The two main sources for micro-organisms are the potable water used for making ice, and the transferal of micro-organisms via the hands.

Microorganisms in ice can also contaminate clinical or medical specimens that require cold temperatures for transporting or holding.

Improper storage and improper handling of ice by staff and /or patients may result in ice-making machines or ice becoming contaminated. To avoid contamination, it is recommended that:

- The selection and installation of ice making machines is made to ensure a button control dispenses ice directly into a portable container.
- Direct hand contact of ice intended for human consumption is avoided or minimised.
- Ice scoops used for dispensing ice are made from a durable and impervious material and are regularly sterilised.

Figure 13: Benchtop dispensing ice making unit

Recommended

Figure14: Bulk/chest ice making units

Not recommended

Frequent cleaning and mild disinfection of portable ice chests and containers is recommended and should be part of operational procedures - while regular ice making machine maintenance is important for appropriate performance. Accordingly, appropriate policies and procedures based on operational and maintenance manuals should be adhered to and verified on a regular basis.

3.4 Materials Management and Chutes

3.4.1 Materials Management

Material Management is a scientific technique of planning, organising and controlling the flow of materials from initial acquisition, usage and ultimate disposal.

Within a healthcare environment, this can include, but is not limited to food distribution, clean and dirty linen distribution, medical product distribution and waste material distribution.

Good waste management practice requires minimising exposure to all types of wastes. Movement of waste materials throughout a healthcare facility should be undertaken to avoid peak activity times such as meal times, visiting hours and change of staff shifts. In addition, any clinical or related waste should not be moved through public areas.

Future trends will quite likely see the introduction of greater mechanisation to all types of material management, particularly waste materials where potential infection risks to patients and operators

can be minimised. A safer solution to all types of waste material handling, whether, hazardous, infectious, or general (non-hazardous) wastes should result.

Automated Guided Vehicles (AGV)

It is therefore anticipated that the use of Automated Guided Vehicles (AGVs) will become more prevalent in coming years. An AGV is a mobile robot that uses vision, magnets or lasers; alternatively, markers or wires in the floor surface to automatically navigate and distribute materials within a healthcare facility environment.

Automated guided vehicles (AGVs) increase the efficiency of waste material handling, reduce the risk of infections, and may assist with reducing long term operating costs associated with waste material disposal.

Capital cost outlays, when measured against the ongoing operating costs for the life of a healthcare facility, may result in a greater acceptance of the AGV methodology.

Whether for immediate or future incorporation, AGVs should ideally be given consideration at the early planning stages of a healthcare facility and included in the overall IPC strategy.

Figure15: Typical AGV with a supply trolley

3.4.2 Waste Chutes

Chutes are vertical hollow tubes, generally steel lined that provide for the movement of waste materials from waste generating areas to a centralised collection point.

Chutes to move clinical, non-clinical, related wastes and dirty linen are not permitted because of the risk of spillage and unnecessary exposure to infection.

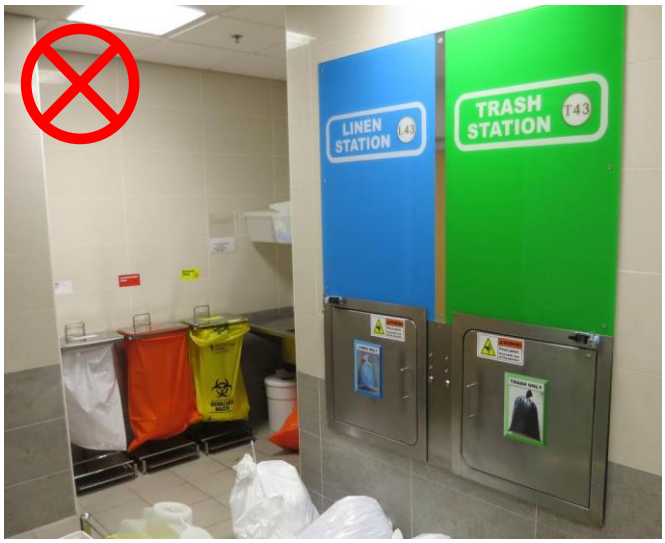

Figure 16: Linen and Waste chutes are not permitted

4. Isolation Rooms

4.1 General

An isolation facility aims to control the airflow in the room so that the number of airborne infectious particles is reduced to a level that ensures cross-infection of other people within a healthcare facility is highly unlikely. This may be achieved by:

- Control of the quantity and quality of intake or exhaust air
- Maintain different air pressures between adjacent areas
- Designing airflow patterns for specific clinical procedures
- Diluting infectious particles with large air volumes
- Air filtration – HEPA filters, etc.
- Air Supply and Exhaust

Isolation facilities include the following types:

- Neutral or standard room air pressure, for example standard air conditioning, also known as Class S
- Positive room air pressure where an immune-compromised patient is protected from airborne transmission of any infection, Class P
- Negative room air pressure, where others are protected from any airborne transmission from a patient who may be an infection risk, Class N
- Negative room air pressure with additional barriers including an Anteroom, also known as Class Q for quarantine isolation

Isolation rooms have fairly high rates of air exchange relative to other patient areas. This applies to both ventilation air supply and exhaust flow rates. Potential draughts within the patient room can result, therefore thermal comfort of the patient needs special attention. Individual thermostats in each room should be installed, so that air temperature can be controlled from within the room. Refer to **Part E - Engineering Services** for further details.

Anterooms must be provided with self-closing doors and be of sufficient area to allow for the donning or removal of personal protective equipment or clothing and hand washing facilities.

An assessment should be made of the service requirements of the Isolation/ Anteroom in order to determine the practicality of sealing junctions at penetrations to ceiling and wall linings. In some instances, the number of service penetrations in partitions and ceilings may suggest the introduction of a "false" wall, or additional partition. The false wall provides a means of locating service points while maintaining the integrity of differential air pressures; due to the room's external lining not having been penetrated. This method should achieve the best air pressure containment possible.

4.2 Anterooms

An Anteroom or airlock lobby, when attached to an Isolation room, functions as:

- A controlled area in which the transfer of supplies, equipment and persons can occur without contamination impacting on the surrounding health care areas
- A barrier against the potential loss of pressurisation
- Controls the entry or exit of contaminated air when the anteroom door is opened
- A controlled area where personal protective equipment (PPE) or clothing can be donned or removed prior to entry/exit of the isolated contamination area
- Hand washing before entering the isolated room
- Foot operated or other hands-free operated clinical and normal waste bins

The Anteroom will require sufficient space to allow for storage of Personal Protective Equipment (PPE) i.e. gowns and gloves for protective isolation. Anterooms may be shared between two Isolation rooms.

Anterooms should have posters strategically places to guide the correct use of PPE's items.

Where an Ensuite is provided for the Isolation Room, the Ensuite entry door should not be located within the Anteroom. The typical Anteroom plan appears below:

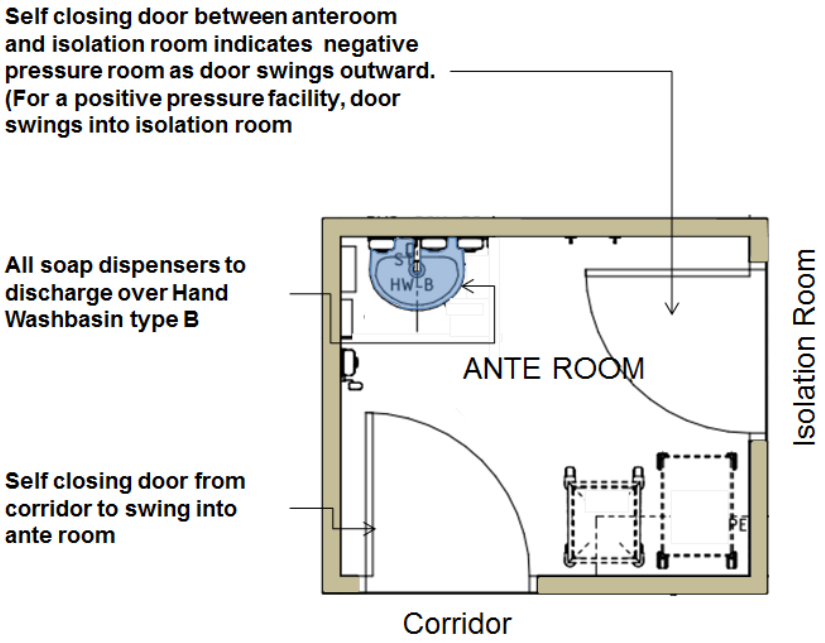

Figure 17: Typical Anteroom plan

The Anteroom is provided for access to the Bedroom by staff and visitors and does not need to permit bed access. Separate entry doors to the Bedroom may be provided for bed access.

The reason bed access is not required through the Anteroom includes the following principles for Class N and Class P Isolation Rooms.

4.2.1 Class N Isolation Rooms

For Negative Isolation Rooms, the patient Bedroom is strongly negatively pressured in relation to the adjacent corridor; when the door to the Bedroom is open, air from the corridor will be drawn into the Bedroom – there is no escape of organisms from the Bedroom into the corridor.

Similarly, the Anteroom is negatively pressured in relation to the corridor, when the door from the corridor to the Anteroom is opened, air is drawn from the corridor into the Anteroom.

The Bedroom is also negatively pressured in relation to the Anteroom, when the door between the Bedroom and Anteroom is open, air will flow into the Bedroom and not escape through the Anteroom.

Negatively pressured rooms should have a pressure gauge and alarm system to advise when pressurisation has not been achieved. Display monitors with audible alarms tied to the Building Management Systems should be provided.

The flow of air for Class N Isolation rooms and recommended pressure differentials is demonstrated in the diagram below:

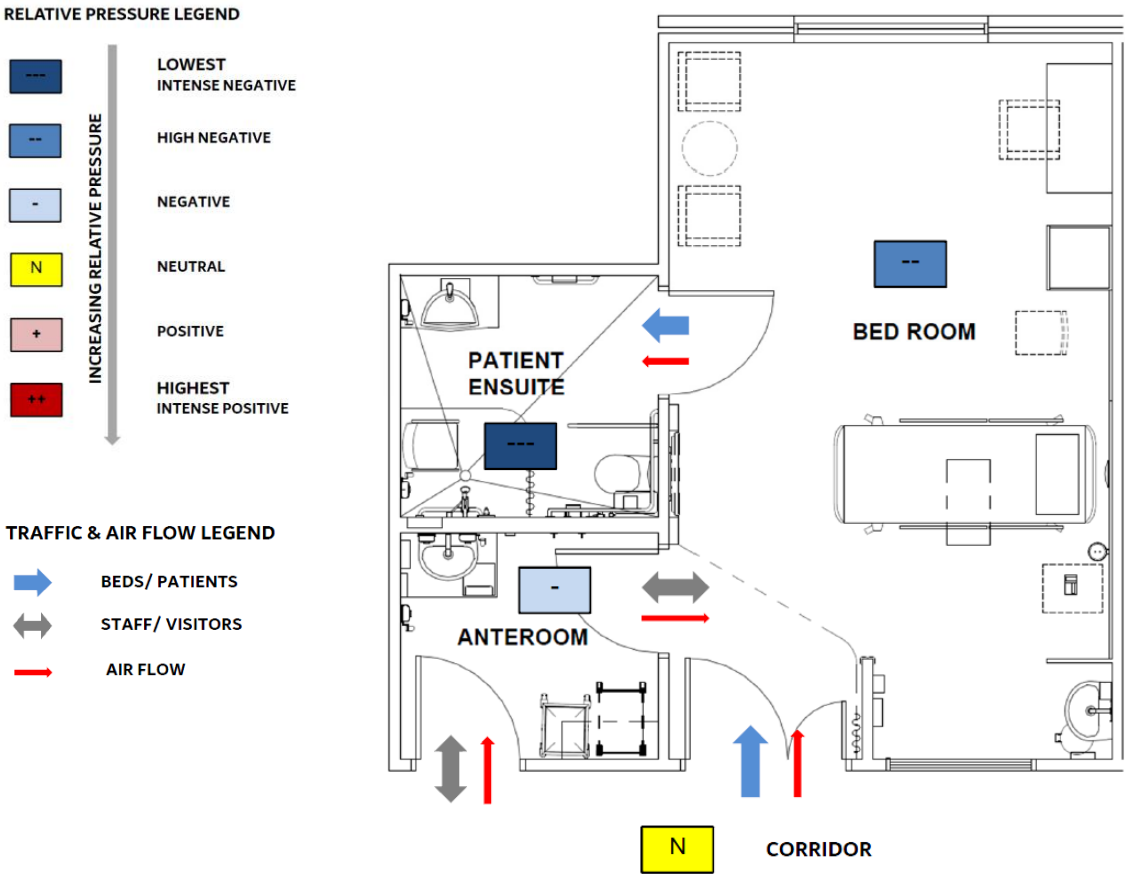

Figure 18: Typical Negative Pressure Isolation Room with Anteroom & Ensuite, showing airflows and relative pressure gradients

4.2.2 Class P Isolation Rooms

For Positive Isolation Rooms, the patient Bedroom is strongly positively pressured in relation to the adjacent corridor; when the door to the Bedroom is open, air from the Bedroom will be drawn into the corridor – there is no entry of organisms from the corridor into the Bedroom.

Similarly, the Anteroom is positively pressured in relation to the corridor, when the door from the corridor to the Anteroom is opened, air is drawn from the Anteroom into the corridor.

The Bedroom is also positively pressured in relation to the Anteroom, when the door between the Bedroom and Anteroom is open, air will flow from the Bedroom and into the Anteroom.

Positively pressured rooms should have a pressure gauge and alarm system to advise when pressurisation has not been achieved. Display monitors with audible alarms tied to the BMS systems should be provided.

The flow of air for Class P Isolation rooms and recommended pressure differentials is demonstrated in the diagram below:

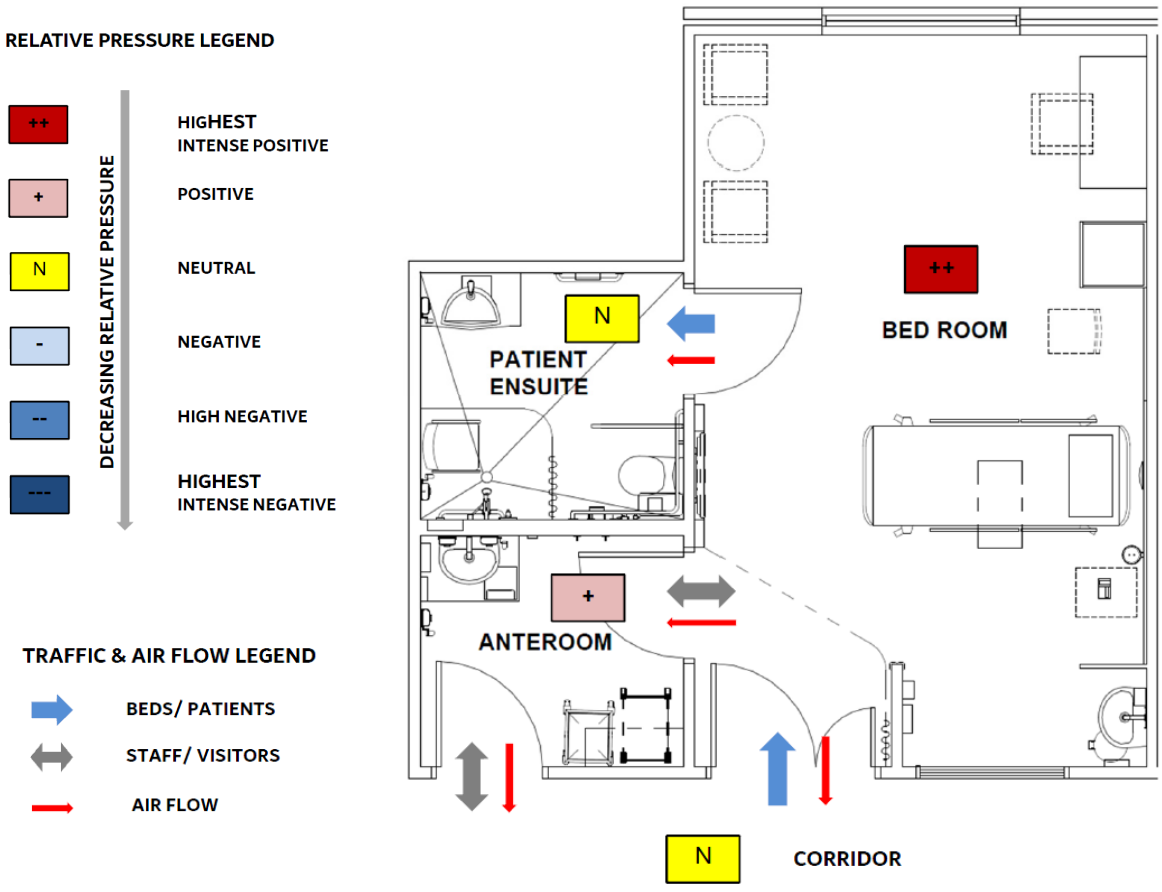

Figure 19: Typical Positive Pressure Isolation Room with Anteroom & Ensuite, showing airflows and relative pressure gradients

4.3 Recommended Pressure Gradients

Where an isolation room is not provided with an Anteroom, the recommended minimum differential pressure between the isolation room and adjacent spaces should be 5Pa. If however an Anteroom is

provided, the recommended minimum differential pressure between isolation room and ambient pressure should be 10Pa.

Recommended pressure gradients are:

Type of Pressurisation	Isolation Room	Anteroom	Ensuite
Class S (Standard pressure)		Not required	
Class N (Negative Pressure)	- 10 Pa	- 5 Pa	- 15 Pa
Class P (Positive Pressure)	+ 10 Pa	+ 5 Pa	0 Pa

Table 4: Recommended Isolation Room Pressure gradients

Refer to **Figure 19** above for a diagrammatic representation of the pressure differentials in the Negative Pressure Isolation rooms and **Figure 20** in relation to Positive Pressure Isolation Rooms.

4.4 Class S – Standard Pressure

A Standard Pressure room is used for patients requiring contact isolation. Normal air conditioning in this application should be appropriate. Standard pressure Isolation rooms may be used for other patients when not required for isolation purposes.

Recommended elements for Class S Isolation Rooms are as follows:

- A clinical handwash basin within the room
- An Ensuite shower and toilet
- A self-closing door

A pan sanitiser located near the room is an optional element for Class S Isolation Rooms.

The room requires labelling as a standard pressure isolation room.

4.5 Class N – Negative Pressure

Negative Pressure Isolation Rooms are for patients who require airborne droplet nuclei isolation (this includes pathogens such as measles, varicella zoster (chicken pox), legionella, tuberculosis). The aim of placing patients in Negative Pressure rooms is to reduce the risk of infection via airborne

transmission to other persons. Negative pressure rooms can also be known as “airborne infection isolation” rooms or “infectious isolation” facilities.

Negative pressure rooms should be located at the entry to an Inpatient Unit, so that the patient requiring isolation does not need to pass other patient areas to access the Isolation Room.

A dedicated exhaust system should be provided to the negative pressure isolation room. To maintain negative pressure the exhaust air should exceed the quantity of the supply air. The exhaust air duct should be independent of the building exhaust air system to reduce risk of contamination due to back draughts and should discharge away from staff, visitor and patient areas. The Isolation Room Ensuite exhaust should not be connected to the building toilet exhaust system.

The Isolation room pressure is lower than the adjoining rooms or corridor.

An Anteroom is required for the negative pressure Isolation Room.

A negative pressure Isolation Room requires the following:

- Anteroom that operates as an airlock with interlocking doors; both doors must not open at the one time; the Anteroom must be large enough to allow for bed movement if direct doors to the patient room from the corridor is not provided
- Alarm to be activated on loss of differential pressure; time delay may be required to permit entry/exit from room
- A clinical handwash basin with ‘hands free’ operation in the Isolation Room and the Anteroom
- An Ensuite shower and toilet
- A self-closing door
- No return air permitted, all air should be exhausted with dedicated exhaust, with low level exhaust ducts approximately 200 mm above floor level to discharge vertically to the outside air
- For patients who are both immunosuppressed and infectious, a HEPA filtration system to be provided on the supply air ducting to protect the patient from unfiltered air
- Exhaust air should be HEPA filtered & provided with UV irradiation

- Provision of a Pan/ utensil sanitiser is optional. If provided, it should be located within the Ensuite or alternatively, disposables can be considered

Differential air pressure instrumentation panels are required external to the isolation and Anteroom in a prominent location. (e.g.: adjacent to the corridor entry door). It is recommended that the isolation room controls are visible to staff so that corrective measure can be implemented when required. It is recommended to allow for display monitors connected to Building Management System.

Air-conditioning systems for negative pressure Isolation Rooms should be connected to an emergency power supply to maintain air pressurisation in the event of a power failure.

The room requires labelling as a negative pressure Isolation Room.

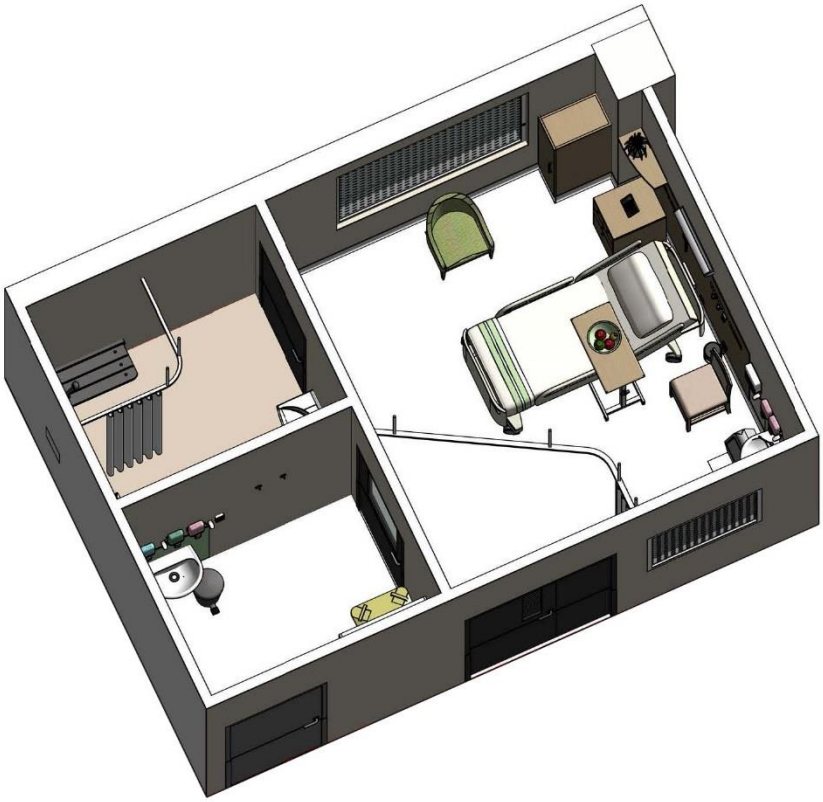

Figure 20: Negative Pressure Isolation room including Ensuite and Anteroom

4.6 Class Q Quarantine Isolation

Class Q Quarantine Isolation requires negative pressure isolation with additional protection for accommodating highly infectious patients with pathogens such as haemorrhagic fever and pneumonic plague. Class Q Isolation Rooms require the following provisions:

- Anteroom that operates as an airlock with interlocking doors; both doors must not open at the one time; the Anteroom must be large enough to allow for bed movement
- Alarm to be activated on loss of differential pressure; time delay may be required to permit entry/exit from room
- Self-closing and interlocking doors
- An Ensuite shower and toilet
- A clinical handwash basin with 'hands free' operation in the Isolation Room and the Anteroom
- No return air permitted, all air should be exhausted with dedicated exhaust, with low level exhaust ducts approximately 200 mm above floor level to discharge vertically to the outside air; exhaust air should be HEPA filtered
- For immunosuppressed and infectious patients, a HEPA filtration system should be provided on the supply air ducting to protect the patient from unfiltered air
- Communication system between the room and the outside area to assist staff movement in and out of the room
- A Pan/ utensil sanitiser in the Dirty Utility Room or alternatively, disposables can be considered

The relationship between the Anteroom, Patient Room, Ensuite and support rooms are demonstrated in the diagram below for an Ultra-isolation facility.

The patient is transported on a bed or trolley and enters the patient room through an Airlock. The airlock is sized to fit the bed within the room with interlocking doors, the internal door will not open while the external door is open, to maintain pressurisation.

Staff enter the Airlock/ Clean Utility, don PPE clothing in the Staff Change and access the Bed Room through the Clean Utility/ Airlock. Waste is taken to the Dirty Utility, double bagged and is removed

via the Airlock, equipment is sterilised through a pass-through autoclave and is removed via the exit Airlock. Interlocking doors are required to the Patient Bedroom, Staff Change and Airlocks to ensure that doors are not open at the same time. Exit of staff, equipment and waste proceeds in one direction only; staff do not re-enter the Dirty Utility or the Bedroom from the Change Room.

Staff re-enter the suite through the Airlock/ Clean Utility and don clean PPE attire in the Staff Change.

The Patient Bedroom should be capable of intensive care treatment with dialysis and able to accommodate an oversized bed. Services pendant arms should be fully sealed, otherwise wall services should be provided.

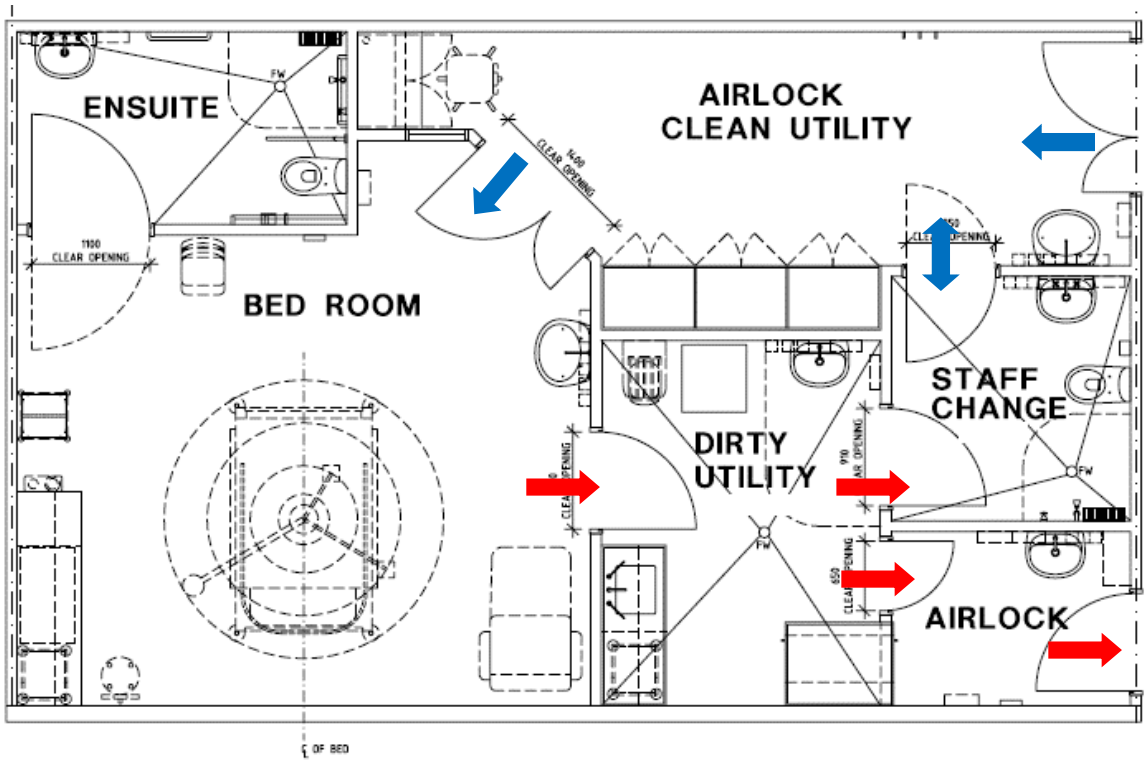

Figure 21: Typical plan of Class Q Quarantine Suite.

Legend:

Entry for Patient and Staff

Exit for Staff, decontaminated equipment and waste

4.7 Class P – Positive Pressure

Positive pressure Isolation Rooms, relative to the ambient pressure are used to isolate immune-compromised patients, for example oncology and some transplant patients. The intent is to reduce the risk of airborne transmission of infection to a susceptible patient.

These rooms are also known as 'protective isolation units' or 'protective environment' rooms. (PE rooms).

The Isolation room is provided with a higher pressure in relation to the adjoining rooms or spaces. An Anteroom is required. The positive pressure Isolation Room requires the following:

- Anteroom that operates as an airlock with interlocking doors; both doors must not open at the one time; the Anteroom must be large enough to allow for bed movement if direct doors to the patient room from the corridor is not provided.
- Alarm to be activated on loss of differential pressure; time delay may be required to permit entry/exit from room
- A clinical handwash basin with 'hands free' operation in the Isolation Room
- An Ensuite shower and toilet
- A self-closing door
- A HEPA filtration system to be provided to the supply air duct to protect patient from unfiltered air
- Low Level exhaust ducts at approximately 200mm above floor level

Positive pressure Isolation Rooms may share a common air system, provided minimum outdoor air requirements comply with DHA regulations. A HEPA filter however must be fitted to the supply air inlet. A HEPA filter is not required to the exhaust air, as the exhaust air is not considered infectious.

Differential air pressure instrumentation panels are required external to the Isolation Room in a prominent location (e.g.: adjacent to the entry door).

The room requires labelling as a positive pressure Isolation Room.

4.8 Class A – Alternating Pressure

Rooms with reversible airflow mechanisms, which enable the room to have either negative or positive pressure, must NOT be used. This is due to difficulties in configuring the appropriate airflow, associated complex engineering, and the high risk of error during operational use for two fundamentally different purposes. Placing a patient requiring airborne isolation (requiring negative pressure isolation) in a positive pressure room could have catastrophic infection control results.

4.9 Schedule – Isolation Room Requirements

The individual components for each type of Isolation Room are identified below.

Component	Standard Pressure Class S	Negative Pressure Class N and Class Q	Positive Pressure Class P
Anteroom	Not required	Yes	Yes
Ensuite (shower and toilet)	Yes	Yes	Yes
Hand basin with hands free operation	Yes	Yes	Yes
Pan Sanitiser (disposables are acceptable as alternative provision)	Optional	Optional for Class N Required for Class Q	Optional
Self–closing door to room	Yes	Yes	Yes
Grille flap to control room air flow	-	Yes	Yes
Low level exhaust 200mm above floor level	-	Yes	Yes
HEPA filter on supply air	-	-	Yes
HEPA filter on exhaust air	-	Yes	-
Pressure monitoring	-	Yes	Yes

Table 5: Schedule of Isolation Room Requirements

Note: Class A Alternating Pressure Isolation is NOT allowed, and requirements therefore have not been included. Also refer to **Part E - Engineering Services** for further information.

4.10 Number of Isolation Rooms

The required number of isolation rooms should be determined by:

- Trends in disease of the general population

- Demographic trends of the population catchment area
- The health facility's specialty services or any projected change to these services

In overnight stay Inpatient Accommodation Units (IPUs) across the whole facility, the number of single Bedrooms or Class S Rooms, (shared rooms are generally not suitable for infection prevention and control) should be maximised where possible. A maximum of 4 beds per room within medical/ surgical IPUs is recommended – dormitory style wards are deemed no longer acceptable and should be avoided.

All IPUs providing overnight accommodation should provide at least one 'Class S – Standard" Isolation Room.

Facilities should provide at least two 'Class N negative pressure' Isolation Room per 60 overnight IPU beds. Additional 'Class N Negative Pressure' Isolation Rooms may be required to meet service profile demands and model of care of the IPU or facility.

There is no set standard for the provision of positive pressure (Class P) Isolation Rooms. The provision of Class P rooms is determined by the service profile and the model of care for the FPU and the facility. The service profile should be based on local population requirements, including prevalence of cancer, AIDS, cystic fibrosis, organ transplant and other conditions that may compromise immunity within the population and an evaluation of threats from pathogens such as aspergillosis.

Available data will inform the service profile of the facility and determine isolation room requirements in regard to number, type and placement of isolation rooms. Data collection should include:

- The number of patient admissions with infections known or suspected to require isolation
- The general duration of isolation required
- Seasonal variation of diseases to determine peak periods of infection
- Infection trends in the populations served by the facility
- Specialties of the health care facility

4.11 Transport of Infectious Patients

It is recommended that transport of infectious patients is limited to movement considered medically essential by the clinicians, e.g. for diagnostic or treatment purposes. Where infectious patients are required to be transported to other units within the hospital or outside the following precautions may be implemented:

- Infected or colonised areas of the patient's body are covered:
  - For contact isolation this may include a gown, sheets or dressings to surface wounds; these patients are transferred to a Standard Pressure or Protective Environment Isolation room.
  - For respiratory isolation the patient is dressed in a high filtrating mask, gown and covered in sheets; these patients are accommodated in a Negative Pressure Isolation Room.
  - For quarantine isolation the patient may be transported in a fully enclosed transport cell or "Isolator" with a filtered air supply and exhaust; these patients are accommodated in a high level quarantine isolation suite.
- The transport personnel remove existing PPE, cleanse hands and transport the patient on a wheelchair, bed or trolley, applying clean PPE to transport the patients and when handling the patient at the destination. Gown-up and gown-down rooms located at the entry to a Unit will assist the staff to enter and exit the facility according to the strict infection control protocols required, thereby reducing the risk of contamination.
- The destination unit should be contacted and notified prior to the transfer to ensure suitable accommodation on arrival.
- It is preferred that the patient is transported through staff and service corridors, not public access corridors During planning stages, design can assist transfer of infectious patients by providing service corridors and strategically placed lifts, capable of separation from other lifts. The nominated lift may be isolated from public and staff transit through access control measures and cleaned following transit of the infectious patient.
- Design may also incorporate a designated floor for horizontal bed transfers of infectious patients away from busy clinical areas. The designated floor may be located at mid-level in the hospital.
- A combination of nominated lifts, corridors and a bed transfer floor would assist in the movement of infectious patients through the hospital and minimise the risk of spread of infection.

5. Surfaces and Finishes

5.1 Surfaces

Regular routine cleaning of the Health Care Facilities premises can be carried out much more efficiently if the design of the building has fully addressed surface finishes appropriate to the functional use. Unnecessary horizontal, textured, moisture retaining surfaces or inaccessible areas where moisture or dust can accumulate should, where possible, be avoided.

All fixtures and fittings should accordingly be designed to allow easy cleaning and discourage the accumulation of dust. Integral blinds (double glazed windows with blinds in-between), vertical blinds and vinyl roller blinds are preferable to curtains for this reason.

All door surfaces, in particular, the top horizontal surface of doors should be sealed to provide a cleanable, moisture-resistant finish.

Where there is likely to be direct contact with patients, blood or other body fluids, floors and walls should be surfaced with smooth impermeable seamless materials, such as vinyl. In equipment processing areas, work surfaces should be non-porous, smooth and easily cleaned.

All surfaces in high risk clinical areas, including the Operating Unit, Intensive Care Unit, Obstetrics Unit and Neonatal Special Care Nurseries, should be smooth, seamless, in-organic and impervious with sealed or welded joints.

Tiles with grouted joints may be used in the following areas:

- Waiting areas
- Consult rooms
- Patient ensuites/ bathrooms
- Corridors but not within Operating Unit, Emergency Unit, Intensive Care Unit, High Dependency Unit, Neonatal Intensive Care Unit and Sterile Supply Unit.
- Public areas

- Kitchen
- Back-of-House areas
- Non-clinical areas

Where tiles are used, it is recommended that they should be as large as possible to minimise joints but without compromising the gradient of falls in wet areas.

Carpet, flocked vinyl and synthetic parquet flooring can be installed in the following areas when preferred:

- Non-clinical areas
- Waiting areas
- Meeting rooms
- Education and lecture rooms
- All administrative rooms and offices

5.2 Ceilings

All exposed ceilings in areas occupied by patients or staff, and in food preparation or food storage areas, should be finished so as to be readily cleanable with equipment routinely used in daily housekeeping activities.

In food preparation and other areas where dust fallout will present a potential problem, such as clinical areas or storage areas and sterile stock supply rooms, there should be a finished ceiling that covers all conduits, piping, ductwork and open construction systems.

Ceilings in Operating Rooms, Recovery Stage 1, Birthing Rooms, Isolation Rooms, Nurseries, Sterile Processing Rooms, Bone Marrow Transplant Units and Oncology Units must be monolithic from wall to wall without fissures, open joints, or crevices that may retain or permit passage of dirt particles. Light fittings shall also be recessed and flush fitting, with seals to prevent dust ingress.

Acoustic and/ or lay-in ceilings shall not be used where the disturbance of particulate matter may interfere with infection control.

Figure 22: Acoustic tile ceiling suitable for Offices and Conference rooms

Figure 23: Monolithic ceilings in Stage 1 Recovery areas

5.3 Walls

Other than special treatments such as feature wall elements in public or staff relaxation areas, all wall finishes to clinical areas should all be washable and have a smooth surface. In the immediate vicinity of plumbing fixtures, wall finishes should be smooth and water-resistant, with edges sealed. Tiled areas in food preparation areas should be supplied with epoxy grouting.

Vinyl-type wall paper may be used instead of standard paint where required. Sheet wall-vinyl, fully welded may be used in lieu of washable paint.

Any low height walls, or walls that are not full height and which provide a ledge for dust collection, particularly when located in clinical or procedural areas, should be capped with a durable and impervious material that can be easily cleaned and maintained. Refer to detail diagram below.

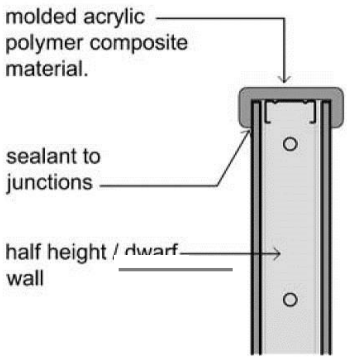

Figure 24: Recommended detail - low height wall capping

5.4 Doors

Cavity sliding doors must not be used in clinical areas so that all IPC requirements can be met. Surface sliding doors are permissible as long as they do not contradict fire safety regulations and there are no floor tracks used.

Figure 25: Cavity sliding doors not suitable for clinical areas

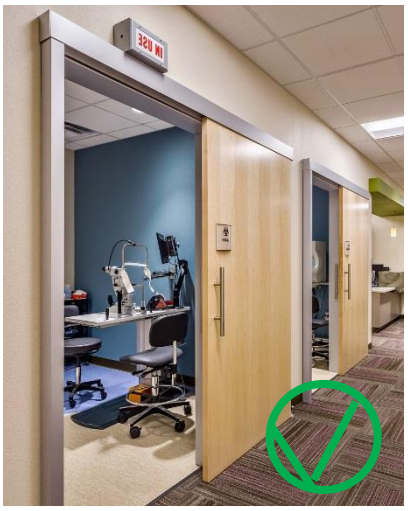

Figure 26: Surface sliding doors permitted when meeting fire safety regulations

Doors to isolation rooms are to be self-closing, fitted with door seals to top and sides of the frame, and include an adjustable drop-down bottom seal. In addition, the astragal or rebated meeting stile of double doors will require a door seal.

Consideration should also be given to the direction of swing of the door, depending on the pressure differential.

Ideally, doors should be swung so that the door action pushes against the seal due to the pressure gradient. Essentially, positive pressure isolation rooms should have an inward swinging door (into the bedroom), while negative pressure isolation rooms should have an outward opening door (into the anteroom). Where this not possible to achieve, an alternative solution is for both self-closing doors to open into an Anteroom.

Sliding doors are not recommended in Isolation Rooms due to difficulties in maintaining door seals. If however space does not permit the use of a swing door, a surface mounted sliding door can be used as a last resort.

5.5 Floors and Skirtings

All flooring selections should enable good housekeeping maintenance and be easy to clean. Treatment Areas should not be carpeted. Non-slip vinyl finishes should be located under all handwash basins.

Floors in areas used for food preparation or food assembly should be water resistant and greaseproof to comply with local Authority Food Hygiene Regulations. Floor surfaces in food preparation areas, including joints in tiles, should be resistant to food acids. Local Authority regulations will typically mandate the use of epoxy grouts in tiled food preparation areas. Adoption of epoxy grout to tiled clinical areas is also recommended as an infection prevention and control methodology.

In all areas subject to frequent wet cleaning methods, floor materials should not be physically affected by germicidal cleaning solutions.

Where floors meet wall surfaces in wet areas, the floor finish should be curved at the junction to avoid a square joint, the cove skirting turned up minimum 100mm from the floor. This assists with cleaning maintenance and improves infection control measures. Gaps which can harbour micro-organisms, dirt and grime at the floor/wall junction should therefore avoided.

Skirtings in all clinical areas, food preparation areas and other areas subject to frequent wetting due to cleaning methods, should be made integral with the floor - tightly sealed against the wall and constructed without voids.

Figure 27: Seamless flooring and coved skirting in clinical areas such as Operating Unit are integral and coved

5.6 Gaps

A gap is defined as a space where two materials do not meet, leaving a space or opening that can harbour dust, germs, mould or vermin.

In the construction of Health Care Facilities, gaps between surfaces are not permitted, and must therefore be properly sealed. In particular, gaps in the following situations are not allowed:

- Between skirting and floor
- Between utility benches and walls
- Between cupboards and floor or walls
- Between fixtures (including sanitary fixtures) attached to floors and walls

Floor and wall construction, finishes and trims in dietary and food preparation areas shall be free of spaces that can harbour rodents and insects.

Floor and wall penetrations by pipes, ducts and conduits shall be tightly sealed to prevent entry by rodents and insects. Joints in structural elements shall be similarly sealed.

Gaps in the following situations must be sealed:

Figure 28:
Gaps between door frame and floor

Figure 29:
Gap between bench fitting and wall

Figure 30:
Gap between skirting and walls

5.7 Indoor Plants and Water Features

Indoor natural plants are not recommended in healthcare facilities. Indoor plants may be used only in limited areas of the public lobby, although not recommended by these Guidelines. Indoor natural or artificial plants must not be sued in any patient or clinical areas of healthcare facilities.

Water features, other than sealed aquariums, are not permitted inside healthcare facilities.

6. Construction and Renovation

6.1 Planning

Infection prevention and control (IPC) precautions during construction should be integrated into the design and documented from the beginning of the design stage. It is important that the infection and prevention control principles developed during the pre-design stage are integrated at the initial stages of the design development.

Infection Prevention and Control needs to be addressed throughout the planning process and measures taken should provide appropriate advice at the right time so that costly mistakes can be avoided.

A back-up emergency power supply should be provided to ensure that mechanical fans, alarms and monitoring systems do not fail when there is a main supply disruption.

6.2 Risk Management

A formal approach to risk management must be part of all building and renovation activities. Risk management should include specific assessment of infection control risks.

A more detailed review of risk is beyond the scope of this document, but adherence to Risk Management principles will provide the framework to assemble a relevant risk management strategy.

Airborne sampling may be part of a risk management program. Cumulative data is used to establish indoor and outdoor background levels of filamentous fungi for a particular site. This will enable establishment of risk profiles for particular locations in and around the hospital.

A back-up emergency power supply should be provided to ensure that mechanical fans, alarms and monitoring systems do not fail when there is a main supply disruption.

The risk profile should as a minimum:

- Identify the location of high-risk patients in relation to the site
- Identify ventilation system types and potential impact
- Determine air monitoring requirements, methodology and frequency
- Take air quality samples to establish a baseline
- Identify possible contaminants and their locations (contaminants may be present in ceiling dust, service shafts, sprayed on fire retardants and bird droppings)
- Identify previously unknown holes, shafts, penetrations etc. connecting one area to another

6.3 Construction

Current construction practices can impact on patient well-being by the dissemination of bacteria and fungi that can cause health care associated infections.

Building, renovation and maintenance activities within a Health Care Facility impose risks upon the incumbent population unlike any other building site.

Building practices therefore require a range of precautions appropriate to the risk. Identification of the “at risk” population, a knowledge of the transmission route of a likely pathogen and location of the “at risk” population in relation to the construction, need to be taken into account in the planning stages.

At Risk population in this context refers to:

- Inpatients and Outpatients
- Staff
- Visitors

Infection control measures to consider during construction are:

- Infection control site induction of building workers should be carried out as a major component of the Occupational Health and Safety induction; this induction process should be documented and signed off by each person inducted.
- Worker compliance with procedures should be monitored and the results of this monitoring should be fed back to the workers routinely through the Builder; a system must be in place to

manage major breaches.

- Ensure that adequate inspections by the nominated representatives take place during the construction of the barrier hoardings; inspections should be monitored and reported on.

Negative pressurisation of the construction zone is recommended to eliminate dust or pollutant penetration into clinical areas. The exhaust/ extraction systems specified in the contract documentation must be constantly monitored and maintained to ensure no failures occur. These inspections should be documented and reported on.

If HEPA filtration is required, a person must be nominated as the responsible person for that duty. The filters should have differential pressure monitoring with alarms. Spare filter elements must be kept on hand. These inspections should be documented and reported on.

Routine inspections of barriers should be conducted by the hospitals nominated representative from the contractor. These inspections should be documented and reported on.

Routine air sampling should be employed by the hospital to monitor the effectiveness of the barriers, pressurisation and housekeeping procedures. The routine air sampling should be documented and reported on.

A high level of site cleanliness is essential. It is recommended that tools with efficient dust extraction systems connected to HEPA filters be used. Tasks such as sanding plasterboard present a high level of potential risk. Therefore, it is recommended that mechanical sanding with vacuum duct collection be used.

Demolition and jack hammering of concrete should be undertaken with a filter unit in close proximity.

HEPA vacuuming, not sweeping, should be used to clean up. Conventional vacuum cleaners disseminate huge quantities of dust and fungal spores and should not be used.

Movement in and out of the site must be controlled by restricting access to only those who have undergone site induction. This will assist greatly in reducing the spread of contaminants.

All inspections should be documented including a non-conformance system for defaults, complete with a corrective and preventative action methodology.

6.3.1 Air Sampling Methodology

Air sampling may be undertaken during renovations, construction and the commissioning process and should involve Microbiology specialists.

There are two distinct sampling methodologies for the detection of viable airborne fungal spores. These are high air volume sampling and low air volume sampling. Sampling for viable fungal spores almost universally is via low air volume sampling. Low volume sampling is used to measure high spore concentrations. High volume sampling is used to measure low spore concentrations.

Along with airborne sampling, routine surface sampling should be used. A combination of settle plates and surface swabbing can be employed to augment airborne sampling. Airborne sampling has limitations due to the burst nature of fungi and the transience of bacilli.

It is important to have a clear idea of what outcomes are required from the sampling. Equally important it is necessary to have an approximate idea of the expected number of fungi that will be obtained. This will determine the appropriate sampling system.

6.4 Verification

All infection control measures described in this section are required to be capable of verification by inspection. There should be no obstacles to prevent the checking and validating the infection control measures described.

7. Glossary

Term	Meaning
ACH or ACHR	Air changes per hour
Air Changes	The volume of air flowing through a space in a certain period of time (i.e.: airflow rate) measured against the volume of air within the space (i.e. room volume). This ratio is usually expressed as the number of air changes per hour (ACH)
Anteroom	A small lobby leading from a corridor into an isolation area or room. The ante room acts as a holding area to prevent contaminants escaping from the isolation area or room into the adjacent corridor.
Clinical HW Basins	Handwash basins used by staff members in the context of clinical care provision and are designed to be used “hands-free” with sufficient clearance to allow for cleansing forearms as well as hands
Droplet nuclei	micro particles of up to 5 um diameter that are formed from the dried residue of droplets that become airborne by coughing, sneezing or from air currents and turbulence; these particles can stay airborne for lengthy periods
Ensuite	Room attached to a single occupancy patient room, with its own door and facilities for washing, such as a non-clinical handwash basin, shower and toilet
Flash Sterilisation	Immediate-use steam sterilisation
HEPA Filter	A High Efficiency Particulate Air (HEPA) filter capable of removing 99.97% of particles 0.3 um in diameter. This size of particle is the most difficult to filter, as larger or smaller particles are filtered at even greater efficiency
Infection	This is a condition where organisms capable of causing disease enter the human body and elicit a response from host’s immune defences
IPC	Infection Prevention and Control (IPC) strategy or methodology.
IPU	Inpatient Unit of a facility that provides beds for an overnight stay
Negative Pressure	The relative pressure difference between two areas in a health care facility. A “negative pressure” room is a single–occupancy patient care room which has a lower air pressure than adjacent areas, which keeps air from flowing out of the room to adjacent areas.
Non-clinical HW Basins	Handwash basins used for general standard of hygiene, such as after toilet use, where hands are soiled, and includes vanity basins in ensuite bathrooms
PPE	Personal protective equipment or PPE refers to protective clothing, helmets or hairnets, goggles, or other or equipment designed to protect a person’s body from injury. The hazards addressed by protective equipment can include physical, electrical, heat, chemicals, biohazards, and airborne particulate matter
Positive Pressure	The relative pressure difference between two areas in a health care facility. A “positive pressure” room is a single occupancy room which has a higher pressure than adjacent areas, which keeps air from adjacent areas flowing into the room.
Um	Micrometre or micron, a measurement of wavelength, length and sizes of cells and bacteria

8. Further Reading

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