

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.

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. Consideration should be given to installing individual thermostats in each room so that air temperature and relative humidity can be controlled from within the room.

Isolation rooms do not necessarily always require the provision of an Anteroom. This should be determined by the proposed operational policy and be included at an early stage of the design process. Where an Anteroom is however a requirement, it 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.

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.

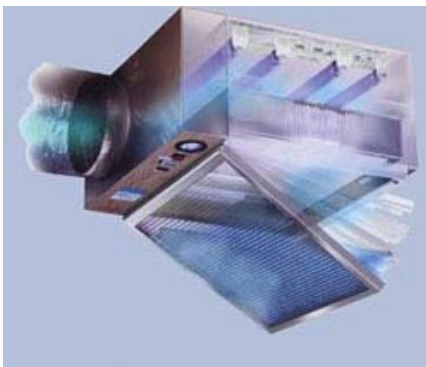
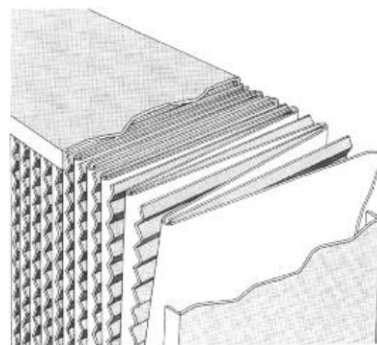


Figure 15: Typical HEPA Filter



Typical HEPA filter construction

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.

The Anteroom will require sufficient space to allow for storage of Personal Protective Equipment (PPE) i.e. gowns and gloves for protective isolation. Anterooms should not be shared between Isolation rooms.

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:

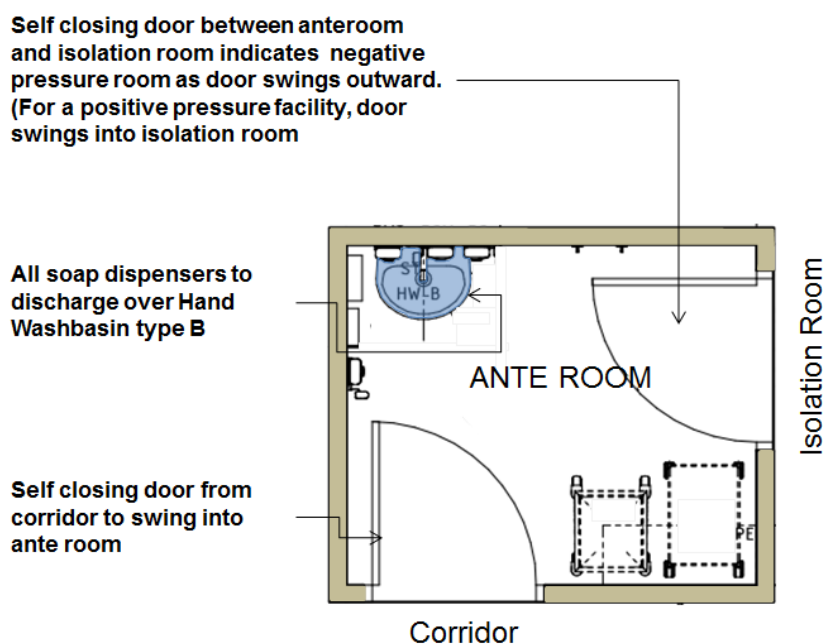


Figure 16: Typical Anteroom plan

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 are provided for bed access.

The reason bed access is not required through the Anteroom includes the following principles:

- 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
- Strongly negatively pressured rooms will prevent air from the Anteroom, Bedroom and Ensuite escaping into the corridor.

Negatively pressured rooms should have a pressure gauge and alarm system to advise when pressurisation has not been achieved.

4 Isolation Rooms

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

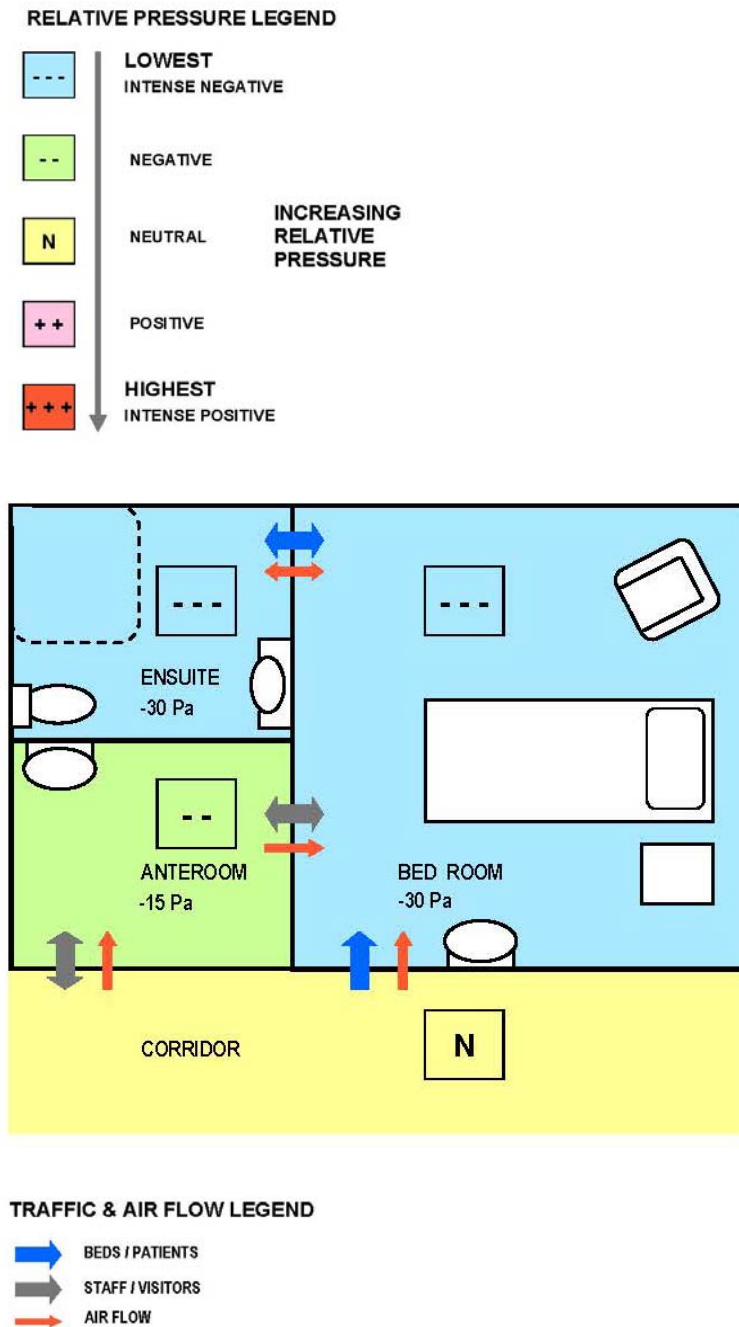


Figure 17: Typical Negative Pressure Isolation Room with Anteroom & Ensuite, showing airflows and relative pressure gradients

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 15 Pa. If however an Anteroom is provided, the recommended minimum differential pressure between isolation room and ambient pressure should be 30 Pa. Any additional pressure gradients between successive pressurized areas should not be less than 15 Pa.

Recommended pressure gradients are:

4 Isolation Rooms

Type of Pressurization *	Isolation Room	Anteroom	Ensuite
Class S (Standard pressure)		Not required	
Class N (Negative Pressure)	- 30 Pa	- 15 Pa	- 30 Pa
Class P (Positive Pressure)	+ 30 Pa	+ 15 Pa	+ 30 Pa
Class P with negative pressure Anteroom	+ 15 Pa	- 15 Pa	+ 30 Pa

Source: Victorian Advisory Committee on Infection Control: Guidelines for the classification and design of isolation rooms in health care facilities, 2007.

Table 4: Recommended Isolation Room Pressure gradients

Refer to Figure 17 above for a diagrammatic representation of the pressure differentials in the Negative 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 system removes a quantity of air greater than that 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. Pressure differentials should not be less than 15 Pa between isolation rooms and the adjacent ambient air. An Anteroom is optional for the negative pressure Isolation Room. If an Anteroom is not provided, a PPE bay with a hand basin should be located adjacent to the room entry.

A negative pressure Isolation Room requires the following:

- A clinical handwash basin with ‘hands free’ operation in the Isolation Room and the Anteroom, if provided
- An Ensuite shower and toilet
- A self closing door
- 100% outside air ventilation (i.e. no return air permitted), with low level exhaust ducts

4 Isolation Rooms

approximately 150 – 300 mm above floor level to discharge vertically to the outside air

- Supply air ducts are to be independent of the building supply air system
- For immunosuppressed and infectious patients, a HEPA filtration system should be provided on the supply air ducting to protect the patient from unfiltered air.
- Exhaust air should be HEPA filtered

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 accessible by staff so that when required, the negative pressure system can be switched off.

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.

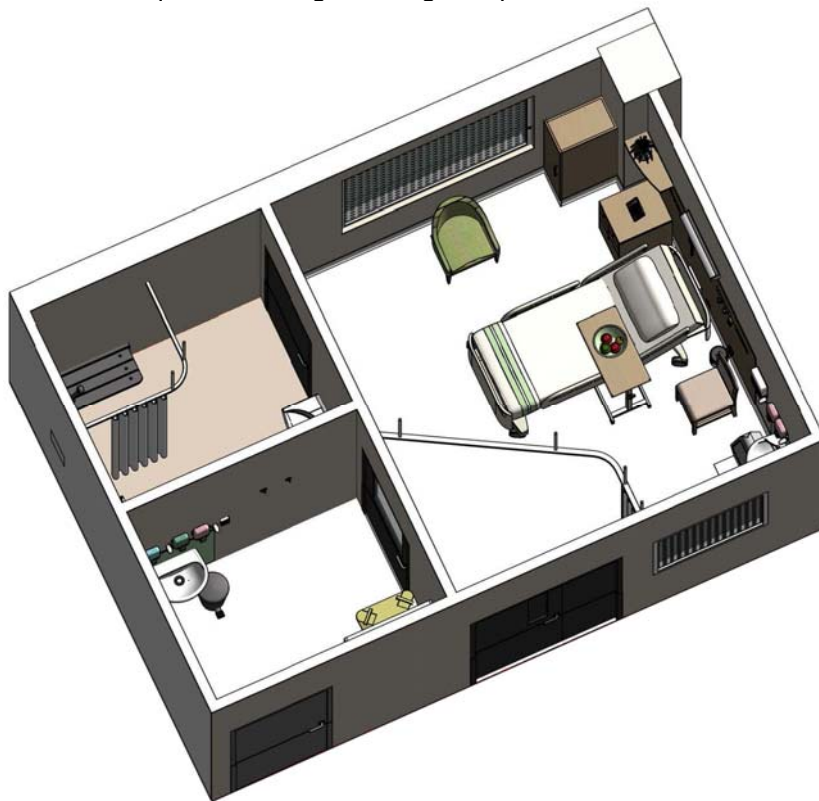


Figure 18: Negative Pressure Isolation room including Ensuite and Anteroom

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
- 100% outside air ventilation (i.e. no return air permitted), with low level exhaust ducts approximately 150 to 300 mm above floor level to discharge vertically to the outside air; exhaust air should be HEPA filtered

4 Isolation Rooms

- Supply air ducts are to be independent of the building supply air system
- 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
- Pan/ utensil sanitiser.

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.

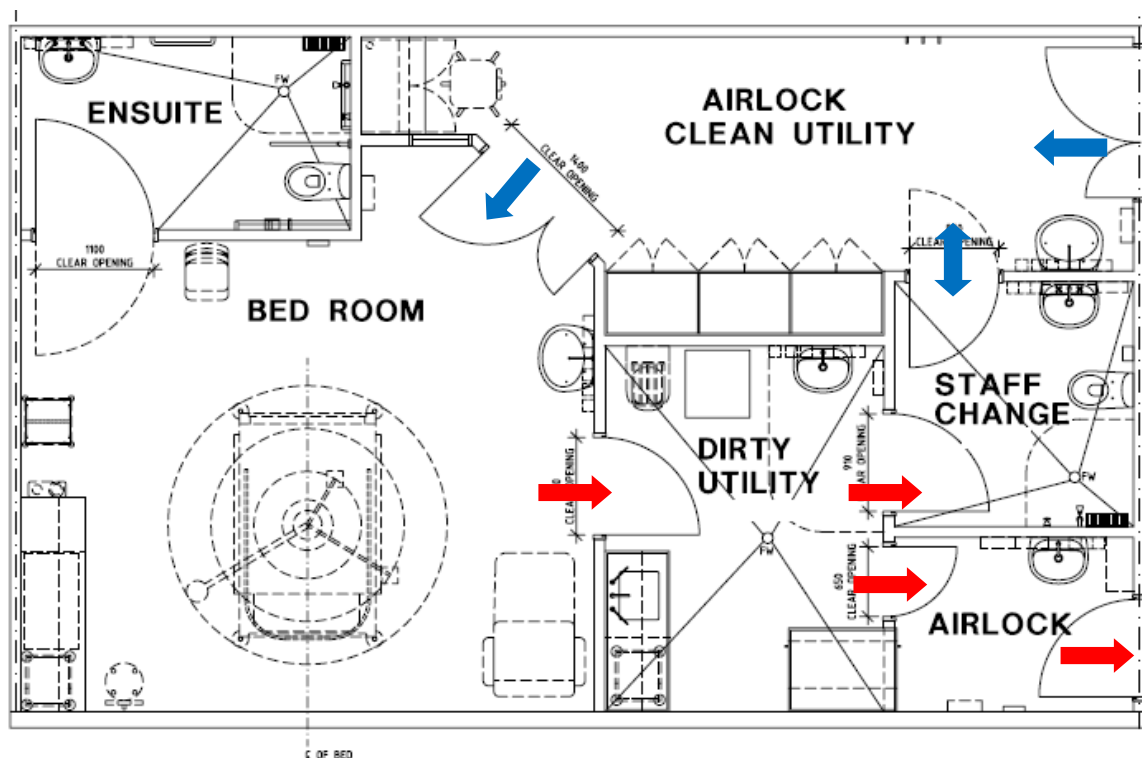


Figure 19: Typical plan of Class Q Quarantine Suite.

Legend:



Entry for Patient and Staff



Exit for Staff, decontaminated equipment and waste

4.6 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 not required. The positive pressure Isolation Room requires the following:

- A clinical handwash basin with 'hands free' operation in the Isolation Room
- An Ensuite shower and toilet
- A self closing door.

Positive pressure Isolation Rooms may share a common air system, provided minimum outdoor air requirements comply with local 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.

4.7 Class A - Alternating Pressure

Rooms with reversible airflow mechanisms, which enable the room to have either negative or positive pressure, should 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.

4.8 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	Optional for Class N Required for Class Q	Not required
Ensuite (shower and toilet)	Yes	Yes	Yes
Hand basin with hands free operation	Yes	Yes	Yes
Pan Sanitiser	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
Independent air supply	-	Yes	-
100% intake of fresh air	-	Yes	-
Low level exhaust 150mm to 300mm above floor level	-	Yes	Yes
HEPA filter on supply air	-	-	Yes
Pressure monitoring	-	Yes	Yes

Table 5: Schedule of Isolation Room Requirements

4 Isolation Rooms

Note: Type A alternating pressure Isolation is not recommended and requirements therefore have not been included

4.9 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 speciality services or any projected change to these services.

A minimum of 20% of the total bed complement in overnight stay Inpatient Accommodation Units (IPUs) across the whole facility should however be provided as single Bedrooms or Class S Rooms, (shared rooms are generally not suitable for infection prevention and control). 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 one 'Class N negative pressure' Isolation Room per 100 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 IPU 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.

4.10 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 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

4 Isolation Rooms

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.



The International Health Facility Guidelines recommends the use of HFBS “Health Facility Briefing System” to edit all room data sheet information for your project.

HFBS provides edit access to all iHFG standard rooms, and departments, and more than 100 custom report templates.

HFBS Health Facility Briefing System



Briefing Module

The Health Facility Briefing System (HFBS) has numerous modules available via annual subscription. It suits healthcare Architects, Medical Planners, Equipment Planners Project Managers and Health Authorities.

Use the HFBS Briefing Module to quickly drag in health facility departments or pre-configured room templates from the iHFG standard, edit the room features such as finishes, furniture, fittings, fixtures, medical equipment, engineering services. The system can print or download as PDF more than 100 custom reports including room data sheets, schedules, and more...

To learn more about the HFBS web-based Healthcare Briefing and Design Software and to obtain editable versions of the “Standard Components” including Room Data Sheets (RDS) and Room Layout Sheets (RLS) offered on the iHFG website, signup for HFBS using the link below.

Get Started Now:
hfbs.healthdesign.com.au

- ✓ iHFG Room Data Sheets and Departments are instantly editable in the HFBS software available online.
- ✓ You can access hundreds of report templates to print your iHFG room data in HFBS.
- ✓ HFBS has a onetime free 3 day trial available to all new users.

Get Started Now:
hfbs.healthdesign.com.au



HFBS

Health Facility Briefing System

hfbsinfo.com | techsupport@healthdesign.com.au